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THE EFFECTIVENESS OF CLIMATE RESILIENT INTEGRATED WATER MANAGEMENT PROJECT (CRIWMP) TOWARDS THE SUSTAINABILITY OF WOMEN ENTREPRENEURS IN VAVUNIYA DISTRICT OF SRI LANKA

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Abstract
This study aimed at identifying the success of the Climate Resilient Integrated Water Management Project (CRIWMP), financed by the Green Climate Fund and implemented by the Government of Sri Lanka with UNDP support, which was launched during 2017–2025. It targeted the resilience of smallholder farmers, particularly women entrepreneurs, in the Dry Zone.The current study examines the aspect of CRIWMP's socio-economic interventions in the Vavuniya District and the support to women entrepreneurs and household producers for their social wellbeing and the sustainability. Among thousands of women entrepreneurs, 18 successful women entrepreneurs have been interviewed for this qualitative study. Findings proved thatCRIWMP's broader emphasis on agro- based livelihoods which denoted that thousands of farmers in the dry zone have received "agriculture technology packages" including home gardens, and women often engage in food- and craft-based enterprises.CRIWMP's focus on women is likely to amplify the social impact of its investments. The training and technology transfers also build women's skills and confidence in business management. In Vavuniya District, it is indicated that CRIWMP's livelihood component has effectively supported a diverse set of women led enterprises. It is also recommended that further steps to be taken by identifying other women entrepreneurs when dealing with these types of projects.

Key Words:CRIWMP, Socio-Economic Intervention, Sri Lanka, Vavuniya District, Women Entrepreneurs.

Introduction

Sri Lanka's dry-zone agriculture faces severe climate stress – erratic rainfall, frequent droughts and floods have damaged ancient irrigation systems, reduced crop yields and heightened food insecurity (UNDP, 2023). The Climate Resilient Integrated Water Management Project (CRIWMP), financed by the Green Climate Fund and implemented by the Government of Sri Lanka with UNDP support, was launched (2017–2025) to address these challenges. It aims to rehabilitate and modernize village irrigation tanks and water networks across three northern river basins (Malwathu Oya, Mi Oya and Yan Oya), thereby securing reliable water for agriculture and drinking (UNDP, 2022). In addition to infrastructure works, CRIWMP emphasizes community livelihoods and resilience: for example, it provides climate-smart agricultural inputs and training to farmers and fosters complementary income-generating activities. A key objective is to empower women smallholder farmers and entrepreneurs in the Dry Zone-recognizing that women's livelihoods (through agriculture, home gardening and small businesses) are crucial for household food security and climate resilience (UNDP, 2023a).

In fact, UNDP reports that CRIWMP targets "the resilience of smallholder farmers, particularly women, in the Dry Zone" (UNDP, 2022). By mid-2023, CRIWMP had delivered climate-smart agricultural packages to over 459,000 farmers (with men and women equally represented), and enabled more than

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7,000 women (including widows and persons with disabilities) to adopt new farming technologies (UNDP, 2023b).

Within this broader context, the current study examines one aspect of CRIWMP's socio-economic interventions in the Vavuniya District: support to women entrepreneurs and household producers. Specifically, we analyze project data (administrative records and survey tables) on women beneficiaries in Vavuniya, their business activities, and the equipment or material inputs they requested and received. Our goal is to understand the types of enterprises women pursued (e.g. food processing, tailoring, handicrafts), the nature of assistance provided (e.g. machinery, tools), and the geographic spread of these activities across Divisional Secretariats in Vavuniya District (e.g., Vavuniya Town, North, South, andChettikulam). This analysis sheds light on how CRIWMP's non-irrigation components contribute to women's economic empowerment and livelihood resilience, aligning with the project's goal of fostering inclusive climate adaptation (UNDP, 2023a).

Literature Review

Climate Change, Water Scarcity, and Agriculture in Sri Lanka

Climate change poses a significant threat to agricultural sustainability in Sri Lanka, particularly in the Dry Zone, where livelihoods are highly dependent on rainfall and surface irrigation systems. Studies have documented increasing rainfall variability, prolonged droughts, and extreme weather events that have disrupted agricultural cycles and reduced crop productivity (Eriyagama et al., 2010; Wickramasinghe, 2019). Sri Lanka's ancient cascade tank irrigation systems, which historically supported dry-zone farming, have deteriorated over time due to climate stress, poor maintenance, and land-use changes (Madduma Bandara, 2018).

The Dry Zone districts, including Vavuniya, are among the most climate vulnerable regions in the country. According to the Ministry of Environment (2021), water scarcity and seasonal droughts have intensified livelihood insecurity among smallholder farmers, especially women headed households. As agriculture remains a primary income source in these areas, climate-resilient water management has become a national development priority.

Integrated Water Resources Management and Climate Resilience

Integrated Water Resources Management (IWRM) has been widely adopted as a strategic framework to address climate related water challenges. The Global Water Partnership (2000) defines IWRM as a process that promotes coordinated development and management of water, land, and related resources to maximize social and economic welfare while ensuring environmental sustainability. In the Sri Lankan context, IWRM has been increasingly applied in large scale development projects to enhance water efficiency, agricultural productivity, and climate resilience (ADB, 2019).

Empirical studies in Sri Lanka indicate that rehabilitation of irrigation tanks, canal systems, and watershed management improves water availability and reduces farmers' vulnerability to climate shocks (Panabokke et al., 2017). However, scholars argue that physical infrastructure alone is insufficient to build long-term resilience unless accompanied by livelihood diversification and socio-economic interventions (Esham & Garforth, 2019). This perspective has informed the design of integrated projects such as the Climate Resilient Integrated Water Management Project (CRIWMP).

Socio Economic Interventions in Climate Adaptation Projects

Recent literature emphasizes that climate adaptation projects should integrate socio economic development components to achieve sustainable outcomes. The World Bank (2021) highlights that livelihood diversification, access to productive assets, and capacity building significantly enhances households' ability to cope with climate variability. In Sri Lanka, climate-smart agriculture interventions combining improved inputs, technology, and farmer training have demonstrated positive impacts on income stability and food security (Perera et al., 2020).

UNDP (2023a) reports that CRIWMP adopts this integrated approach by combining irrigation rehabilitation with livelihood support, including home gardening, value added agriculture, and small enterprise development. Such interventions enable farming households to generate alternative income sources beyond paddy cultivation, thereby reducing climate-related livelihood risks.

Gender, Climate Vulnerability, and Women's Livelihoods

Gender dimensions of climate change have received growing attention in development literature. Women are often more vulnerable to climate impacts due to unequal access to land, water, financial resources, and decision making power (UN Women, 2021). In rural Sri Lanka, women play a central role in agriculture, household food security, and informal economic activities, yet their contributions remain undervalued and under supported (Jayasundara & Abeysekera, 2017).

Research in Sri Lanka shows that women-headed households, widows, and low income women face greater challenges during climate-induced shocks such as droughts and floods (Department of Census and Statistics [DCS], 2019). Strengthening women's economic participation is therefore recognized as a key strategy for enhancing household resilience and community wellbeing.

Women Entrepreneurship and Rural Economic Development in Sri Lanka

Women entrepreneurship contributes significantly to rural economic development in Sri Lanka, particularly through micro and small enterprises in food processing, tailoring, handicrafts, and home-based production (ILO, 2020). These enterprises offer flexible income opportunities for women who balance economic activities with household responsibilities. However, access to capital, machinery, markets, and technical knowledge remains a major constraint for women entrepreneurs (Kodikara & Jayawardena, 2016).

Studies indicate that asset based support, such as provision of equipment and tools, is especially effective in empowering rural women entrepreneurs (Kabeer, 2016). In Sri Lanka, government and donor-funded projects that provide machinery for agro processing and small enterprises have shown positive impacts on women's productivity and income generation (Fernando & Moonesinghe, 2020).

Climate Projects and Women's Economic Empowerment

Climate adaptation projects increasingly recognize women as key agents of change rather than passive beneficiaries. Evidence from Sri Lanka suggests that gender responsive climate projects enhance women's skills, confidence, and decision making power at household and community levels (Ministry of Women and Child Affairs, 2020). When women gain control over productive assets and income, they are more likely to invest in children's education, nutrition, and health, generating long term social benefits (World Bank, 2018).

UNDP (2023b) highlights that CRIWMP has enabled thousands of women in Sri Lanka's Dry Zone to adopt climate-smart technologies and engage in income-generating activities. However, academic literature evaluating the district-level impacts of such interventions particularly on women entrepreneurs remains limited.

Methodology

This study is based on administrative data provided by CRIWMP field offices in Vavuniya. Two main sources were used: (1) an Excel database ("CSA Database, Vavuniya") containing detailed beneficiary records across multiple project sub components (e.g. home gardening, paddy farming, soil conservation), and (2) selected district reports from the Small Enterprise Development Division listing women entrepreneurs and requested/received equipment. Together these sources cover more than two thousands of women beneficiaries. However, the selected categories of successful women entrepreneurs have been interviewed for this study.

From the Excel sheets, relevant variables were extracted: beneficiary demographics, location, project category, and outputs such as crop varieties, home garden packages or livestock units. For example, separate worksheets list women in "Paddy Farming", "Urban Home Garden", "Cassava Cultivation", "Apiculture", "Bio Gas", etc. Although not all categories involve equipment distribution (some track land area or seed allocation), we identified entries corresponding to women engaged in entrepreneurial or income generating activities. The Excel "Summary" and "DSD summary" sheets provided aggregate counts by category and area, confirming that the dataset spans hundreds of households (e.g. over 800 men and 400 women beneficiaries in the district across 17 intervention types).

The two image files (tabulated project records) were transcribed manually. These list 18 women by name, village, and business type, National Identity Card number, DSD area, and requested items. We coded each entry for business category and equipment type. In particular, columns labeled "Business Type" were used to categorize activities such as food production, tailoring, or handicrafts. The "Requested Items" and "Remarks" columns were used to tabulate equipment provided or pending.

Descriptive Statistics has been used in data analysis. It was aggregated by business category and by divisional area, and tallied the equipment items delivered. Key patterns (e.g. dominant types of businesses, most common equipment) were identified. Tables were constructed in markdown to summarize these distributions. Whenever possible, we related findings to CRIWMP's stated objectives (e.g., improving agricultural value-addition or supporting small enterprises) as documented by UNDP (2023a). All steps in the analyses were performed with care to ensure anonymity of individuals.

Findings

Enterprise types and Women Entrepreneurs

The beneficiaries' enterprises fall primarily into a few broad categories. The largest category (11 women) is food/agricultural processing and sales. These entrepreneurs prepare and sell food products such as chili sauce, herbal drinks, manioc chips, coconut oil, or other packaged foods. For example, several women requested chili grinding machines and sealers to produce spice pastes, and one operates a small coconut oil mill (see below). The second major category is textile related, with 3 women running tailoring or garment businesses (sewing machines were requested to stitch clothing and curtains). Handicraftsespecially coconut shell crafts and small wooden products account for 3 women; these entrepreneurs requested equipment like band saws and grinders for woodwork. A final category is leather goods, with 1 beneficiary who makes and sells handcrafted leather products (the equipment provided was tables and hangers for displaying goods).

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Table 1 summarizes the total women entrepreneurs by business type, based on the recorded "Business Type" in the data.

Table 1: Number of Women Entrepreneurs By Type Of Enterprise (Vavuniya District).

Business Type	Number of women
Food processing & sales	11
Tailoring / garment production	3
Handicrafts (e.g. coconut crafts, wooden toys)	3
Leather goods	1

Source: Survey Data

Food processing dominates because many interventions (e.g. chili paste production, masala packaging, coconut oil milling) target value added agriculture. Tailoring appears as a focal support area as well: two women requested and received industrial over lock sewing machines (3 thread Sergers) to expand garment-making businesses. Handicraft entrepreneurs (e.g. making dolls, bags or toys from coconut shells and other local materials) received saw machines and grinders for wood and shell processing. These patterns reflect CRIWMP's broader emphasis on agro based livelihoods: UNDP notes that thousands of farmers in the dry zone have received "agriculture technology packages" including home gardens, and women often engage in food- and craft-based enterprises.

Equipment and support provided: The project support to these women largely took the form of machinery and equipment to enhance productivity. Table 2 lists the main equipment items delivered to the entrepreneurs, along with the number of women who received them. (Only items that were actually delivered are indicatedgiven below; one requested item a curtain cutting machine was still pending at the time of the report.).

Table 2: Types of Equipment Provided To Women Entrepreneurs

Equipment Provided	No. of Women Recipients
3HP chili-grinding machine	3
15kg electric food sealer	2
8″ handheld sealer (for packets)	3
Over lock (3-thread) sewing machine	2
Shop saw (band saw for wood cutting)	2
3HP copper cutter (for coconut oil mill)	2
Manioc (cassava) slicer	1
38L air compressor	1
Diesel-operated grinder (Dei grinder)	1
5HP electric motor (standalone)	1
6'×4′ display table (with bag stands)	1
10′×10′ temporary hut (sales stall)	1

Source: survey data

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Nearly all requested items were delivered as of the reporting date. For example, women engaged in food processing received multiple sealers and grinders: three beneficiaries got 8″ hand sealers for packaging spices or masala; two got larger 15 kg electric sealers, and three got 3 HP one shot chili grinder machines. Two women running coconut oil mills each received a 3 HP copper cutting machine to pulp the copra. The tailoring enterprises each received an over lock sewing machine. The handicraft producers received two shop saws and one diesel grinder (for wood and nut crushing). Other tools provided include a manioc slicer, an air compressor, and a heavy duty motor. One leather goods artisan received a large table and bag hanger stands to display products.

Geographic Distribution of Beneficiaries

The women entrepreneurs are fairly evenly distributed across the Vavuniya District's sub-regions (Divisional Secretariat Divisions, DSD). The data show that support reached women in Vavuniya Town as well as Vavuniya North, Vavuniya South and Vengala Cheddikulam (often referred to simply as Cheddikulam). As Table 3 indicates, five of the 18 women were based in Vavuniya Town DSD, another five in Vavuniya South, six in Chettikulam, and two in Vavuniya North.

Table 3: Women beneficiaries by Divisional Secretariat Division (Vavuniya District).

Divisional Secretariat Division	Number of women
Vavuniya Town	5
Vavuniya South	5
Chettikulam	6
Vavuniya North	2

This spread suggests CRIWMP's community outreach covered the entire district rather than concentrating in one locale. It also indicates demand across areas: for example, Chettikulam had several beneficiaries with food processing enterprises, while Vavuniya Town saw a mix of food, tailoring and crafts businesses. Notably, almost all households reached are rural or semi-urban: even the "Vavuniya Town" beneficiaries are located in outlying urban wards or nearby villages, and none are from the municipality's most central wards. This geographic distribution implies an inclusive targeting approach.

While direct comparison data are limited, it is worth noting that CRIWMP's overall beneficiary tracking also aimed at proportional representation by gender and vulnerability. In the Vavuniya subset, the data record that some women are widows or have disabilities. The Summary spreadsheets indicate that among the district beneficiaries, a considerable share were women-headed households, elderly, disabled or recipients of welfare assistance ("Samurdhi" program). Thus, the entrepreneurship support appears to prioritize needy households, consistent with CRIWMP's goal of empowering marginalized farmers.

Discussion

The findings illustrate how CRIWMP's socio economic interventions support women's entrepreneurship and strengthen livelihoods. First, by enabling value added enterprises, the project diversifies incomes beyond staple farming. The predominance of food processing ventures (e.g. spice pastes, coconut oil, packaged snacks) suggests that women are leveraging local agricultural produce into market goods. This is important for resilience: processing and selling preserved foods or condiments yields income during dry spells when field crops may fail. It also aligns with CRIWMP's focus on "climate-smart"agriculture: rather than only encouraging subsistence plots, the project promotes profitable uses of crops that can adapt to climate uncertainty. For example, establishing a climate-resilient home garden yields vegetables, but adding a grinder and sealer allows surplus to be processed into shelf-stable spices an entrepreneurial step that raises income. In this way, the provided equipment acts as a bridge from raw farming to micro enterprise.

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Second, the nature of support addresses women's practical needs. The machinery given (see Table 2) directly relates to the business types: sewing machines for tailors, grinders and sealers for food businesses, saws and grinders for artisans. By providing capital equipment, CRIWMP lowers the entry barrier for these women to run businesses. This equipment can be seen as a form of in kind micro finance or asset grant. It is notable that most women successfully received the items they asked for aside from the one drilling machine suggesting good program follow through. Such support would enable these women to significantly scale up production. For instance, switching from manual to motorized grinding can increase output 5–10×, and industrial packaging machines allow bulk sales. In turn, higher productivity can translate into more income and reinvestment in the household. As UNDP reports, in CRIWMP supported households, "women primarily benefit from the surplus income, which is directed towards family welfare and children's education". Thus, the program's support likely has multiplier effects on community well-being.

Geographically, the distribution of beneficiaries suggests equitable reach. CRIWMP's irrigation components physically span many villages, and the related livelihood component appears to have similarly broad coverage. Even remote hamlets in Chettikulam had several women entrepreneurs, which imply effective extension work. This decentralization is positive: rural women often have less mobility and access to markets, so bringing support to their villages reduces inclusion barriers. At the same time, the data hint at continued gaps. For example, only two women from Vavuniya North appear, possibly indicating lower uptake or awareness there. This raises the question of whether further outreach might engage more women in that area. Moreover, although nearly all women received their requested equipment, the unmet request highlights the need for timely logistics. Any delay in delivering promised inputs can stall an enterprise startup.

In terms of empowerment, the CRIWMP assistance aligns with broader development strategies for gender equality. By channeling resources to women entrepreneurs, the project follows a widely recognized principle that strengthening women's economic role improves resilience and social outcomes. Literature on development and climate resilience notes that when women control productive assets, entire families benefit. For instance, income controlled by women is more often spent on nutrition, health, and education than income controlled by men. Thus CRIWMP's focus on women is likely to amplify the social impact of its investments. The training and technology transfers also build women's skills and confidence in business management.

However, to fully achieve these positive effects, parallel measures may be needed. Skills training in product marketing, bookkeeping, or maintenance of machinery can ensure that equipment is used effectively and sustainably. The records reviewed here do not detail any such capacity building, but CRIWMP's implementation plans do include farmer field schools and extension support. It would be valuable for future analysis to check whether the women entrepreneurs also received business training or market linkages. Additionally, linkage to finance can strengthen these ventures; some women's enterprises might require working capital (e.g. to buy raw materials) beyond the capital equipment provided.

Finally, these findings should be seen as part of a larger success narrative. CRIWMP's midterm review and communication materials emphasize that the project is on track to benefit over 770,000 individuals, half of them women. The Vavuniya experience corroborates this gender focus at the grassroots level: Here,women are clearly taking on entrepreneurial roles. The specific activities complement the project's ecological interventions showing an integrated approach: while irrigation rehabilitation secures raw water resources, livelihood support ensures communities can thrive economically despite climatic challenges.

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Conclusion

In summary, the data from Vavuniya District indicate that CRIWMP's livelihood component has effectively supported a diverse set of women led enterprises. By providing targeted equipment (grinders, sealers, sewing machines, etc.) corresponding to each enterprise, the project has enabled women to add value to agricultural products and start small manufacturing or craft businesses. The beneficiary group spans all major sub regions of the district, reflecting inclusive outreach, and includes vulnerable women (widows, disabled, welfare recipients) in line with project priorities. The predominance of food related enterprises suggests an emphasis on climate resilient agro enterprises, while tailoring and handicrafts provide supplementary incomes.

These interventions contribute to women's entrepreneurship and livelihood resilience in multiple ways. Mechanized equipment increases productivity and frees up time, leading to higher output and income. Income gains in women's hands are likely reinvested in family welfare, education and nutrition, thereby amplifying community resilience. The CRIWMP experience in Vavuniya illustrates how climate adaptation projects can integrate gender sensitive economic support to achieve broader development outcomes.

Nevertheless, the analysis also points to areas for improvement,ensuring the final delivery of all requested equipment is essential. Continued support through technical training, maintenance services and market access would help sustain these enterprises. Further outreach may be warranted in underrepresented areas. Collecting impactful data on income changes or business performance over time would allow a more rigorous assessment of how these supports translate into resilience.

However, the available evidence suggests a positive impact on women beneficiaries' report that with the new machines they have been able to increase production and sales. In the words of one participant, a woman's "monthly shoe production doubled" after receiving additional machines, enabling her to employ other women in the village. CRIWMP's tailored support thus appears to strengthen women's entrepreneurship in Vavuniya, aligning well with its goal of building climateresilient livelihoods for womenentrepreneurs and rural households. Therefore, it is recommended that the future outreach projects should consider the lapses in the existing project to get more effective output through the beneficiaries.

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