

Socio-Technical Innovation Bundles for Enhancing Women's Resilience and Empowerment:

A Case Study of Swayam Shikshan Prayog's Women-led Climate Resilient Farming



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Socio-Technical Innovation Bundles for Enhancing Women's Resilience and Empowerment: A Case Study of Swayam Shikshan Prayog's Women-led Climate Resilient Farming

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Table of Contents

Executive Summary	4
1. Introduction	6
1.1 Review and Research Gaps	6
1.2 Research Question and Objectives	7
1.3 The Research Theme	7
1.4 The Contribution	8
2. Methodology	8
2.1 Axiology, Ontology, and Epistemology	8
2.2 Research Design/ Strategy	9
2.2.1 Research Philosophy: Constructivism/ Interpretivism	9
2.2.2 Research Type: Inductive	9
2.2.3 Methodological Approach: Qualitative	9
2.2.4 Research Design/ Strategy: Case Study	10
2.2.5 Time Horizon: Cross Sectional	10
2.2.6 Sampling Design: Purposive - Critical Case	10
2.2.7 Data Collection Method: Semi-Structured Interviews and Focus Group Discussions	11
2.2.8 Data Analysis and Technique: Thematic Analysis	11
3. Description of the Case	12
3.1 Challenges and Strategies	13
3.2 Interventions	13
4. Results and Discussion	14
4.1 Socio-Technical Innovation Bundles (STIBs)	14
4.2 Market Intervention	17
4.3 Building Resilience	17
4.4 Empowerment Process	18
4.5 Challenges and Lessons	19
5. Conclusion	20
References	22
Annexures	23

Executive Summary

Marathwada region of Maharashtra in India faces severe water scarcity, posing challenges for cash crop cultivation and leading to economic, social, and ecological concerns, including crop failure and forced migration. In response to these challenges, Swayam Shikshan Prayog (SSP) developed a 'Women-led Climate Resilient Farming' (WCRF) model in 2014 to reposition women as farmers, leaders, and change agents. The model aims to address gender disparities in access to resources by marginalized women farmers in distressed agrarian areas of Marathwada, known for high rates of farmer suicides. This study aims to fill the research gap in the limited focus on the lived experiences of women farmers by examining the specific challenges faced, providing critical insights for targeted interventions.

The study explores how Socio-Technical Innovation Bundles (STIBs) integrated into SSP's WCRF model contribute to building the resilience and empowerment of women farmers in Dharashiv district in the region. By comprehending the dynamics and interaction of STIBs, it aims to contribute substantively to the discourse on empowering marginalized women farmers in the face of agrarian challenges and climate change impacts.

The research methodology for the study revolves around axiological, ontological, and epistemological considerations, a research design that employs a constructivist/interpretivist paradigm, aligning with an inductive approach, and a qualitative approach to capture nuanced aspects of the research question. The study used purposive critical case sampling, semi-structured interviews, focus group discussions (FGDs), and a thematic analysis for data analysis. The cross-sectional time horizon provided a snapshot of prevalent characteristics within the population.

In the WCRF model, women not only cultivate for family consumption but also produce goods for the market, autonomously taking their produce to market without interference from male family members (Tewary 2018). Through participatory training, women farmers progress from informal groups to producer groups, cultivating with water-efficient, chemical-free practices. The model's core components encompass soil management, water harvesting, mixed cropping, fruit tree plantation, vermicomposting, bio-fertilizers, and bio-pesticides. Also, livestock rearing, modern agricultural techniques, extension services, and market support are key components of the model. Demonstration farms run by successful women farmers serve as learning platforms, and trained women become Krishi Samvad Sahayaks (KSS), playing pivotal roles in awareness campaigns and farmer selection. SSP identifies, trains, and develops skilled women as coaches, fostering collective empowerment. A Women-led Community Resilience Fund (CRF) offers micro-funding for agricultural innovation. The model links women to government schemes and enables the establishment of FPOs.

Underpinning the WCRF model are five key impact areas: Food Security with Nutrition, Water Security, Livelihood Security, Natural Resource Management and Women Empowerment. However, the model faces challenges such as resistance from decision-making family members, especially men, and socio-cultural barriers hindering women's land ownership. SSP strategically addresses these challenges by cultivating women's agency to navigate socio-cultural complexities.

To overcome the region's resistance to expensive technology, SSP adopts a mixed-crop one-acre model, integrating traditional knowledge and emphasizing water conservation techniques. SSP also collaborates

with technology partners and facilitates access to agricultural technologies. The mixed crop technology has yielded significant outcomes. Participants in this study reported a reduced risk of food scarcity and stable income during adverse climatic conditions such as droughts or unseasonal rains. The model ensures income stability by diversifying crops and mitigating the impact of crop failures. Organic crop cultivation has led to decreased health-related expenditures, and there is a diminished need for migration, as participants earn sufficient income from their farmlands. Despite potential yield variations, cost savings on fertilizers and pesticides compensate, resulting in increased overall income.

Resistance from men, accustomed to single sowing and harvesting cycles, is mitigated by technology adoption, including solar water pumps and other innovations. Training sessions facilitated by SSP have played a crucial role in disseminating knowledge about organic farming and the mixed crop model. Participants, acting as disseminators, extended this knowledge to other women in their villages. Training improved communication skills, enabling some to persuade family members to adopt mixed cropping. Training in small-scale businesses fostered skills in entrepreneurship, tailoring, dairy, poultry, and small grocery shop operations. SSP facilitated market linkages and product training, leading to a substantial increase in annual income and savings.

Government schemes have provided participants with resources such as sprinklers, wells, support for onion storage, farm ponds, toilets, house units, and Ujjwala gas. Participants also emphasized the need for policy intervention at the government level to secure appropriate prices for their produce. Participants highlighted that men traditionally handle market transactions, even in families where women are primary decision-makers regarding cultivation choices. Resilience among participants is both a process and an outcome, signifying adept adaptation to challenging life experiences. The exposure to SSP's WCRF model, along with participation in a network of women, has substantially influenced their resilience. Participants detailed the coping strategies they have adopted, strengthening their ability to navigate and surmount social, agroecological, and economic challenges. Diversifying income streams has fostered economic resilience, eliminating the need for women to engage in daily wage labor or seek loans from money lenders. The majority of participants expressed their ability to make independent decisions confidently and support other women in exercising their agency. Participants view empowerment as a personal struggle that requires individual initiative, with external support serving as a facilitating factor.

The lessons learned from SSP's rehabilitation work in the aftermath of the Latur earthquake in 1993 played a pivotal role in shaping a comprehensive approach to the WCRF model, and actively contributing to the empowerment, resilience, and economic sustainability of women farmers in the Marathwada region.

1. Introduction

Swayam Shikshan Prayog (SSP) was founded in 1998, following a collaborative venture with the state Government of Maharashtra (India) in the aftermath of the Latur earthquake reconstruction project, encompassing 1200 villages. Subsequently, the organization made a strategic decision to concentrate on women's empowerment as a catalyst for change in water-scarce and drought-prone regions spanning seven states in India. Presently, SSP's focus is on women farmers' collectives in the Marathwada region of Maharashtra which grapples with severe water scarcity, exacerbated by inadequate irrigation infrastructure, thereby posing economic, social, and ecological challenges and risks for farmers cultivating cash crops. The region's 22 droughts in 145 years indicate a probability of occurrence of around 15%, suggesting the likelihood of a drought approximately every 6 to 7 years. In fact, within the examined period, there have been five consecutive droughts: 1876-77, 1920-21, 1971-72, 1984-85, and 2014-15 (Kulkarni et al. 2016).

The ongoing trend of rural-to-urban migration among men has led to a discernible "feminization" of the agriculture sector, with more women undertaking diverse roles as cultivators, entrepreneurs, and laborers. Women are playing a major role in ensuring food security and preserving local agro-biodiversity. These rural women assume responsibility for the integrated management and utilization of diverse natural resources to fulfill daily household needs (Press Information Bureau 2018). Against this backdrop, identifying and addressing existing disparities in women's access to resources, including technology, land, credit, water, seeds, and markets becomes imperative to formulate strategies that promote gender equity in the agricultural domain. In 2014, SSP teams developed a Women-led Climate Resilient Farming (WCRF) model to address these issues and to reposition women as farmers, leaders, and change agents who adopt food secure and climate-smart practices on their farms.

1.1 Review and Research Gaps

The recent All India Report of Agriculture Census (2015-16) notes a 5.86% increase in the total number of operational holdings in the country, from 138.35 million in 2010-11 to 146.45 million in 2015-16 (Ministry of Agriculture & Farmers Welfare 2020). Male-operated holdings, excluding institutional holdings, constituted 86.0%, while female-operated holdings accounted for 14.0% in 2015-16, compared to 87.2% and 12.8%, respectively, in 2010-11. This data underscores a rising trend in the involvement of women in the management and operation of agricultural holdings. Data for 2015-16 reveals that 72% of female operational holders fell in the marginal farmer category, followed by 17% in the small category, and 8.1% in the semi-medium category.

This distribution is particularly noteworthy given that approximately 86% of farmers in India fall within the small and marginal categories, with an average landholding size of less than 1.1 hectares. The agricultural sector in India is the primary employer of 80% of economically active women in the country. Of these, 33% constitute the agricultural labor force and 48% are engaged as self-employed farmers (Jadhav 2023).

Research conducted by the Indian Council of Agricultural Research (ICAR) indicates that women's participation in the production of major crops is 75%, in horticulture 79%, in post-harvest work 51%, and in animal husbandry and fisheries 95% (Press Information Bureau 2018). However, there is a major gap in research pertaining to the lived experiences of women in agriculture, particularly those confronting grassroot realities, with an emphasis on women farmers and labor from marginalized

communities, made worse in agrarian distressed areas such as the Marathwada and Vidarbha regions in Maharashtra known for high rates of farmer suicides. Maharashtra accounted for 7,887 reported suicides, 47% of the total number of farmer suicides in India between 2019 and 2021 (Lok Sabha 2023). The highest number of farmer suicides in the state occurred in the Vidarbha and Marathwada regions. Between 1 January 2020 and 31 December 2022, there were 4,409 farmer suicides in Vidarbha (Amravati and Nagpur), while Marathwada recorded 2,683 cases (Maharashtra Assembly 2023).

Despite the challenges posed by climate vagaries in these regions, there is a conspicuous dearth of studies on the role played by marginalized women farmers in building resilience in relation to the agrarian crisis and the process of empowering themselves. An understanding of the specific challenges and realities faced by them can offer critical insights necessary for informed interventions and targeted strategies that can fortify their agency and resilience.

1.2 Research Question and Objectives

This study critically examines the WCRF model, explaining the interplay of technology, technical interventions, social dynamics, policy interventions, and market forces in augmenting the multifaceted process of women's resilience and empowerment. It also scrutinizes the convergence of these pivotal domains, dissecting their collective impact on fostering women's agency.

The research question for this study is:

"How do Socio-Technical Innovation Bundles (STIBs) integrated into Swayam Shikshan Prayog's Women-led Climate Resilient Farming (WCRF) model contribute to the augmentation of resilience and empowerment among women farmers?"

This study focuses on villages in Dharashiv (erstwhile Osmanabad district) in Marathwada region of Maharashtra, India, and its objectives are to:

1. Examine the demographic and socio-economic characteristics of women farmers actively engaged in the WCRF model.
2. Investigate the spectrum and variations in the social, economic, technical, institutional, and policy interventions bundled within the model.
3. Analyze the intricacies involved in the process of identifying gender-responsive innovations bundled into the model.
4. Scrutinize the multi-stakeholder processes involved in the rollout and implementation of the bundled interventions within the WCRF framework.
5. Evaluate the procedures and gender-specific outcomes stemming from the integration of STIBs within the model.
6. Examine the transformative impact of STIBs on women farmers, specifically how they contribute to empowerment and resilience-building among the targeted demographic.

The study thus intends to provide a comprehensive understanding of the complex tapestry that shapes and advances the empowerment trajectory of women in the Marathwada region.

1.3 The Research Theme

The study endeavors to investigate the symbiotic impact of technology and technical interventions, coupled with concurrent social, policy, and market interventions within the framework of WCRF and evaluating their efficacy in ameliorating the socio-economic challenges faced by marginalized

women farmers. This approach is vital as the perception of farmers is shaped by socialization and perpetuated by mainstream media, predominantly portraying men as farmers and women as mere helpers. This ingrained stereotype adds complexity to the challenges faced by women in agriculture, hindering their struggle against oppression. In the context of patriarchy, oppression takes various forms, like exploitation, violence, marginalization, deprivation, and subjugation. When women farmers engage in innovative climate-smart agriculture, they confront layers of oppression as they challenge traditional agricultural norms upheld by society (Jadhav 2023). By examining the interplay between these elements, the study aims to bring out the complex dynamics that shape resilience-building and empowerment processes.

1.4 The Contribution

The United Nations acknowledges the universal ramifications of climate change, underscoring, however, that its impact is not evenly distributed among global populations. There is a consensus that climate change disproportionately affects the most vulnerable demographic groups, irrespective of their status in developed or developing nations, thereby accentuating prevailing societal inequities. Women find themselves confronted with elevated risks and heightened burdens arising from climate change, especially in impoverished contexts, compounded by entrenched societal roles, responsibilities, and cultural norms. Recognizing their pivotal role in agriculture, the empowerment of women in this sector is a strategic avenue for enhancing climate adaptation efforts. Facilitating access to suitable technology and resources becomes instrumental in fostering sustainable agricultural and conservation practices. Furthermore, alleviating poverty has the potential to enhance adaptive capacities in the face of climate change impacts. Notably, the involvement of women in community initiatives proves pivotal in the pursuit of climate resilience (UNFCCC 2023).

This study emphasizes the role played by women farmers from marginalized communities in addressing the agrarian crisis exacerbated by climate change. The study posits that their empowerment is contingent upon their access to technical and technological innovations and interventions. However, such access is complex, given the socio-economic and cultural contexts wherein women are systematically marginalized, impeding their recognition as equitable participants in agricultural domains. The study delineates the imperative bundling of technological and technical interventions with concurrent social, policy, and market interventions to address these challenges comprehensively. This study highlights the experiences of women participants and the formidable obstacles they encounter as exemplified by their struggles to attend training programs organized by the SSP.

Apart from highlighting the critical importance of integrating women into the planning process, the study contributes substantively to the discourse on climate change mitigation and adaptation and documents the processes and outcomes of STIBs incorporated in the WCRF model. It also delves into the women's progression from securing fundamental rights to emerging as leaders within their households and communities.

2. Methodology

2.1 Axiology, Ontology, and Epistemology

An inception workshop was held in Dharashiv on 9 November 2023, attended by key stakeholders, including SSP representatives, women actively implementing the model, data collectors, and

researchers. The participants engaged in extensive discussions encompassing axiological, ontological, and epistemological perspectives. The deliberations led to a paradigm shift, rejecting detached objectivity in favor of acknowledging the inseparable link between the researcher and the subject under investigation.

Axiologically, the workshop prioritized upholding the rights and dignity of individual women farmers, emphasizing respect for the knowledge derived from their lived experiences. The ethical underpinning centered around understanding and analyzing the meaning and value ascribed by women to their work and lives. To facilitate this, the participants stressed the importance of establishing an informal dialogue, considering the socio-cultural context.

Ontologically, the research embraced relativism, focusing on subjective meaning rather than an absolute truth, a vital lens shaping the researcher's understanding of the nature of reality and human experiences. It guided inquiries into whether resilience and empowerment are objectively measurable entities or socially constructed realities within the context of women-led climate-resilient farming.

Epistemologically, the collaborative and dynamic approach highlighted the joint involvement of the researcher and participants in co-creating meaning and generating findings through interactive methods. The interactive nature of the methodological approach ensured that findings emerged collaboratively through shared dialogues, acknowledging the importance of contextual sensitivity.

2.2 Research Design/ Strategy

2.2.1 Research Philosophy: Constructivism/ Interpretivism

The selection of the constructivism/interpretivism paradigm was a deliberate outcome driven by the nuanced nature of the research question, objectives, and the underlying axiological, ontological and epistemological framework. The constructivist lens is particularly adept at unravelling the socially constructed realities by acknowledging the subjective nature of human experiences.

The interpretivist paradigm within this constructivist framework is instrumental in facilitating an in-depth understanding of the individual experiences through which these constructed realities manifest. It aims to explore the intricate interplay of narratives, power structures, reflexivity, and the women farmers' perceptions of the social world, providing insights into how they position themselves within the broader socio-cultural context. It offers a robust analytical framework to navigate the complexities of understanding the subjective realities, power dynamics, and self-perceptions embedded in the socio-cultural context.

2.2.2 Research Type: Inductive

The rationale for adopting an inductive approach is grounded in the absence of extant theoretical foundations pertaining to the WCRF model. This approach involves a bottom-up process, where the researcher started with individual instances and, through analysis, identified patterns, themes, or commonalities that lead to the formulation of more abstract and generalized theories. This choice underscores the commitment to derive insights organically from the amassed data, unfettered by a priori theoretical constraints. Methodologically sound and pragmatic, it aligns seamlessly with the research's overarching objective.

2.2.3 Methodological Approach: Qualitative

The inaugural workshop and subsequent meetings constituted a forum to deliberate on the methodological approach for the study. Both quantitative and qualitative approaches were rigorously scrutinized, and a consensus emerged that mere reliance on numerical data and statistics would

inadequately capture the intricacies inherent in the subject matter. Recognizing the need for a more profound understanding encompassing rationales, contextual nuances, as well as emotional and affective dimensions, a methodological framework that integrates qualitative methods was chosen. This decision aligns with the imperative to holistically shed light on the multifaceted aspects underlying women farmers' resilience in the context of climate change. The choice was also made since the research questions involve exploring complex, context-dependent, and socially embedded phenomena. The qualitative data also helped the researcher explore how and why certain social phenomena unfolded over time.

2.2.4 Research Design/ Strategy: Case Study

The CGIAR Initiative on Gender Equality, Work Package 2 led by International Rice Research Institute (IRRI) and the GENDER Impact Platform invited proposals for a case study to assess process and gendered outcomes of STIBs. The research philosophy and type and methodological approach that evolved following deliberations in the inception workshop suited the case study format as it allowed the researcher to delve deep into a specific phenomenon in Dharashiv district where the WCRF model is being executed. The design provided a comprehensive understanding of the complexities and intricacies of real-life situations, offering insights that would not be achievable through other research methods.

The phenomena selected for the study was context-dependent, and case studies excel at capturing the context in which social processes occur, which is crucial for interpreting and generalizing findings to other settings. This case study involved the collection of rich qualitative data, and the depth of information allowed researchers to gain a nuanced understanding of the social processes under investigation. To understand the role of the WCRF model in facilitating empowerment and resilience among women farmers, this approach contributed to theory development by providing empirical evidence through detailed examination of specific cases, identification of patterns, relationships, and factors that contribute to theoretical insights.

2.2.5 Time Horizon: Cross Sectional

The research methodology employed a cross-sectional time horizon due to the imperative for speedy data collection and analysis within a limited timeframe. It involved the acquisition and analysis of data at a singular point in time, emphasizing a static examination of the current state and characteristics of the subjects under investigation, avoiding temporal changes. This choice offered a cost-effective alternative to protracted longitudinal studies, and allowed the rapid acquisition of insights into the variables studied, enabling a snapshot of the subject matter at hand.

2.2.6 Sampling Design: Purposive - Critical Case

Purposive critical case sampling allowed the researcher to focus resources and attention on cases that are strategically chosen to maximize the study's relevance, richness, and contribution to knowledge and aligns with the qualitative research goal of gaining a deep understanding of specific cases and contexts. The selected cases are rich in information, providing a depth of understanding that might not be achievable with randomly or conventionally selected cases. In the process of sample selection, the researcher systematically applied 15 distinct criteria to identify eligible women farmers. These criteria include identity (belonging to scheduled castes or tribes), landless status, association with families living below the poverty, experiences of marital abandonment or widowhood, classification as a small and marginal farmer, active participation in the WCRF model, limited educational attainment (up to standard 10), disability, exposure to domestic violence, early marriage below the age of 18, affiliation with religious minorities, farmer husband's suicide, and absence of a permanent dwelling.

From the pool of potential participants, the top 50 women who met the maximum number of criteria were purposely selected as the sample for the study. However, four women were not available for the interview; hence the final sample comprised 46 women farmers. The underlying assumption is that if the WCRF model demonstrates positive outcomes in terms of resilience and empowerment among these highly marginalized women, it is likely to be effective among women in relatively better socio-economic positions. Data collectors sought participants' consent for audio recording during in-depth interviews and FDGs and to include their names and the names of their villages in the research study.

2.2.7 Data Collection Method: Semi-Structured Interviews and Focus Group Discussions

Semi-structured interviews with 46 women farmers were conducted using a set of predetermined questions. Data collectors also asked follow-up questions and explored emerging themes in order to adapt to the participant's responses and delve deeper into relevant topics. Participant-centered semi-structured interviews allowed for in-depth exploration of participants' experiences, perspectives, and feelings, and women farmers expressed themselves freely and shared their own narratives and interpretations of the WCRF model, concept of resilience, and process of empowerment.

Getting women to speak was a major challenge; hence the semi-structured format allowed interviewers to build rapport with participants. Also, in cross-cultural research, semi-structured interviews allow for cultural nuances to emerge. Interviewers can adapt their approach to be culturally sensitive, ensuring that questions are relevant and respectful within the participants' cultural context. The researcher also collected data through two FDGs with SSP members who are key players in shaping and executing the WCRF model, two FDGs with women farmers, and data from organizational records. The FDG with SSP members took place on 9 November 2023 in Dharashiv, in which 10 women farmers distinguished as grassroots leaders within SSP actively guided other women in agricultural experimentation. These participants were specifically chosen to glean insights into their on-the-ground experiences, how they navigated oppressive structures while establishing themselves as cultivators and decision-makers, and eventually assuming leadership roles. A subsequent FDG dedicated to comprehending the WCRF model, was held on 11 December and involved three women leaders from SSP who are key in evolving the WCRF model. These FDGs were a prelude to field visits for comprehensive data collection. Two additional FDGs -- in Borda village with five women farmers (12 December 2023) and in Partapur with four participants (17 December 2023) -- aimed to further explore and contextualize the findings from individual interviews. This data triangulation was used to enhance the validity and reliability of research findings.

2.2.8 Data Analysis and Technique: Thematic Analysis

Considering the research question and objectives of the research, thematic analysis technique was used to analyze the data as it helped to identify patterns, themes and meanings within the dataset. A deductive coding approach was used to identify STIBS in the WCRF model, starting with a predefined set of codes based on existing study material, concepts, and the research question. While this approach offers structure and efficiency, the researcher remained open to unexpected findings and to refine the coding structure as needed. The emergence of the inductive elements prompted adjustments to the initial coding framework based on the nuances and richness of the data. A descriptive coding method was used to identify and label key features, characteristics, and themes within the data, aiding its thorough understanding.

3. Description of the Case

The Women-led Climate Resilient Farming model advocates integrated farming techniques, emphasizing the growth of livestock and farm-allied businesses, alongside the greater consumption and marketing of nutritious, locally-grown food crops. In the model, beyond cultivating for family consumption, women actively engage in the production of goods intended for the market. What sets this model apart is the autonomy women enjoy in taking their produce to market, free from interference by male family members. This allows women to independently navigate the market sphere, showcasing their agency in economic endeavors. By participating in both subsistence farming and market-oriented production, women contribute significantly to the overall household economy (Tewary 2018).

Developed by SSP based on women farmers' lived experiences, this model serves as an empowerment conduit, facilitating the transformation of women from being only laborers to leaders as well in agriculture. The model advocates for women securing cultivation rights to a small parcel of land to grow food crops (also called the one-acre model). Women employ water-efficient, chemical-free cultivation practices, engaging in diversified mixed cropping and increasing crop cycles. Leveraging traditional roles, women, traditionally the household livestock managers, are trained to produce low-cost bio-fertilizers and natural pesticides. The model helps women in decision-making processes related to cultivation, sales, consumption, and income, thereby establishing autonomy and savings. Core components of the mixed crop model encompass soil management, water harvesting, mixed cropping, fruit tree plantation, vermicomposting, natural pesticides, livestock rearing, modern agricultural techniques, extension services, and market support. Demonstration farms run by women who have successfully implemented all these components serve as practical learning platforms. Trained women progress to become Krishi Samvad Sahayaks (KSS) for SSP, playing a central role in on-the-ground campaigns, creating awareness, and farmer selection. KSS also act as facilitators between women farmers and local government officials. They identify, train, and develop skilled women as coaches for other women farmers, fostering collective empowerment. The training covers organic cultivation, vermicomposting, water harvesting, leadership, financial management, and entrepreneurship. Peer learning is encouraged to create a supportive network, with community facilitators and trainers serving as touchpoints for learning, demonstrations, and issue resolution.

The Women-led Community Resilience Fund (CRF) initiated by SSP offers microfunding for innovative agricultural endeavors, empowering rural women farmers. More mature groups link with Agriculture Technology and Management Agency (ATMA) to access government schemes, expand enterprises, and enhance market linkages. Some groups graduate to become FPOs for collective marketing, contributing to rural value chains.

SSP collaborates with diverse stakeholders, including family members of women farmers, resource organizations, government departments, and CSR initiatives, garnering support for the model. Recipient of the United Nations Development Program's Equator Prize 2017, SSP is a pioneer in ecologically sustainable agriculture, countering the adverse impacts of drought.

Underpinning the WCRF model are five key impact areas: Food security with nutrition, Water security, Livelihood security, Natural Resource Management and Women empowerment. Leveraging the inherent knowledge of women in local food crop cultivation, the model ensures food and nutrition security for families. According to a study conducted by SSP in 2019, WCRF adopters currently experience a notable 10 to 15% increase in food crop productivity, cultivating an average of 15 different food crops. The cultivation of local, less water-intensive crops, and the use of naturally available bio-inputs contribute to soil moisture retention. A fundamental aspect involves

linking farmers to government schemes for micro-irrigation and water harvesting models. The SSP database shows that 35 to 45% of adopter farmers have access to drip or sprinkler irrigation or a farm pond. Livelihoods are secured by reducing cultivation costs, enabling savings on purchased food, and diversifying income sources.

Since 2015, SSP has trained approximately 42,700 farmers in WCRF, with a notable adoption rate of 25,803 individuals, covering 12,901.50 acres. According to the SSP's internal database, farmers who embraced this model have reported a substantial improvement in crop yields ranging from 10 to 15% and realized significant cost savings on agriculture inputs ranging from 20 to 30%. The model has proven effective in promoting economic efficiency, as evidenced by reported savings in food consumption ranging from 35 to 45%. Presently, 83% of farmer adopters have initiated at least one additional farm-based business. The model has also helped women by facilitating access to land titles for 13% of the adopters and mentoring 25% to become agri-entrepreneurs. These numbers are from the SSP's database which is regularly updated to evaluate the impact of the WCRF model (Patil 2023, personal communication). These impactful outcomes underscore the model's success in addressing food security, water sustainability, livelihood enhancement, and the process of resilience building and empowerment of women farmers.

3.1 Challenges and Strategies

The drought experienced in Marathwada during 2012-2015 compelled numerous women to adopt the WCRF model, given its emphasis on less water-intensive crop cultivation and its pivotal role in ensuring household food security. However, its implementation encountered several challenges. Initially, decision-making family members and men were reluctant to endorse the adoption of the model, primarily due to its focus on cultivating household food staples such as vegetables, grains, and pulses, as opposed to cash crops. In response, women used available land as demonstration plots to illustrate the advantages of organic farming. The model's promotion of multi-cropping served to diversify risks and reduce input costs. Leadership from SSP conducted a thorough mapping of household expenditures to elucidate the benefits associated with cultivating food at home.

Another substantial impediment pertained to giving agricultural decision-making authority to women. Families hesitated to transfer the land title to women. This often hinders women from availing of government schemes. Following persistent policy intervention efforts, the Maharashtra government instituted a policy allowing women to access schemes with written documentation from the landholder, typically the husband. Witnessing this policy change, men have increasingly begun transferring land to their wives' names to avail themselves of enhanced benefits from various schemes. In response to the region's socio-cultural challenges that are formidable barriers to the empowerment of women farmers, SSP strategically orchestrates the empowerment process, aiming to enable women farmers to autonomously discern and address these challenges.

3.2 Interventions

The Marathwada region's resistance to expensive technology necessitated the strategic adoption of a mixed-crop one-acre model by SSP. The model integrates traditional knowledge derived from women farmers, emphasizing the cultivation of local crop varieties and the use of homegrown seeds, mixed/intercropping, crop diversification, and the application of bio-pesticides (Dasparniark, Neem Ark, Brahmastra, Agniastra, etc.) and bio-fertilizers (compost, cow dung, vermicompost). Central to the model is the incorporation of water conservation techniques, including farm ponds, drip irrigation, sprinkler sets, tree plantation, and soil conservation. The organization facilitates access to diverse technologies such as biogas, solar, and battery-operated spraying. Collaboration with technology partners ensures the dissemination of agricultural technologies, with SSP actively engaging in securing feasible and affordable access to extension

services for farmers, rendered through its policy interventions and partnerships with government bodies, non-government organizations, and financial institutions. SSP plays a facilitator role in aligning farmers with government schemes, policies, and subsidies related to agriculture and streamlining access to such initiatives, sensitizing the community, and enhancing their participation. Emphasizing training sessions and workshops for women farmers, it collaborates with agricultural training bodies like Krishi Vigyan Kendras (KVKs) to enhance the skill levels of women farmers.

The introduction of technology and the provision of technical training necessitates concurrent social intervention. SSP's engagement extends to assisting women in persuading their families to embrace technology and facilitating their attendance at training sessions. It actively supports women farmers in their struggle to establish themselves as cultivators, gain cultivation rights, and partake in decision making processes, facilitated by local SSP leaders operating at the village level.

Importantly, SSP's interventions have succeeded in mitigating rural-to-urban migration, thereby securing livelihoods for women farmers with dignity. A critical understanding of the oppressive structures within which women farmers operate is vital to understand the empowerment process and building of resilience. Ideological, institutional, interpersonal, and internalized oppression operate independently but also intersect and can be multiplied by layers of prejudice, privilege, power, and authority to become more unfair, coercive and cruel, particularly for women of marginalized caste, class, or race groups. Hence, the WCRF model operates on the concurrent bundling of technology, technical, social, and policy interventions.

Acknowledging the stark social realities, the model incorporates social intervention alongside technological and technical interventions. The viability of the latter two is contingent upon concurrent policy intervention. SSP has been trying another separate intervention in the market ecosystem by forming FPOs led by women farmers. The existing Agriculture Produce Market Committee (APMC) structure in India provides very little scope for women farmers to play an active role in marketing their produce as these mandis are dominated by men.

Despite the extensive discourse surrounding agricultural produce pricing and policies, women farmers have traditionally remained on the periphery of these discussions. SSP's advocacy efforts have propelled women farmers to actively participate in and contribute to the discourse.

4. Results and Discussion

The introduction of technology at the rural level is ineffective without concurrent technical proficiency. Access to both technology and technical skills necessitates social intervention, while policy intervention serves as a crucial facilitator in streamlining the pathways to seamless technology accessibility. The synergistic interplay of these factors underscores the holistic and multifaceted strategy employed by SSP in the execution of its WCRF model.

4.1 Socio-Technical Innovation Bundles (STIBs)

The mixed crop technology developed by SSP (see annexures) yields six significant outcomes. Firstly, study participants noted a mitigated risk of food scarcity and no instances of family members experiencing hunger during adverse climatic conditions like droughts or unseasonal rains. Secondly, the model ensures income stability by diversifying crops, thereby mitigating the impact of crop failures. Thirdly, households employing organic crops report a decrease in health-related expenditures. The fourth outcome is a diminished need for migration, as participants earn sufficient income from their

farmlands and other small businesses. Despite potential yield variations compared to traditional farming, cost savings on fertilizers and pesticides compensate for it. The fifth outcome is an increase in overall income, as reported by participants. The sixth outcome is enhanced yields due to diversification and the use of organic inputs. However, resistance from men, accustomed to single sowing and harvesting cycles, is mitigated by technology adoption, such as solar water pumps, threshing machines, spraying pumps, manual seed drillers, electric charging spray pump, battery-operated pumps, and sowing machines. While some participants combine chemical with organic inputs, others assert the effectiveness of organic methods. Participants also commend natural fertilizers and pesticides for pest control and employ water conservation technologies like drip irrigation and sprinklers, particularly during drought seasons. Biogas and solar panel technologies further facilitate cultivation practices.

Introducing technology marked the initial phase, while including women in training and overseeing the implementation of their acquired knowledge constituted another crucial step in the model. Participants in the study reported acquiring comprehensive knowledge of organic farming and the mixed crop model through SSP training sessions. The engagement of study participants from marginalized communities in the training sessions occurred following persistent efforts by SSP leaders in the villages to explain the benefits of participation. These participants, acting as disseminators, passed on this knowledge to other women in their villages, especially those not part of the SSP network. Trainings were instrumental in improving participants' communication skills, enabling some of them to persuade family members to adopt mixed crop cultivation using organic methods, and spelling out the detrimental effects of chemical fertilizers.

The training sessions were informal and conducted in the Marathi dialect so that women feel more confident expressing themselves in their native language. Unlike traditional one-way lectures, they encourage a dynamic dialogue, providing a platform for women farmers to actively share their experiences and the knowledge they have gained through practical work in their fields. This emphasis on dialogue is transformative, as it conveys to the women that they are not merely passive recipients of information but valued contributors to the collective learning process. This recognition of their expertise and experiences instills a newfound confidence, reinforcing the idea that they are present not only to acquire new skills but also to share their invaluable insights.

The training methodology underlines the importance of acknowledging women's role as farmers, emphasizing their resourceful cultivation practices in the absence of monetary support. The sessions by experts are a mix of scientific and theoretically grounded knowledge about natural farming, alongside practical demonstrations. Communicating to women that their contributions hold significant value serves as a catalyst for effective communication.

The training sessions also informed participants about their cultivation rights and mixed cropping. Some women, initially restricted by family members from cultivating agricultural land, began growing crops in their backyard, guided by SSP's training on organic farming. Training on spraying, harvesting, and preparing natural fertilizers and pesticides reduced their dependence on husbands who withheld financial support. Women farmers in Maharashtra are engaged in agriculture within the confines of their households, cultivating vegetables with available resources. Post-training, these women demanded a portion of land from their families. Some families readily allocated land, while others assigned some area after the male members had completed their cultivation. Importantly, this wasn't an additional burden to the women since they have been working in family fields but without the authority to make decisions about crops or marketing strategies.

After just a few harvest cycles, women demonstrated that their cultivation methods were economically beneficial to the family. Many times, men joined them in cultivation, recognizing them as equal partners in decision-making. The self-help group movement played a crucial role, offering

women access to low-interest loans. Financial support from organizations like SSP further enabled them to market their organic produce at competitive prices. The economic advancements achieved by women compelled men to actively participate in their agricultural endeavors. Where resistance persisted within families, female farmers in the village extended support to their counterparts, assisting with cultivation and harvesting. The tradition of "irjik" (collective labor) is deeply ingrained among women farmers, fostering a strong sense of community and leading to the emergence of collective farming, and marking a significant shift in traditional gender roles within the agricultural landscape.

Participants received guidance in entrepreneurship, fostering skills in tailoring, dairy, poultry, and small grocery shop operations. SSP facilitated market links and product training, leading to a substantial increase in annual income and savings. SSP's guidance on agriculture loans enabled participants to secure loans from banks and self-help groups, reducing reliance on private moneylenders. An interesting observation noted by participants is the consistent visit by representatives of private financial institutions to the villages, extending loan offers to women farmers who are generating substantial income from their agricultural pursuits and other businesses. The use of mobile technology and the internet facilitates communication, with SSP leaders providing regular updates on schemes and motivational stories. Some participants joined WhatsApp groups, receiving information on minimum support prices, weather updates, and other developments. Leaders of the SSP at the village level ensure that women farmers without mobile access receive all the information circulated on WhatsApp groups.

Water conservation workshops enhanced the adoption of drip and sprinkler technologies. Even women facing resistance in shifting from water-intensive crops like sugarcane successfully implemented drip irrigation. Sarita Gaikwad is a farmer from Partapur village who was impacted by the suicide of her farmer brother-in-law in 2017. Prior to it, she and her husband had taken loans from a private money lender. Sarita said, "After joining SSP, I attended various meetings, learning farming techniques and transitioned from chemical to organic farming, resulting in reduced farming costs and stable income." Chaya Khandekar is a farmer from Shelka (Dhonara) village who worked as farm labor despite having farmland which she could not afford to cultivate. Sharing her experience in working with SSP, Chaya said, "By participating in SSP, I received training in goat rearing and flour milling, gaining valuable insights into business development. The coming together of vocational training, organic farming education, access to government schemes, and capacity building collectively contributed to a substantial increase in my monthly income by Rs 10,000, enabling me to save Rs 3,000 every month."

Participants asserted that thorough training, guidance, and the promotion of organic farming and agri-allied businesses can alleviate the financial burden on farmers, mitigating the struggle for basic family necessities and potentially contribute to a reduction in suicides in the region. A significant social intervention facilitated by SSP through the WCRF model is enabling small and marginal women farmers to transition away from physically demanding daily wage labor. The mixed crop model and other allied agricultural ventures generate substantial income, freeing women from labor-intensive work. Another social intervention is the cultivation of self-assertiveness in women farmers. The majority of participants acknowledged their initial reticence, where they had to seek permission from husbands and in-laws even for trivial matters. SSP village leaders, in collaboration with established network members, encouraged women to vocalize their rights and join the SSP network. Though this led to community gossip and familial discontent, it dispelled anxiety, instilled confidence, and fostered a sense of empowerment among the women.

Manisha Savashe, a farmer from Selgadh remarked, "A lot has changed since I started attending SSP meetings and trainings. This transformation is not limited to me; it extends to other women in the village as well. We were once confined to our homes, but now the scenario has shifted. Previously, there was no guidance on our basic rights. Today, we are confident that successful agriculture is sufficient for a prosperous livelihood." Asha Gaikwad, a farmer from Bhatshirpura, initially constrained by her husband's suicide, has since taken control of her life. Numerous participants reported that they succeeded in convincing their family members to collaborate and share earnings. Women asserted their equal partnership in cultivation and income, gaining independence in managing their finances. However, some participants lamented that men in the family still dictate decisions regarding farmland and handling finances even when women are allowed to cultivate. Challenges persist, with some men unwilling to recognize women as equal partners, questioning their agricultural knowledge and capacity.

Often, government schemes fail to reach the intended beneficiaries. SSP's direct intervention with the government has ensured the effective implementation of these schemes, resulting in benefits for participants in both agriculture and non-agriculture sectors. Government schemes have provided participants in the study with resources such as sprinklers, wells, support for onion storage, farm ponds, toilets, housing units, and Ujjwala gas. Women farmers and local leaders too are actively addressing these issues at the village and block levels. Ujjwala Tawale from Shelgaon expresses confidence in communicating with government officers. In villages where speaking about menstruation is still a taboo, she sells sanitary napkins and helps women understand the importance of hygiene. Parvati Gapat from Borda village advocates for farmers in village panchayat meetings and approaches village leaders if discrimination or denial of benefits occurs. Participants noted SSP's role in demanding policy intervention at the government level to secure an appropriate price for their produce and connecting them to other agencies and platforms, enhancing their exposure to agricultural experiments. In addition to facilitating bank loans and forming Self Help Groups, SSP has supported farmers through its federation.

4.2 Market Intervention

Several participants highlighted that traditionally, men in the family handle the farm produce's market transactions and financial dealings. Where women are primary decision-makers on cultivation choices, the market aspect is typically managed by men. Some participants mentioned their ability to suggest to their husbands what to sell and what to store for the family. While SSP has facilitated market connections for some participants, there is a significant untapped potential in this area. Due to the inflexibility of APMC structures, SSP is taking a proactive approach by spearheading the formation of FPOs to help women navigate through and benefit from the intricacies of the market system.

4.3 Building Resilience

Resilience is a dynamic process and a tangible outcome, signifying adept adaptation by participants to demanding and challenging life experiences. Participants articulated their adaptation to such situations through mental, emotional, and behavioral flexibility. The establishment of support networks and community bonds has notably contributed to their adaptive capacities. Participants detailed the coping strategies they have cultivated, fortifying their ability to navigate and surmount challenges, particularly on three significant fronts: social, agroecological, and economic. Participants highlighted the formidable social challenge of maintaining morale, contending that societal and familial hindrances often deter women from realizing their full potential. The initiation of SSP training and the assertion of women's cultivation rights and small businesses faced unsupportive responses from family and society, questioning their capabilities

and prescribing traditional gender roles. Participants underscored the pivotal role of the women's network in the village, fostering self-assertion and perseverance. Disregarding societal opinions, refraining from responding to criticism, avoiding a submissive attitude, and seeking support from SSP village leaders and fellow women were some of the strategies enhancing social resilience. Participants noted their familiarity with social challenges since childhood (being a girl child) as the commencement of life's challenges. Their strategy encompasses facing and surmounting challenges as they arise, embodying a guiding principle for constructing social resilience.

Participants emphasized that a significant number of male farmers in the region resort to suicide primarily due to economic crises and a lack of resilience in coping with these challenges. The WCRF model empowered women not only to engage in agriculture, but also to initiate agri-allied ventures and other small businesses. These women highlighted that by diversifying their income streams, they are no longer entirely reliant on a single income source. In the event of crop failures due to drought or unseasonal rains, they can still sustain themselves with income from alternative sources. Multiple income sources have led to economic resilience, eliminating the need for women to engage in daily wage labor or seek loans from moneylenders, as they now possess substantial savings. Recurring crop failures often lead to extensive borrowing for the subsequent season, with private moneylenders and financial institutions charging exorbitant interest rates. Participants asserted that embracing a multi-income source approach is key to mitigating farmer suicides in the region, and underlined the importance of men inculcating similar resilience by diversifying their economic activities and changing the way of cultivation.

Participants have affirmed that the WCRF model has effectively showcased the ability of diversified agroecological systems to bolster resilience. This system has demonstrated an enhanced capacity for recovery from diverse climatic challenges, including droughts, floods, and unseasonal rains, along with an enhanced ability to resist pest and disease attacks. According to the participants, unpredictable shifts in weather patterns pose a substantial threat to the livelihoods of small and marginal farmers. However, the WCRF model has proven instrumental in mitigating the impacts of climate vagaries. The use of natural fertilizers, pesticides, water conservation techniques, and homegrown seeds entails reduced investment. Even in the event of crop loss, farmers can absorb the losses. Participants also stated that the model contributes to preserving soil health and enhancing overall yield. Manisha Savase expressed readiness to confront any climate vagary post-sowing, attributing the minimal investment required to maintain the health of her farmland to the model's mixed-method technique.

4.4 Empowerment Process

The majority of participants expressed their ability to take independent decisions confidently and also support other women in exercising their agency. They affirmed having secured the right to cultivate, with many assuming leadership roles on their farmlands and making significant decisions acknowledged by family members. While not always the sole decision-makers in households, the participants opined that their inclusion in the decision-making process was a marked improvement from before. The WCRF model and associated agri-allied businesses have fostered financial independence among participants, enabling them to make decisions about earnings and savings. Some participants highlighted their management of bank accounts and loans obtained from self-help groups. Despite challenges such as the absence of land titles in women's names, participants assert their authority and right to cultivate. Family and societal attitudes, financial dependence, information and networking gaps, and a lack of self-confidence are identified as barriers to empowerment. Empowerment has been defined as a process of constructive struggle by self-assertive people against oppression to gain the power to control their lives, and resources and attain sustainable development while giving meaning to

their lives (Jadhav 2023). Participants unanimously view empowerment as a personal struggle that requires individual initiative, with external support serving as a facilitative factor.

4.5 Challenges and Lessons

Challenges

Resistance from Men: Despite the WCRF model's success, participants highlighted the initial resistance from men, particularly in relinquishing control over decision-making regarding the farmland. Men, accustomed to traditional farming practices, initially resisted the shift to mixed cropping and organic methods. Overcoming ingrained practices and convincing male family members posed a significant challenge.

Societal and Familial Hindrances: The participants faced societal and familial challenges that questioned their capabilities and reinforced traditional gender roles. Community gossip and family discontent were noted as obstacles. Overcoming deeply rooted stereotypes and societal expectations required sustained efforts, impacting the women's mental and emotional well-being.

Market Intervention Complexity: The complex agricultural market system in India posed a formidable challenge. Traditionally, men in the family handled market transactions, limiting women's involvement. Despite SSP's facilitation of market connections, there is an untapped potential caused by inflexible structures. The formation of FPOs was identified as a proactive measure to help women in navigating the market system.

Land Title Issues: The absence of land titles in women's names remained a significant barrier for women to assert their cultivation rights. Despite policy changes allowing women to access schemes with written documentation from the landholder, some men were unwilling to transfer land to the spouse's name. This obstacle highlighted the persisting challenges in establishing women's ownership of agricultural land.

Lessons Learned

Holistic Approach: The bundling of technology, technical, social, and policy intervention demonstrated the effectiveness of a holistic and multifaceted strategy. Recognizing the interconnectedness of these dimensions contributed to the success of the WCRF model.

Importance of Training and Knowledge Dissemination: Training sessions were instrumental in enhancing participants' knowledge and skills. Participants, acting as disseminators, extended this knowledge to other women in their villages. Empowering women with extensive knowledge, not just in agriculture but also in small-scale businesses, proved to be a key factor in the success of the model.

Policy Intervention and Government Collaboration: SSP's direct intervention with the government ensured the effective implementation of various schemes, providing resources to women farmers. Collaborating with government agencies and actively advocating for policy changes emerged as crucial strategies in securing benefits for the participants.

Economic Diversification for Resilience: The adoption of diversified agroecological systems and agri-allied businesses were key in building economic resilience. Participants highlighted the importance of multiple income sources, reducing dependence on a single agricultural activity and mitigating the impact of crop failures.

Community Building and Support Networks: The establishment of support networks and community bonds significantly contributed to participants' resilience. The women's network in the village played a pivotal role in fostering self-assertion, perseverance, and overcoming societal

challenges. Building a sense of community and solidarity was identified as a key element in the empowerment process.

The challenges encountered in implementing the WCRF model underscored the need for persistent efforts in changing deeply ingrained practices and societal attitudes. The lessons learned emphasized the importance of a comprehensive approach, knowledge dissemination, economic diversification, community building, and proactive engagement with policymakers to address systemic barriers. The dynamic nature of empowerment as a process of constructive struggle highlighted the ongoing nature of efforts needed to achieve sustainable development for women farmers.

Engaging Men: The agrarian crisis in Marathwada continues to contribute to an alarming rate of farmer suicides. Effectively addressing this crisis necessitates the active involvement of male farmers in adopting alternative agricultural practices aimed at fostering social, agro-ecological, and economic resilience. Encouraging men to participate in these transformative practices is crucial.

Moreover, it is imperative to sensitize men about gender equity in agriculture. Recognizing women as equal partners in agricultural activities is essential for sustainable and inclusive agricultural development. By promoting a more equitable approach, not only can the agrarian crisis be tackled more comprehensively, but it also paves the way for empowering women in the farming community.

5. Conclusion

The strategic bundling of technology, technical, social, and policy interventions to address the grassroots experiences of women in agriculture underscores their interdependence. The mixed crop technology has yielded significant outcomes. The study participants reported a reduced risk of food scarcity and stable income during adverse climatic conditions such as droughts or unseasonal rains. The model ensures income stability by diversifying crops, mitigating the impact of crop failures. Organic crop cultivation has led to decreased health-related expenditures, and there is a diminished need for migration, as participants earn sufficient income from their farmlands and small businesses. Despite potential yield variations, cost savings on fertilizers and pesticides compensate for it, resulting in increased overall income. Resistance from men, accustomed to single sowing and harvesting cycles, is mitigated by technology adoption, including solar water pumps and other innovations.

Training sessions facilitated by SSP have played a crucial role in disseminating knowledge about organic farming and the mixed crop model. Participants, acting as disseminators, shared this knowledge with other women in their villages. Trainings improved communication skills, enabling some to persuade family members to adopt mixed crop cultivation using organic methods. Beyond agriculture, training in small-scale businesses proved instrumental, fostering skills in entrepreneurship, tailoring, dairy, poultry, and small grocery shop operations. SSP facilitated market links and product training, leading to a substantial increase in annual income and savings. SSP's collaboration with the government has streamlined accessibility of government schemes by women farmers, providing participants with resources such as sprinklers, wells, support for onion storage, farm ponds, toilets, house units, and Ujjwala gas. Participants also emphasized the need for policy intervention at the government level to secure appropriate prices for their produce.

Market intervention remains a challenge. Participants highlighted that men traditionally handle market transactions, even in families where women are primary decision-makers regarding cultivation choices. SSP is actively spearheading the formation of FPOs to help women benefit from the market system. The exposure to SSP's WCRF model, along with participation in a network of women, have substantially influenced their resilience. Participants detailed the coping strategies they have adopted, fortifying their

ability to navigate and surmount challenges, particularly on three significant fronts: social, agroecological, and economic.

The WCRF model has helped women engage in agriculture, initiate agri-allied ventures, and other small businesses. Diversifying income streams has fostered economic resilience, eliminating the need for women to engage in daily wage labor or seek loans from moneylenders. The majority of participants expressed their ability to make independent decisions confidently and support other women in exercising their agency. Participants view empowerment as a personal struggle that requires individual initiative, with external support serving as a facilitator. The integration of technology, technical, social, and policy interventions in the WCRF model has created a holistic approach, contributing to the empowerment process, resilience building, and economic sustainability of women farmers in the Marathwada region.

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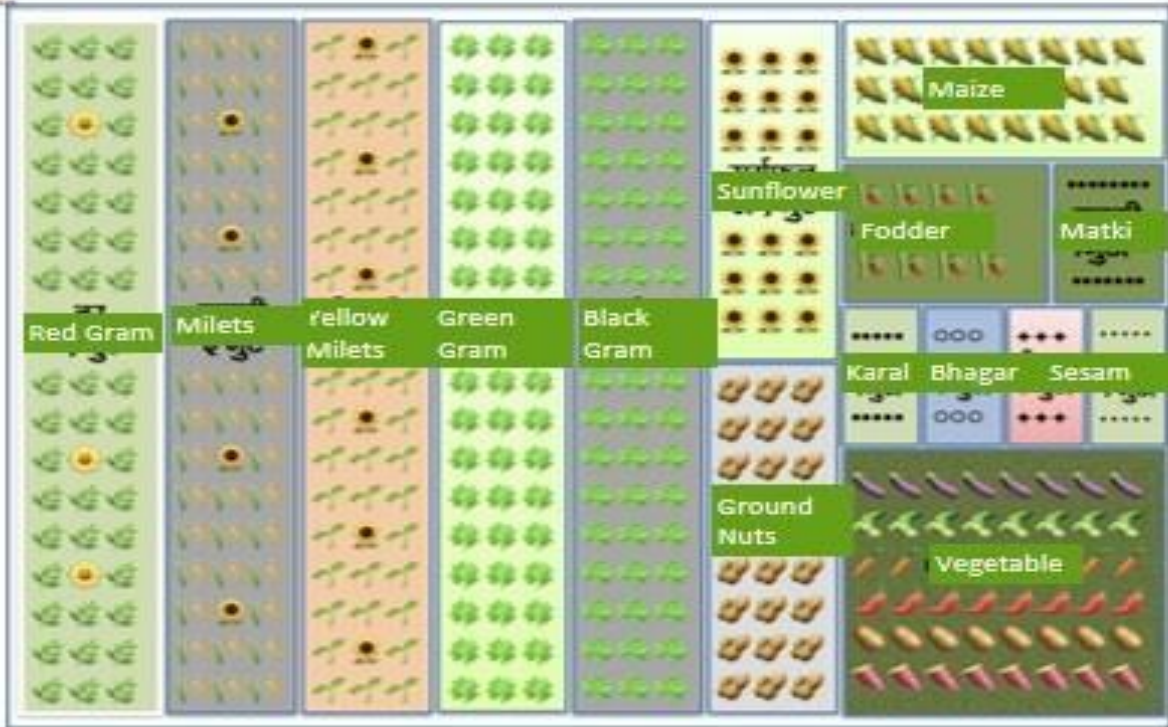
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Annexures



One Acre Model - Kharif





One Acre Model - Rabi



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