Education as an Enabler: Exploring the Link between Literacy and Sustainable Development Participation among Rural Women in Hill Regions of Uttarakhand, India

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Abstract:

This study investigates how educational attainment influences rural women's awareness of sustainability-related government programs and their adoption of digital technology in the Ramnagar block of Nainital district, Uttarakhand, India. Drawing from a sample of 159 rural women engaged in micro and small-scale enterprises including tailoring, food processing, dairy, and handicrafts—the research adopts a descriptive and quantitative approach. Primary data were collected through structured questionnaires using a snowball sampling technique.

Three core variables were examined: education level (independent), awareness of sustainability-linked government schemes, and digital technology usage (dependent). Descriptive statistics were used to assess educational profiles and awareness levels, while Chi-square tests were conducted to explore associations between education and the dependent variables. The results indicate that while awareness and technology use were somewhat higher among more educated women, the relationships were not statistically significant. This suggests that factors beyond education such as local digital infrastructure, targeted training, or community outreach, may play a more critical role in enabling sustainable participation.

The study highlights the need for more inclusive policy interventions that address structural barriers to digital inclusion and information access for rural women, regardless of their education level.

Keywords: Rural Women, Education, Sustainability, Government Schemes, Technology Use, Digital Inclusion, Uttarakhand, India

1. Introduction

Rural women play a crucial role in sustaining household economies, managing small enterprises, and preserving ecological balance, especially in hilly regions of India like Uttarakhand. Despite their centrality to local development, their participation in formal sustainability-linked initiatives such as government development schemes and digital technology platforms remains limited. This limitation is often attributed to a mix of socio-economic, infrastructural, and informational barriers. While education is commonly cited

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as a foundational enabler of empowerment and informed decision-making, its independent role in shaping rural women's engagement with sustainability-related initiatives warrants closer examination.

Ramnagar block in Nainital district, Uttarakhand, offers a semi-rural setting where women are actively involved in micro and small-scale enterprises such as tailoring, food processing, dairy, handicrafts, and other local services. Although multiple central and state government programs exist to promote sustainable livelihoods and women's inclusion in development, the actual uptake and impact of such schemes among rural women remain uneven and poorly understood.

This study exclusively focuses on women entrepreneurs in the Ramnagar block and investigates the relationship between their educational attainment, awareness of sustainability-focused government programs, and usage of digital technology in business and livelihood practices. By grounding the research in a specific ecological and cultural context, the study provides localized insights that challenge generalized policy assumptions. The findings aim to guide more targeted and inclusive strategies for enhancing rural women's participation in sustainability and development pathways in India's hill regions.

2. Review of Literature

The intersection of education, sustainability awareness, and digital participation among rural women has drawn increasing scholarly attention in recent years. Education is widely recognized as a foundational enabler of empowerment and access to opportunities for rural women. According to Kabeer and Mahmud (2019), educational attainment plays a pivotal role in enhancing women's agency and their ability to engage with institutional systems, including government programs and market interfaces.

In the Indian context, Ghosh (2021) highlights that educated women are more likely to access financial and sustainability-linked government initiatives, though structural barriers such as poor outreach, limited awareness campaigns, and procedural complexities remain. Similarly, Rani and Sharma (2020) observed that awareness of schemes like PMEGP and Udyogini Yojana was significantly correlated with higher education levels, though not all educated women could convert awareness into program participation.

With the rise of digital governance and paperless service delivery, technology use has emerged as a key mediator in scheme access. Raman and Yap (2022) found that while digital platforms have improved accessibility, actual usage among rural women remains constrained by low digital literacy, infrastructure gaps, and lack of training. However, Kumari and Joshi (2023) noted a positive shift where mobile-based interventions and WhatsApp-led peer networks improved women's participation in income-generating activities and sustainability-linked practices, particularly in Uttarakhand and Himachal Pradesh.

Despite these advances, Yadav et al. (2024) argue that education alone is insufficient to ensure digital or scheme participation. Cultural norms, community support, and localized training efforts play equally significant roles in enabling meaningful engagement. As such, a holistic ecosystem approach is necessary—where education, digital tools, and targeted outreach converge.

This review suggests that while education remains a critical variable, it must be complemented with systemic digital enablement and localized awareness-building to empower rural women toward sustainable development.

3. Objectives

- To assess the educational attainment levels among rural women in Ramnagar block of Nainital District Uttarakhand, India
- To evaluate the association between education levels and awareness of sustainability-related government programs among rural women in Uttarakhand.
- To examine the relationship between educational attainment and the usage of digital technology in business and sustainable practices among rural women

4. Hypothesis

H1: There is a significant association between educational attainment and awareness of sustainability-related government programs.

H2: Women with higher education are significantly more likely to use digital technology in business and sustainable practices than women with lower education.

5. Research Methodology

This study adopts a descriptive and quantitative research design to examine how educational attainment influences rural women's awareness of sustainability-related government schemes and their usage of digital technology in the Ramnagar block of Nainital district, Uttarakhand, India. The primary focus is to assess education levels, analyze awareness patterns, and evaluate the association between education and technology adoption among women engaged in micro and small-scale economic activities, including tailoring, dairy, food processing, handicrafts, and other local services.

Primary data were collected through a structured questionnaire**,** comprising Yes/No and multiple-choice questions**,** designed to capture three key variables:

- Educational attainment (independent variable)
- Awareness of sustainability-linked government programs (dependent variable)
- Usage of digital technology in entrepreneurial or sustainable practices (dependent variable)

The sampling method employed was snowball sampling**,** initiated with known women entrepreneurs and expanded through local referrals in Ramnagar. After excluding incomplete or invalid entries, a total of 159 valid responses were used in the final analysis, ensuring a consistent and reliable dataset.

The data were coded and analyzed using SPSS**.** Descriptive statistics summarized the frequency and percentage distributions of educational attainment and awareness levels. To examine the association between education and the two dependent variables (awareness

and technology use), the Chi-square test of independence was applied. A standard significance threshold of $p < 0.05$ was used to assess statistical significance.

All ethical considerations were followed during fieldwork. Informed consent was obtained from every participant, and confidentiality of responses was strictly maintained throughout the research process.

6. Data Interpretation

Objective 1:

To assess the educational attainment levels among rural women in Ramnagar block of Nainital District, Uttarakhand, India

Table 1-Showing Education level of rural women in Ramnagar block of Nainital District, Uttarakhand

Education Level	Respondent	Respondent (%)
Intermediate	82	51.57
Matriculation	47	29.56
Graduation	30	18.87
Total	**159**	**100**

Primary Data

Interpretation:

As shown in Table 1, over half (51.6%) of the rural women entrepreneurs in Ramnagar have studied up to the intermediate level.

This suggests that while basic schooling is common, access to higher education remains limited. It also highlights a target group for sustainability training programs those with intermediate education who are capable but need structured support for advanced participation in digital and sustainability-linked initiatives.

Objective 2:

To evaluate the association between education levels and awareness of sustainability-related government programs among rural women in Uttarakhand.

H1: There is a significant association between educational attainment and awareness of government programs.

Table 2: Education vs Awareness among rural women in Uttarakhand

Education Level	Awareness			Chi-square	p-value
	No	Yes	Total		
Graduation	6	24	30	0.73	0.694
Intermediate	19	63	82		

Matriculation	14	33	47		
Total	**39**	**120**	**159**		

Primary Data

Interpretation:
Table 2 shows that there is no statistically significant association between educational attainment and awareness of sustainability-related government programs ($\chi^2 = 0.73$, $p = 0.694$). Therefore, education level alone may not strongly influence awareness; community outreach or media exposure could be more influential.

Objective 3:

To examine the relationship between education level and the usage of digital technology in sustainable practices among rural women.

H2: Women with higher educational attainment are significantly more likely to use digital technology than women with lower education.

Table 3: Education vs Technology Use

Education Level	**Digital Technology**			**Chi-square**	**p-value**
	No	**Yes**	**Total**		
Graduation	12	18	30	3.83	0.147
Intermediate	49	33	82		
Matriculation	28	19	47		
Total	**89**	**70**	**159**		

Primary Data

Interpretation:
As presented in Table 3, the relationship between education level and usage of digital technology is not statistically significant ($\chi^2 = 3.83$, $p = 0.147$). Education appears to have some influence, but not enough to confirm a direct relationship. Other factors like tech training or local digital infrastructure might play a bigger role.

7. Findings

The study revealed that the majority of rural women respondents in Ramnagar had attained at least an intermediate level of education, with over 50% completing schooling up to the 12th standard, followed by matriculation and graduation levels. This indicates a moderate educational background among women engaged in small-scale activities such as

tailoring, dairy, food processing, and handicrafts. However, when education level was tested for its association with awareness of sustainability-linked government schemes, no statistically significant relationship was found. While graduates showed slightly higher awareness, the difference across education levels was not meaningful at the 5% significance level. Similarly, the relationship between education and usage of digital technology also did not show a significant statistical association. Although graduates demonstrated comparatively better digital participation, many women with intermediate and matriculation qualifications also reported using mobile phones or digital tools in limited ways. These findings suggest that formal education alone does not determine whether rural women are aware of government schemes or engage with digital technology; other factors such as access to information, local training, and infrastructural support may play a more influential role.

8. Conclusion

This study concludes that educational attainment alone is not a strong predictor of either awareness of sustainability-linked government schemes or the adoption of digital technologies among rural women in the Ramnagar block of Uttarakhand, India. While intermediate and graduate-level respondents showed slightly better awareness and usage, the differences were statistically insignificant. This highlights the need for complementary interventions such as digital literacy training, localized awareness campaigns, and capacity-building programs to ensure inclusive participation in sustainability initiatives.

The findings underscore that empowering rural women for sustainable development requires more than education; it demands access, infrastructure, support systems, and context-specific engagement**.** Policymakers and program designers must adopt a holistic and decentralized approach to reach women at all educational levels and ensure equitable participation in India's digital and green transitions.

9. Suggestions

Based on the findings, it is evident that formal education alone does not guarantee awareness of government schemes or adoption of digital technology among rural women. Therefore, localized awareness campaigns using simple, culturally appropriate communication tools should be promoted to reach women at the grassroots level. Digital literacy programs tailored to the needs of semi-educated women must be implemented, with a focus on mobile usage, online schemes, and digital payments. Establishing community-based help desks or resource kiosks staffed by trained local women can bridge the gap between policy and practice. Furthermore, integrating sustainability-linked schemes with women's actual livelihoods—such as tailoring or food processing—will enhance relevance and uptake. Peer-led learning models should be encouraged to foster confidence and digital readiness. Finally, regular feedback mechanisms and collaborations with local institutions can ensure that such interventions remain effective, inclusive, and scalable.

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