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PROMOTING WOMEN-LED SUSTAINABLE BUSINESS MODELS THROUGH WATERSHED INNOVATIONS IN RURAL TIRUCHIRAPPALLI

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INTRODUCTION

Agriculture continues to be the backbone of the Indian rural economy, employing over half the population directly or indirectly. Within this landscape, rural women play a pivotal role, not only as agricultural labourers but also as knowledge holders, seed savers, livestock managers, and custodians of traditional farming wisdom. Despite their substantial contribution, they are often excluded from decision-making, and their access to resources such as land, water, credit, and technology remains significantly lower than that of men. This gender gap becomes even more critical when we examine the increasing environmental and climatic challenges facing rural India today.

The Tiruchirappalli district in the southern Indian state of Tamil Nadu exemplifies this dual challenge. The region experiences semi-arid climatic conditions, erratic rainfall, and frequent droughts, particularly in blocks like Musiri, Thottiyam, and Lalgudi. Agricultural productivity is often threatened due to water scarcity, land degradation, and poor irrigation infrastructure. Farmers in these areas largely depend on seasonal rainfall, making agriculture a risky and less profitable endeavor. Simultaneously, traditional water bodies such as tanks and ponds, once critical to the region's agrarian sustainability, have suffered from years of neglect and encroachment.

However, over the past two decades, innovations in watershed management have emerged as practical solutions to reverse this degradation. Watershed development involves a holistic approach to conserving soil and water in a defined drainage basin or micro-watershed.

Techniques such as rainwater harvesting, construction of check dams, percolation ponds, bonding, and soil moisture conservation practices have significantly improved water availability and land productivity in rain fed regions. These interventions have been further supported by government schemes such as the Integrated Watershed Management Programme (IWMP) and Pradhan Mantri Krishi Sinchayee Yojana (PMKSY).

WOMEN'S ROLE IN SUSTAINABLE DEVELOPMENT

Despite their invisibility in formal statistics, women form the invisible backbone of Indian agriculture. In rural Tamil Nadu, especially in Tiruchirappalli, women are actively engaged in sowing, weeding, harvesting, composting, fodder collection, and post-harvest management. They are also primary users of domestic and farm water, making them inherently aware of the importance of conserving water resources. Yet, watershed development projects and agricultural modernization efforts have often been gender-neutral in design but gender-biased in impact largely ignoring women's specific needs, perspectives, and contributions.

This oversight results in the underutilization of women's potential in achieving long-term agricultural sustainability. Research by institutions such as the Indian Council of Agricultural Research (ICAR) and M.S. Swaminathan Research Foundation (MSSRF) has repeatedly shown that when women are actively involved in natural resource management, project outcomes tend to be more effective and sustainable. Women's participation leads to better maintenance of water structures, equitable distribution of benefits, and stronger community ownership.

INTEGRATING WOMEN IN WATERSHED-BASED MICRO-ENTERPRISES

One promising avenue for ensuring both ecological sustainability and gender empowerment lies in linking watershed innovations with women-led micro-enterprises. The improved water availability resulting from watershed projects opens up new livelihood opportunities that women can harness. These include:

- **Organic Farming**: Women's traditional expertise in natural composting, seed selection, and pest control can be combined with organic certification and value chain integration to create viable agribusinesses.
- **Nursery Development**: Watershed zones often support reforestation or agro-forestry components. Women-led nurseries for fruit trees, timber species, or medicinal plants can supply these programs while generating income.
- **Dairy Units and Fodder Cultivation**: With improved irrigation and increased fodder availability, women can engage in small-scale dairy units, which are traditionally managed by them in many parts of Tamil Nadu.
- **Agro-processing**: Post-harvest value addition such as drying, grinding, and packaging can be built around crops grown in revitalized watershed areas, offering women group-based entrepreneurial opportunities.

Such micro-enterprises do not require significant capital investments but do need support in terms of training, credit, market linkages, and access to technology. Women's self-help groups (SHGs), already active in many parts of Tiruchirappalli under the Tamil Nadu Corporation for Development of Women (TNCDW) and National Rural Livelihoods Mission (NRLM), can act as institutional anchors for these business models.

ROLE OF TECHNOLOGY AND INNOVATION

To scale up these models, there is a pressing need to blend traditional agricultural

wisdom with modern technology. Smart technologies such as drip irrigation, sprinkler systems, and soil moisture sensors can significantly enhance water efficiency and crop yields in semi-arid zones. Simple mobile-based tools that offer weather forecasts, pest alerts, and market prices can empower women to make informed decisions. When these are made accessible in local languages and through community networks, women's uptake of such innovations increases.
Moreover, by involving women in training programs for climate-smart agriculture, GIS mapping, and resource planning, we enable them to actively participate in decisions related to land and water management. This shifts their role from passive recipients to co-creators of sustainable development.

POLICY AND INSTITUTIONAL SUPPORT

The Government of India's push towards sustainable agriculture through innovation and technology, as articulated in programs like the Digital Agriculture Mission and Atma Nirbhar Bharat, provides a policy window to formalize such integrative approaches. However, it is crucial that these frameworks explicitly address gender dimensions and ensure that women farmers are not left behind in the transition to modern agricultural systems.

Local governance institutions such as Panchayati Raj bodies must also be sensitized and equipped to recognize women's leadership in watershed committees, farmer producer organizations (FPOs), and village-level agricultural planning. Public-private partnerships, too, can play a catalytic role by offering technology, inputs, and value chain access tailored for women-led enterprises.

The integration of traditional ecological knowledge with modern agricultural technologies, when done through a gender-inclusive approach, offers a powerful pathway toward sustainable and equitable rural development. In regions like Tiruchirappalli, where water stress intersects with economic vulnerability, watershed innovations can act as a foundation for both ecological regeneration and livelihood diversification. When women are empowered to lead this transformation through training, technology, and institutional support they become not just beneficiaries but change agents in their communities.

Harnessing their potential is not only a matter of social justice but also a strategic imperative for achieving India's broader goals of climate resilience, food security, and inclusive economic growth. The challenge lies in bridging the gap between policy intent and grassroots implementation a challenge that calls for coordinated action across sectors, institutions, and communities.

REVIEW OF LITERATURE

Several studies underscore the role of watershed management in improving rural livelihoods. According to the **National Bank for Agriculture and Rural Development** (NABARD, 2021), watershed projects have led to increased groundwater recharge, enhanced crop productivity, and reduced migration in rural areas. A report by the Indian Council of Agricultural Research (ICAR, 2022) found that gender-inclusive watershed programs yielded better outcomes in community participation and sustainability.

Further, the **Ministry of Rural Development (MoRD, 2019)** highlighted that women's self-help groups (SHGs) trained in soil and water conservation developed successful micro-enterprises, particularly in regions like Karnataka and Maharashtra. However, limited evidence exists for similar integration in Tiruchirappalli, despite its conducive geography and active women's SHGs.

International Water Management Institute (IWMI, 2020): A study by IWMI on gender and water resource management in South Asia found that women's participation in water user associations significantly improved the outcomes of watershed and irrigation projects. The study emphasized that where women had decision-making roles, there was:

- Better prioritization of domestic and agricultural water use.
- More equitable distribution of resources.
- Enhanced adoption of soil moisture conservation and drip irrigation techniques.

The report stressed that capacity-building for women, combined with gender-sensitive planning, leads to more sustainable and equitable watershed outcomes. This has direct implications for regions like Tiruchirappalli, where women's SHGs are already active and can be further engaged in formal watershed governance structures.

Planning Commission of India (2014) – Evaluation of IWMP (Integrated Watershed Management Programme): An evaluation conducted across multiple states under the Integrated Watershed Management Programme found that projects which mainstreamed gender concerns such as allocating funds specifically for women-led activities, and including women in watershed committees experienced:

- Higher livelihood diversification, including agro-processing and livestock-based microenterprises.
- Better natural resource management outcomes, such as reduced soil erosion and increased vegetation cover.
- Greater community ownership and reduced project dependence on external agencies.
- The study concluded that gender mainstreaming in watershed projects is not optional but essential for maximizing socio-economic and ecological benefits.

OBJECTIVES

- Examine existing secondary data on watershed development and women's entrepreneurship in Tiruchirappalli.
- Identify potential micro-enterprise models that align with watershed innovations.
- Explore how these models can promote women-led sustainable business development.
- Provide policy suggestions for scaling such models.

METHODOLOGY

This study uses secondary data from:

Government Reports: Ministry of Jal Shakti, MoRD, and Tamil Nadu Department of Rural Development and Panchayat Raj.

Research Publications: ICAR journals, NABARD working papers, and academic articles.

Case Studies: Documented practices from NGOs like DHAN Foundation and MSSRF (M.S. Swaminathan Research Foundation), which operate in Tamil Nadu.

SHG Data: Reports from Tamil Nadu Corporation for Development of Women (TNCDW) and National Rural Livelihoods Mission (NRLM).

The analysis involves qualitative synthesis and cross-comparison of program outcomes, women participation rates, and enterprise performance in watershed-managed zones.

FINDINGS

Watershed Development in Tiruchirappalli- Secondary sources confirm that areas like Musiri, Thuraiyur, and Thottiyam blocks have undergone watershed treatment under IWMP (Integrated

Watershed Management Programme). Key outcomes include:

- 20–30% increase in groundwater levels.
- Improved irrigation coverage.
- Diversification from single-crop to multi-crop systems.

ROLE OF WOMEN

Women participated in SHG activities and soil conservation work but were mostly in unpaid roles. However, some NGOs facilitated SHG-linked enterprises:

- **Organic vegetable farming** using bio-compost from watershed zones.
- **Nurseries** for drought-resistant saplings linked to afforestation schemes.
- **Dairy units** supported by improved fodder cultivation due to enhanced water availability.
- **Barriers Identified**
- Lack of technical training in watershed technologies.
- Inadequate access to credit for enterprise development.
- Low representation of women in local watershed committees.

SUGGESTIONS

1. **Capacity Building-**Training women in sustainable farming, water budgeting, and post-harvest technologies can increase enterprise viability.
2. **SHG Integration with Watershed Committees-**Including SHGs in decision-making can ensure that women's needs are reflected in watershed planning.
3. **Financial Inclusion-** Linking women entrepreneurs to micro-finance and government schemes like PMEGP and NRLM will ease credit access.
4. **Promotion of Convergence Models-**Integrating watershed projects with rural enterprise schemes can yield better results (e.g., convergence of IWMP with DAY-NRLM).
5. **Technology Use-** Mobile-based apps for water resource tracking and market information can empower women to make informed decisions.

CONCLUSION

Women in rural Tiruchirappalli possess immense potential to emerge as key drivers of sustainable development, particularly through the effective use of watershed innovations. While physical infrastructure such as check dams, farm ponds, and rainwater harvesting systems has been developed under various government and community-led programs, these efforts often fall short without the active and empowered involvement of women. **To truly unlock their potential, there is a critical need for institutional support, ongoing capacity building, access to finance, and gender-inclusive planning frameworks.**

Currently, many women in these communities contribute significantly to agricultural labour and resource management but remain confined to subordinate roles. **Transforming them from passive labourers into active leaders of green micro-enterprises** such as organic farming, plant nurseries, dairy cooperatives, or herbal product ventures requires deliberate efforts in skill development, technology training, and market linkage facilitation.

By integrating women's participation into every stage of watershed project planning and execution, and by linking these interventions with income-generating opportunities, rural Tiruchirappalli can serve as a **model for inclusive and sustainable rural development**. This approach not only promotes environmental conservation and climate resilience but also fosters

economic independence and social empowerment for women. **When ecological sustainability and women's entrepreneurship are aligned, the result is a transformative pathway toward holistic and equitable rural progress.**

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