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Farm women empowerment in watershed development programmes: An empirical impact analysis

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Abstract

Women's active participation in watershed development programmes in India is multifaceted and significant. Women as key stakeholders and primary users, are crucial for community development in general and individual empowerment in particular. Therefore, it is essential to recognize and involve women in watershed management. This study was conducted to investigate the level of empowerment and livelihood development of women through watershed programmes in different agroecological regions (AER) of India. Data were analysed from seven watersheds covering six AERs of India with watershed villages taken as treatment and non-watershed villages as control. The dimensions of women's empowerment were compared between watershed farm women (n=280) and control farm women (n=280). Under social empowerment, watershed farm women (3.93) scored higher in terms of active participation in meetings than control farm women (2.33). Similarly for recognition of women as user group/ Self-Help Groups, farm women from watershed (4.20) scored higher than farm women from control area (2.70). The economic empowerment of farm women from watershed area had higher values in all sub-dimensions (family expenses planning, control over income, income generating activity and access to credit facilities) compared to control. Livelihood development index was assessed in terms of human, social, economic, political, physical, and natural capital. This analysis showed that post watershed (5.10) women were more empowered in terms of social capital (5.59) due to enhanced contact of watershed women with social groups and progressive farmers followed by physical (presence of pucca houses, infrastructure, and sanitation facility) and human capital (5.21) (female literacy and availability of nutritious food for family). Overall, watershed farm women registered higher levels (53%) of empowerment across dimensions compared to control, as evident from the mean scores and z values.

Keywords: Farm women, livelihood analysis, watershed, women empowerment

Introduction

Watershed development programmes are important initiative that aims to address various issues related to water conservation, resource management, and sustainability of natural resources. Evaluation of various watershed programs has revealed the significance of people's involvement in the development process and the institutions in fostering enhanced community participation (Meena *et al.*, 2022) [15]. Integrating gender perspective into watershed management programs is crucial for ensuring inclusivity and effectiveness. The gender dimension in watershed development programs is of vital importance as gender equality is the focal issue of sustainable development goals. Contribution of women community in water management programmes in India is multifaceted and significant. Historically, women have been primary caregivers, particularly responsible for water-related tasks such as fetching water, managing household water use, and other crucial agricultural activities. Therefore, women's participation must be ensured in project planning, preparation of action plans, and execution of watershed projects. Being actively involved in agricultural activities, women play a significant role in soil and water conservation technologies, both as beneficiaries and as active participants

in adopting and implementing the techniques. Despite their crucial role, women's participation in formal water management and governance is limited. Community and organizational rules and regulations, formal as well as informal, generally exclude women from institutions or programs involved in natural resource management (Rawat *et al.*, 2019) [21]. Through policies and reforms in water management, women involvement can be increased, which would bring benefits to individuals, society, and the conservation of resources. Across agroecological regions (AERs) of India, women play vital roles in water-related activities such as fetching water, irrigation, drainage, and household water management. Therefore, it is an urgent necessity to recognize and actively involve women in decision-making processes related to watershed management. Their involvement could ensure more sustainable and equitable outcomes, as women often have unique knowledge and wisdom on resource use, management, and conservation. Improving their participation in water management can also lead to better natural resource management (Manase *et al.*, 2003) [13], by playing important roles in water conservation activities like afforestation and rain water harvesting through constructing pond, trenches etc.

In recent years, there has been increasing recognition of the importance of integrating gender perspectives into water management policies and programs in India (Anonymous, 2021) [2]. Efforts have been made to promote women's participation in decision-making processes related to water governance, through the formation of women's water user groups and ensuring their representation in local water management committees such as *jal sahelis* and *pani panchayats* etc. It is reported that the construction of check dams reduced women's time per day for fetching water by about 29% (Padmaja *et al.*, 2020) [19]. Rise in groundwater level reduced the effort required by women to draw water from open wells and hand pumps. To achieve this, there is a need for more effective participatory water institutions and enhanced social rationality, where greater involvement of women can play a crucial role in improving outcomes. Mathew (2007) [14] also reported that 54% from the project area were involved in developmental activities by women while only 20% from the non-project area achieved same proving that the implementation of the watershed development project has enabled women to get involved in various developmental activities even after its completion. The impact analysis carried out by Argaw *et al.* (2023) [3] revealed that due to the implemented watershed development and management practices, the agricultural productivity, and incomes of the community increased, employment opportunities were generated, and social service and infrastructure were improved (Kumar *et al.*, 2021, Bihari *et al.*, 2022) [11, 4]. Keeping in view all the above issues, a study was realized to assess the women empowerment through watershed programmes in different agroecological regions of India. The main objective was to assess the extent of women empowerment and their livelihood improvement due to watershed programmes.

Methodology

Conceptual framework

The present study was conducted in seven watersheds executed under National Watershed Development Project for Rainfed Areas (NWDPR) Scheme of Govt. of India during the year 2007-2012 in different states of India (Table 1). Grover (2002) [8] defined empowerment as a process both individualistic and collective. It is through self and then involvement in groups that people most often begin to develop their awareness and ability to organize to act and bring about change. The quality of life is measured not just by financial earnings or longer lifespans, but by the autonomy and security that women experience everywhere. This empowerment process becomes apparent only when a favourable environment for enlightenment is established, which must be ensured first. Therefore, women's empowerment is achieved through the provision of opportunities, resources, and skills, and is facilitated by specific strategies designed by the organization under study. To measure the level of empowerment an index has been developed based on six dimensions of women empowerment, *viz.* Social, Economic, Political, Personal, Psychological and Health-Security Empowerment. Women Empowerment Index (Wi) is respective weightage calculated based on the response of 20 experts by following analytical hierarchy process (AHP) and assigned to the six components of women empowerment by following methods

of Saaty (2008) [28] and as used by Mukherjee *et al.* (2018) [16]. Table 2 shows the AHP-based weights for the components of the Wi. Experts assigned the highest weight to economic empowerment (0.38), followed by personal and psychological empowerment (0.20), and social empowerment (0.15). The Consistency Ratio of the AHP analysis was 0.139, and the Consistency Index was 0.0984, both indicating good consistency.

Women Empowerment Index (Wi)

Empowerment of farm women as a result of watershed programmes was measured by an index developed for the purpose. This index consisted of six components of empowerment and in each component 5-7 statements with 1 to 5 points of scale were there on which the respondents were asked to give their responses, where 1 indicates strongly disagree, 2-disagree, 3-neutral, 4- agree, 5- strongly agree. The response of all six components in this index were normalized by z transformation and then averaged as suggested by Abadi (2010) [1]; and Mukherjee *et al.* (2020) [17]. The dimensions of women's empowerment were compared between two groups: watershed farm women (n=280) and control farm women (n=280). From same samples, livelihood index was assessed in terms of six capitals *viz.* human, social, economic, political, physical, and natural capital.

Social empowerment (SE) refers to the promotion of more equitable social status for women within society, recognizing that the primary responsibility of any human society is to ensure dignity for all its members. This concept is measured through several indicators that fall into two main dimensions: (i) enhancement of social status and (ii) recognition from the community.

Economic empowerment (EE) focuses on promoting economic development and encouraging women to achieve the necessary conditions to seek justice and equality. Without economic strength, women cannot fully exercise their rights and entitlements. Women employment is considered an important determinant of women empowerment (Faridi *et al.*, 2009) [7]. Most probably working women are more competitive while competing roles give women greater access to extra familiar sources of information and resources with increasing their potential autonomy in family settings.

Political empowerment (POE) is a process that enables women to increase their mobility, break isolation, and develop self-reliance, allowing them to establish a public presence and participate actively in decision-making processes about the direction of development (Roona, 2009) [22]. Group or collective processes provide vital support for empowerment by connecting members to local networks.

This social interaction raises awareness about local realities and helps women overcome barriers to accessing resources. Personal empowerment (PEE) involves enhancing skills, gaining knowledge, and fostering better thinking for societal improvement and overall leadership development. This index includes three sub-dimensions: (i) enhanced leadership capacity, (ii) increased knowledge of advanced technologies, and (iii) improved thinking for societal development.

Psychological empowerment (PSYE) is the process of empowering women from within, encouraging them to push

beyond self-imposed boundaries. In this study, two sub-dimensions were identified: (i) active participation in any activity and (ii) feeling motivated.

Health and security empowerment (H&SE) is a process where women become more aware of health and family well-being. As custodians of food and nutritional security in a family, empowered women make informed decisions about quality food to ensure both food and nutritional security. This empowerment also extends to ensuring social security from a broader perspective. However, the relationship between women's empowerment and health is multi-dimensional, and complex. This index includes four sub-dimensions of economic empowerment: (i) saving money for the future, (ii) effective business planning, (iii) effective family expense planning, and (iv) income enhancement. The index, prepared based on the above-mentioned parameters was calculated by the following equation:

$$WEI = \frac{SE \times W1 + EE \times W2 + PoE \times W3 + PeE \times W4 + PsyE \times W5 + H\&SE \times W6}{W1 + W2 + W3 + W4 + W5 + W6}$$

where,

- 1) SE = Social Empowerment
- 2) EE = Economic Empowerment
- 3) PoE = Political Empowerment
- 4) PeE = Personal Empowerment
- 5) PsyE = Psychological Empowerment
- 6) H&SE = Health and Security Empowerment

To measure livelihood wellbeing, a comprehensive index was developed, consisting of six dimensions namely natural capital, which includes acquiring new land and improving existing land, physical capital (assets such as livestock, television, mobile phone, permanent house, vehicle, agricultural machinery, electricity etc.), economic capital, includes year-round income-generating activities, a bank account, investments in agribusiness, increased savings, and repaid old loans, human capital (training in income-generating activities, business planning, personal development, providing nutritional food to family members, and sending children to school), social capital which involves participation in multiple social groups, membership in other groups, and contact with other progressive farmers and political capital like becoming a committee member at the panchayat level, participating in project planning, implementation, monitoring, and evaluation, and engaging in village development activities.

Research design

The study employed an *Ex-Post Facto* research design (before-and-after design) to estimate the changes resulting from the watershed project compared to a non-watershed scenario. Women from the watershed project and non-watershed (control) were interviewed using the common interview schedule to delineate the impact. The difference-in-difference technique was then applied to calculate the actual impact. Focused group discussions (FGDs) and a series of key informant interviews were conducted to identify aspects of effectiveness. Additionally, previous

studies on effectiveness were reviewed to prepare the survey instrument. The survey instrument was sent to experts for feedback, and modifications were made based on their recommendations. It was translated into the local language, and a pilot test involving 20 farmers was conducted to further refine the questions. In-depth interviews with key informants were conducted for data triangulation. Proper care was taken to ensure comfortability of the respondents and that the data recording was unbiased. Comparison of socio-economic characteristics of members of watershed in the study area was done through nonparametric tests, *viz.* (Mann-Whitney). For the statistical analysis, the data were analysed using MS excel and SAS software.

Results and Discussion

Watershed characteristics

India has five agro-ecosystems sub-divided into 20 AERs. The location of seven selected watersheds falling in six different AERs (Fig. 1) are 7-deccan plateau (Malwa, Kathiawar), 9-deccan plateau under semi-arid eco system, 12-eastern plateau (red laterite), 13-northern plain (lower Gangetic), 14-western Himalaya (hot sub humid to humid) under sub-humid agro-ecosystem and 18-north eastern hills under humid per humid agro ecosystem. The elevation of different watersheds ranged between 51 m to 1258 m, with annual rainfall varying from 435 mm to 1578 mm. Through these seven watersheds across the country, a total of 4367 ha of area was covered out of which cultivable area was 2390 ha. Total 4391 households covering 1658 ST population and 2161 SC population were included. The total population of these seven watersheds was 11222 with 5990 females and 6132 males. The watershed area has 70 numbers of functional self-help groups (SHGs).

Socio-economic assessment

The basic characteristics of the watershed and the control villages are detailed in (Table 3) With respect to age, education, farming experience, and family size, no significant differences were found between the two groups of farm women (Table 3). The average annual family income, of the watershed village was 2.5 times than that of control villages of watersheds. The average irrigated area (2.2 ha) was found more in watershed villages because of the interventions made under treatments whereas for control villages, the mean value was only 0.9 ha. The watershed villages were found receptive in adopting new and innovative technologies (9.5) to increase the farm yield and to conserve the natural resources, whereas in control villages, the mean value of technology adoption was only 6.7. The skill development parameters were higher (1.6) in watershed as compared to 0.9 in control villages.

In crop production activities like ploughing, sowing, weeding, harvesting etc. majority activities are dominated by men and some are performed by women and joint participation of men and women. It was found out that in watershed villages women participation (3) was enhanced in production activities as compared to 2.5 in control villages. With respect to participation of men in these activities, it has been reduced to 5.7 in watershed as compared to 6.4 in control villages. The joint participation of men and women is also improved in watershed villages due to sensitization programmes and other motivational factors. The post-

harvest activities like threshing, winnowing, cleaning etc. in the study area are performed by women. The mean value of post-harvest activities for women of watershed villages was 4.0 as compared to control villages (3.0). According to Jahan and Sarker (2015)^[9], households lacking women are deemed unsustainable, with women being involved in 90% of post-harvest activities. Women's responsibilities were predominantly in cleaning (83.12%), followed by drying (82.66%), seed retention (81.77%), threshing (79.96%), and winnowing (72.73%) operations (Saikia *et al.*, 2020)^[23]. According to Lakra *et al.* (2023)^[12], females showed the highest participation in processing activities (97.50%) and grading activities (93.33%).

Our study also revealed that both males and females had the highest participation (84.17%) in produce drying activities, followed by winnowing (83.33%), threshing (81.67%), storage/packaging (78.33%), dehusking (72.50%), and processing (2.50%) activities. Similarly, due to watershed interventions with abundance of fodder and water sources, women contribution (mean value 6.0) for animal rearing was found more in watershed as well as control villages (6.0 and 3.4 respectively). This result corroborates the data of increasing participation of women in dairy cooperatives. In 2015-2016, there were five million women members in dairy cooperatives across more than 190,000 societies in India, which increased to 5.4 million by 2020-2021, constituting 31% of all cooperative members (Chander, 2023)^[6].

Women Empowerment

A comparative data analysis (Table 4 and Fig. 2) showed that women were found socially empowered as they actively participated (mean value 19.0) in watershed meetings and other important meetings of village as compared to women from control villages. They were more involved in user groups, SHGs etc. to get the recognition (19.06) within their society. Mukherjee *et al.* (2020)^[17] also apprised that the FPO member farm women scored 4.50 out of 5, whereas the non-member farm women scored 2.90 with respect to enhanced social status. The Man Whitney test z value was found significant for income generation activity / self-employment (16.8) followed by family expenses planning (15.83) and access to credit facilities (15.51) which reflected that women in watershed villages were more involved in income generating activities for getting additional income to improve their livelihood. They were able to plan their family expenses in a better way and had good access to credit facilities as compared to the women in control villages. Another aspect that emerged from the study conducted by Mukherjee *et al.* (2020)^[17] is increased savings, with a mean score of 4.32. This indicates that women were able to save more money from their earnings than before. Besides, personal empowerment was a significant dimension of women empowerment under which watershed women got more awareness about various technologies (14.08) followed by access to knowledge and resources (14.0). Sundarambal and Bihari (2021)^[26] also indicated that the overall knowledge level of farm women

on soil and water conservation (SWC) technologies within the watershed was 43.76%, compared to 32.05% for those outside the watershed. This significant difference suggests that the farm women within the watershed have benefited from the watershed programs. Health and security empowerment, being the most important part of women empowerment got mean value of 14.24 for women in watershed area for achieving better family health and security in comparison to women from control areas. Chander *et al.*, (2020)^[5] reported that with improved *in-situ* and *ex-situ* water availability, farmers began cultivating vegetables. Additionally, crop productivity for maize and sorghum increased two to three-fold compared to the base year. These changes led to enhanced and diversified food availability, along with surpluses that boosted income. Consequently, village migration ceased, providing greater social security for families and women.

Livelihood development

The mean score values of various dimensions of livelihood empowerment of women from watershed and non-watershed area were compared with the help of Man Whitney z test (Table 5) and presented in Fig 3. The test value was significantly higher for social capital dimension with mean value of 19.04 for creating more numbers of social groups and 10.7 for contact with progressive farmers. In watershed areas, women were able to form more social group for exchange of information and were also in contact of progressive farmers. It may also be taken *vice-versa* that due to watershed interventions, women were more confident in forming social groups and user groups. Whereas in control areas, they were reluctant and less interested to take up any developmental activities in their areas. In similar trend, Rani and Kumar (2017)^[19] apprised that the number of SHG groups in all the watershed villages increased significantly, from an average of four to five groups to 30 to 33 groups. Political capital was found as another significant dimension under livelihood empowerment. Women in watershed areas were more involved in project planning, implementation, project monitoring and evaluation activities (mean value 17.25). Singh and Bhardwaj (2018)^[25] reported that 69.66% of respondents identified reservation policy as the most effective measure to increase women's participation in decision-making. This was followed by nomination to local decision-making bodies, cited by 16.66% of respondents. Only 7.32% and 6.33% of women mentioned that women facilitators and an increased number of women staffs, respectively, were policies that affected their participation in Integrated Wasteland Management Programme. As far as physical dimension is concerned, watershed villages got better infrastructure facilities such as availability of water, regular supply of electricity etc with mean value of 17.9 followed by basic sanitation facilities (12.89). This can be supported by the results that improved productivity with the cost-efficient water harvesting structures, improved the livelihoods through crop intensification and diversification through high value crops (Wani *et al.*, 2008; Sherka (2023)^[27, 24].

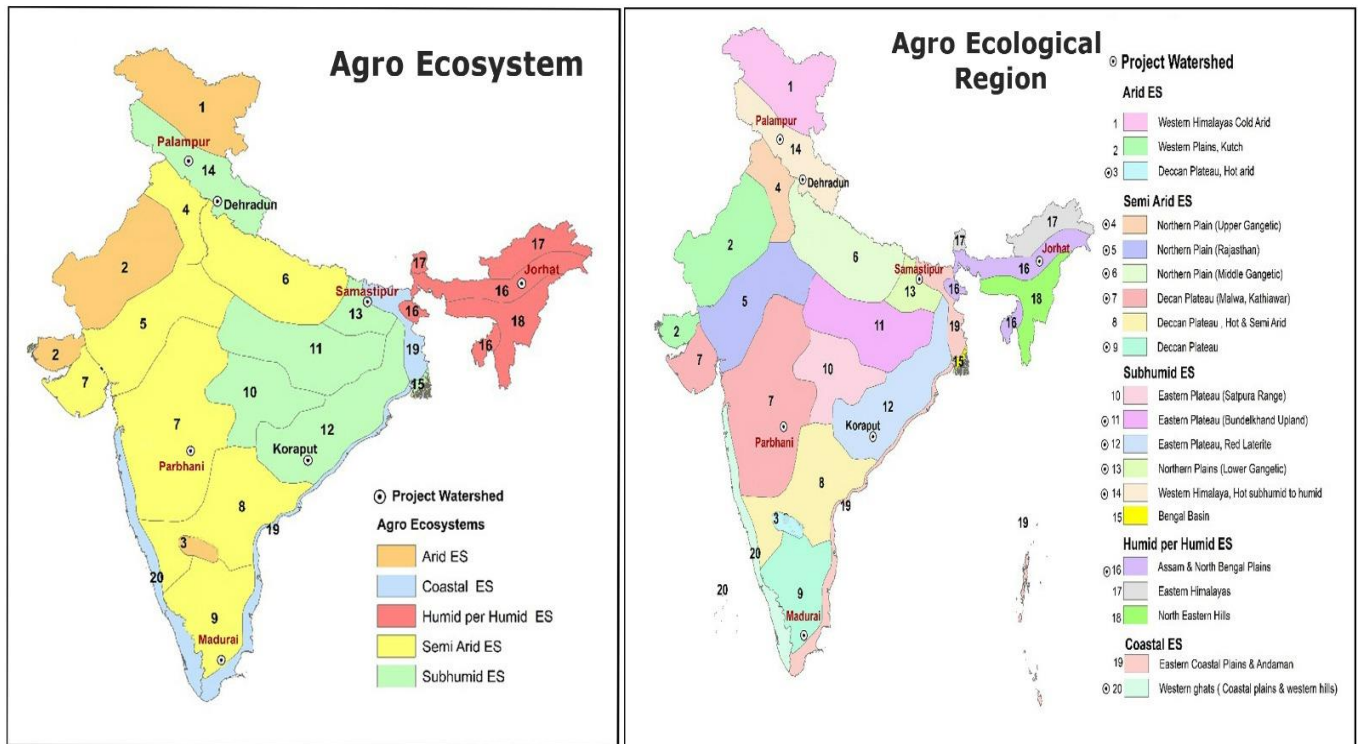


Fig 1: Details of watersheds in different agro ecosystem and agro ecological regions of India

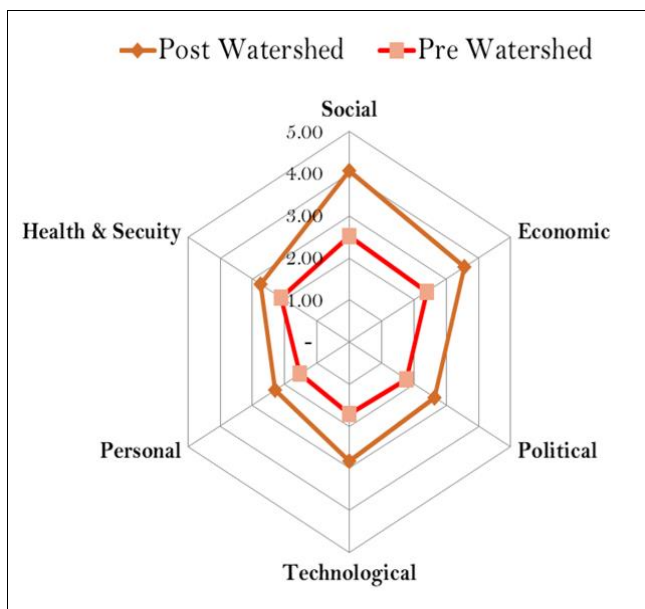


Fig 2: Changes in the dimension of women empowerment in pre and post watershed project period

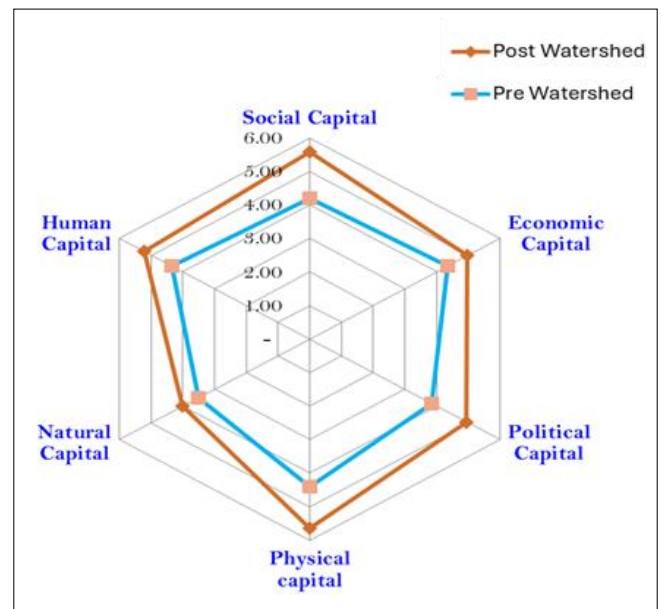


Fig 3: Changes in the dimension of livelihood wellbeing in pre and post watershed project period

Table 2: Calculations of weightage of dimensions of women empowerment index based on Analytical Hierarchy Process (AHP)

Dimension of Women Empowerment	Eigenvector based AHP	Weights for the index
Social Empowerment	0.137	0.14
Economic Empowerment	0.379	0.38
Political Empowerment	0.090	0.09
Personal Empowerment	0.198	0.20
Psychological Empowerment	0.153	0.15
Health And Security Empowerment	0.043	0.04
Consistency ratio (CR) :0.139; Consistency Index (CI)=0.0984		

Table 3: Comparison of farm women from watershed and controlled villages on basis of socio-economic characteristics

Sl. No.	Particulars	Mean		Std Error		Std Deviation	
		Control	Watershed	Control	Watershed	Control	Watershed
1.	Age (years)	44.73	42.93	0.8	0.7	13.0	11.2
2.	Education (Years)	4.83	5.27	0.3	0.3	4.3	4.5
3.	Farming experience (Years)	21.08	20.06	0.8	0.7	12.9	11.2
4.	Family (numbers)	4.99	4.34	0.1	0.2	1.7	3.3
5.	Annual Income (lakhs/ha)	1.34	2.47	0.1	0.1	0.9	1.5
6.	Land holding Rainfed (ha.)	4.16	1.60	0.1	0.1	1.4	2.3
7.	Land holding irrigated(ha.)	0.87	2.25	0.1	0.3	1.7	5.6
8.	Total land holdings (Acres)	5.03	3.85	0.1	0.4	2.3	6.7
9.	Technology Adoption (no.)	6.73	9.50	0.2	0.1	3.4	1.7
10.	Skill training (no.)	0.88	1.60	0.1	0.01	0.9	0.5
11.	Man-days in crop production	6.50	5.64	0.1	0.2	2.2	3.8
12.	Woman days in crop production	2.50	3.00	0.2	0.3	3.7	4.5
13.	Joint contribution in crop production	4.00	4.36	0.2	0.2	2.9	3.4
14.	Man-days in post-harvest operations	1.44	1.30	0.1	0.1	1.6	2.0
15.	Woman days in post-harvest operations	3.06	4.00	0.1	0.2	2.1	2.9
16.	Joint contribution in post-harvest operations	2.50	1.70	0.1	0.1	2.3	1.5
17.	Man-days in livestock operations	3.44	2.80	0.2	0.2	2.6	3.1
18.	Woman days in livestock operations	6.00	6.20	0.2	0.2	3.2	3.0
19.	Joint contribution in livestock operations	0.56	1.00	0.1	0.1	1.0	1.4

Table 4: Status of women empowerment watershed and controlled watershed villages

Dimensions of LI	Sub dimensions	Mean score of watershed farm women (n=560)	Mean score of control farm women (n=560)	Mann Whitney test z value
Social Capital	More no. of social groups	407	153	19.04
	Contact with progressive farmers	348	212	10.7
Economic Capital	Availability of employment throughout the year	342	218	9.75
	More number of earning members	306	254	3.9
	More number of enterprises	298	262	NS
	Access to financial services	358	202	11.6
Political Capital	Participation in project planning, implementation	392	163	17.25
	Participation in village development activities	337	223	8.8
Physical capital	Pucca house /paved roads	324	236	6.61
	Infrastructure facility (water, electricity)	399	161	17.9
	Basic sanitation facility	364	196	12.89
Natural Capital	Purchase of new land	289	211	NS
	Improvement in the existing land	328	232	7.31
Human Capital	Female literacy	350	210	10.5
	Availability of nutritious food for family	306	254	3.99

Table 5: Status of livelihood development of women from watershed and controlled villages

Dimensions of Women Empowerment	Sub dimensions	Mean score of watershed farm women (n=560)	Mean score of control farm women (n=560)	Mann Whitney test U value
Social empowerment	Active participation in meeting	403	157	19.0
	Recognition / UGs/SHGs	404	156	19.06
Economic empowerment	Family expenses planning	382	178	15.83
	Control over income	357	203	12.25
	Income generation activity	386	174	16.8
	Access to credit facilities	373	187	15.51
Political empowerment	Involvement in village administration	348	212	10.33
	addressing social problems	362	198	13.01
Personal empowerment	Change in time use on daily works	341	219	10.28
	Awareness about technologies	372	188	14.08
	Access to knowledge and resources	369	191	14.0
Psychological empowerment	Enhanced confidence	321	239	6.94
	Enhanced motivation	366	194	13.55
Health and security empowerment	Quality food intake	293	267	2.03
	Better Family health and security	372	188	14.24

Conclusion

Watershed programmes play a crucial role in water conservation, resource management, and economic sustainability of villages in which women's involvement is essential. Empowering women through watershed programs not only enhances their participation in decision-making but also leads to sustainable and equitable outcomes. Results from the study indicates significant differences between women from watershed and non-watershed areas in terms of their social status, economic activities, access to credit, adoption of technologies, and family security. Women from watershed areas showed enhanced participation in social groups, decision-making processes, and income-generating activities, which contributed to their overall empowerment. Additionally, improved infrastructure, water availability, and agricultural productivity in watershed villages positively impacted their livelihood. The formation of self-help groups (SHGs), involvement in project planning, and better access to resources further facilitated women's empowerment. In conclusion, integrating gender perspectives in watershed management programs is vital for achieving Sustainable Development Goals (SDGs). Women's active participation in these programs leads to better resource management, increased agricultural productivity and improved livelihood outcomes. Policymakers should continue to promote and support women's involvement in watershed projects to enhance their empowerment and ensure the success and sustainability of such initiatives.

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