

Women as Drivers of Environmental Action in the Himalayan Region for Sustainable Development: A Case Study on Uttarakhand

¹Prabha Modi, ²Preeti Joshi, ³Sneha Mesvaniay and ⁴Akansha Sing

^{1,2}*Department of Applied Science, Parul University*

^{3,4}*Department of Biotechnology Engineering, Parul University*

Corresponding Author: prabharawat.modi@gmail.com

Abstract

Women in the Himalayan region are key drivers of environmental action, combining traditional knowledge with adaptive practices to promote sustainable development amid growing ecological challenges. This case study highlights their roles in resource conservation, community initiatives, and resilience in vulnerable mountain ecosystems, particularly in Himalaya regions of Uttarakhand. The findings reveal how women's contributions to forest regeneration, water management, and biodiversity preservation intersect with their specific workloads and empowerment efforts. Initiatives such as tree-planting campaigns, restrictions on forest overexploitation, and the cultivation of organic foods not only rejuvenate ecosystems but also enhance livelihoods. Despite facing challenges such as migration pressures and policy neglect, these women embody eco-feminism, advocating for gender-responsive strategies. The research stresses the importance of recognizing women's stewardship in policy frameworks to achieve long-term sustainability in the Himalayas, where environmental health and gender equity are closely linked.

Keywords: Women, Environment, Sustainability, Himalayan, Gender Dynamics

Introduction

The Himalayan region, which includes parts of India, Nepal, Bhutan, and other areas, is one of the most ecologically sensitive zones in the world. It is home to diverse biodiversity hotspots and serves as a vital source of glacial water for billions of people. Communities in this region are facing rapid climate changes, and women, particularly those from indigenous and tribal groups, play a crucial role in managing natural resources. They are essential agents in promoting environmental stewardship and sustainable development. Their deep understanding of local ecosystems—earned through daily interactions with forests, water bodies, and agricultural lands—enables them to effectively tackle issues such as deforestation, unpredictable monsoon patterns, and glacier melt. (Bagchi, 2011)

Ecological Context and Gender Dynamics

The altitudinal gradients of the Himalayas create microclimates that support a unique variety of agrobiodiversity, ranging from medicinal herbs to rare fungi. However, this biodiversity is under threat from overexploitation and climate variability. In the Western Himalayas, such as Himachal Pradesh's Pangi Valley, indigenous women are responding to these challenges by reviving traditional practices. They identify forest patches that are at risk, enforce longstanding bans on harvesting to allow for regeneration, and cultivate high-value products like hazelnuts and 'Gucchi' mushrooms. This not only promotes conservation but also enhances economic self-reliance. (Bishnoi, 2024)

In Uttarakhand's Kumaon region, particularly in the Khul Gad micro-watershed, women's lives are deeply connected to land, water, and forests. Degradation in any one of these areas disrupts the entire agro-ecosystem, which increases their vulnerabilities, especially as men migrate to urban areas. This relationship between gender and the environment aligns with ecofeminist principles, as women's greater dependence on communal resources exposes them to risks but also empowers them to be innovators. Studies from ICIMOD highlight how mountain women manage fuelwood, fodder, and water collection, often finding new solutions amid shortages. However, their exclusion from decision-making processes limits their ability to adapt effectively. Programs like Himalayan Ecotourism's reforestation initiatives engage women in seed collection, nursery maintenance, and fire prevention. These efforts challenge traditional norms and encourage community mobilization.(Bhatt & Bhardwaj, 2023),(Rogelja & Kroese, 2025)

Case Study Focus: Pangi Valley and Kumaon Initiatives

Focusing on Pangi Valley in Himachal Pradesh, tribal women have successfully transformed fragile ecosystems through entrepreneurship. Confronted with poverty and underdevelopment, they have adopted sustainable practices, such as prohibiting the harvesting of resources from stressed forests, adding value to local products, and avoiding harmful activities like stripping the bark of Bhojpatra trees. These initiatives not only sustain their livelihoods but also conserve the region's unique biodiversity. Similarly, women's groups in Kumaon, such as Mahila Mandals, are actively involved in regenerating forests by planting and protecting trees, thereby integrating resource management with poverty alleviation.(Singh, 2014),(Bharti et al., 2020)

Initiative	Location	Key Practices	Outcomes
Forest Regeneration	Pangi Valley, HP	10-year harvest bans; value addition (e.g., Gucchi mushrooms)	Biodiversity conservation; income generation
Reforestation & Fire Prevention	Himalayan communities	Seed collection; sapling care; community mobilization	Ecosystem restoration; gender equality
Agro-ecosystem Sustenance	Khul Gad, Kumaon	Household agriculture; resource interlinkage management	Livelihood stability amid degradation
Mahila Mandal Groups	Central Himalayas	Tree planting; forest protection	Women's empowerment; sustainable resource use

This table illustrates literature study of localized actions yielding scalable impacts, underscoring women's role as "harbingers of change" in mountain economies.

Challenges and Barriers

Despite their contributions, women face multiple challenges. Male outmigration results in doubled workloads for women, while environmental decline undermines their subsistence. Additionally, policy neglect overlooks their expertise. Gender inequalities, such as limited access to resources and exclusion from decision-making, hinder women's ability to cope with climate change. This is evident in the Eastern Himalayas, where women play a dominant role in agriculture across various economic strata. Furthermore, governmental oversight in Uttarakhand's lesser Himalayas further marginalizes their conservation efforts.(Pundir et al., 2025)

Pathways to Empowerment and Sustainability

Empowering Himalayan women requires the implementation of gender-integrated policies that facilitate access to renewable energy, reduce drudgery, include women in climate negotiations, and leverage their knowledge in conservation efforts. ICIMOD advocates for the recognition of rural women's technical expertise in agriculture and resource management. By promoting groups like Mahila Mandals, governments and NGOs can catalyze sustainable development, ensuring both ecological and social resilience.(Singh, 2014)

Women should not be seen as passive victims; they are proactive drivers of change, blending traditional wisdom with modern needs to promote sustainability in the Himalayas. This case study highlights their transformative potential and calls for increased support to secure the region's future. In the Uttarakhand Himalayan region, women face significant challenges in resource management due to their crucial roles in handling forests, water resources, and agriculture amidst ecological fragility. These challenges arise from environmental degradation, gender inequities, and socio-economic pressures present in the Himalayan hills.(Bhatt & Bhardwaj, 2023)

Deforestation and resource scarcity disproportionately affect women, who are the primary collectors of fuelwood, fodder, and water. Uttarakhand's watersheds are experiencing erosion, reduced forest cover, and hydrologic imbalances, issues further exacerbated by monoculture farming, landslides, and groundwater depletion. These factors double women's daily workloads, resulting in:

- Longer treks of 5 to 10 kilometers to collect fuelwood and fodder due to scarcity.
- Increased time spent fetching water as springs dry up during erratic monsoon seasons.
- Threats to subsistence farming caused by soil depletion and biomass loss, which is their main source of livelihood.

Moreover, male outmigration to urban areas leaves women to manage farms alone, heightening vulnerabilities in remote villages. Socio-economic barriers, such as financial constraints, limit access to essential tools, seeds, and credit, with 40% of rural women identifying this as a significant issue, despite 62% of them engaging in agriculture. Patriarchal norms often prevent women from owning land and participating in important decisions, such as choosing which crops to grow, despite their significant contributions to family labor. Uttarakhand faces similar resource management challenges as other Himalayan states like Himachal Pradesh, Arunachal Pradesh, and Sikkim. However, the region's steeper terrain and the pressures from pilgrimage-related activities further increase the gender-specific burdens that women must bear. (Sati & Banergee, 2025)((Bagchi), 2011)

Barrier	Impact on Resource Management	Prevalence
Financial Limits	No loans for irrigation or sustainable seeds	40%
Social Norms	Restricted mobility and decision-making	25%
Low Education	Hinders modern techniques adoption	15%
Health Issues	Reduces productivity in labor-intensive tasks	8%

All Himalayan states face fragile ecosystems that are vulnerable to landslides, deforestation, and water scarcity due to glacier melt. In these regions, women are responsible for collecting 70-80% of fuelwood, fodder, and water, especially as men migrate for work.

- Ecological Fragility: High erosion rates and seismic risks in states like Uttarakhand, Himachal Pradesh, and those in the Northeast hinder sustainable resource extraction.
- Outmigration: The departure of male workers depletes the local labor force, placing a heavier burden on women. For example, women often undertake daily treks of 5-10 kilometers for resource collection, a situation common from Uttarakhand to Arunachal Pradesh.
- Infrastructure Gaps: Poor road conditions increase costs and delay access to aid and markets across these regions..

Uttarakhand vs. Other States

Uttarakhand's Char Dham routes concentrate development, intensifying cumulative impacts like hydropower siltation and tourism waste, unlike Himachal's dispersed apple economy or Sikkim's organic focus.((Bagchi), 2011)(Sati & Banergee, 2025)(Sati & Banergee, 2025)

Challenge	Uttarakhand	Himachal Pradesh	Arunachal Pradesh	Sikkim
Terrain Impact	Steepest gradients; pilgrimage traffic worsens erosion	Moderate hills; better roads aid access	Remote, forested; biodiversity offsets scarcity	Compact; organic policies ease pressure
Water Stress	Spring drying + hydropower overuse; women fetch 200L/day	Balanced via irrigation; less acute	Abundant but polluted by mining	Glaciers stable; rainwater harvesting strong
Forest Dependence	65% cover but fodder shortages; male migration 30%	Commercial orchards reduce reliance	Shifting cultivation strains women	Community forests; lower outmigration
Policy Execution	PRI gaps despite 50% women quota	Stronger SHGs via apple cooperatives	Tribal autonomy aids but isolates	Eco-tourism integrates women effectively
Climate Intensity	Frequent disasters (Kedarnath-like); high tourism load	Managed via fruit economy buffers	Border issues divert resources	Resilient via small scale, organic shift

Role of women in addressing resource challenges across Himalayan states

Women across the Himalayan states play critical roles in addressing resource challenges by utilizing traditional knowledge, mobilizing communities, and adapting their livelihoods. They often compensate for male outmigration and gaps in policy(Singh, 2014)(Pundir et al., 2025)(Rogelja & Kroese, 2025)(Bhatt & Bhardwaj, 2023).

Himalayan women manage 70-80% of daily resource collection, including fuelwood, fodder, and water, while also innovating conservation practices in the face of deforestation and climate change. Their deep understanding of ecosystems promotes regeneration through activities like seed banking

and sustainable harvesting, positioning them as "invisible managers" who are essential for building resilience.

- Direct resource stewardship: Their daily interactions with the environment develop their skills in agro-biodiversity, medicinal plants, and water harvesting.
- Adaptation leadership: Left behind by migration, these women sustain their households through diversified farming and microenterprises.
- Knowledge custodians: Their traditional practices help buffer the impacts of climate change, but their exclusion from decision-making processes limits the scale of their contributions.

Investigating the lifestyle and role of women of Himalayan Region of Uttarakhand and contribution as Drivers of Environment for Sustainability.

As a part of Investigation, a survey on the lifestyle of Himalayan women was carried in the form of a questionnaire, collecting the data of the work carried out by them in the Mountains of Uttarakhand region. The survey was carried at different region of the state -

The pie chart titled "Age Group" (Fig. 1) illustrates the percentage distribution of individuals across various age categories. The 36–45 age group constitutes the largest segment of the population, making up 36.1%, indicating that most individuals fall into the middle-age bracket. The 26–35 age group is the second largest at 22.2%. The 46–55 age group accounts for 19.4% of the total population. Both the youngest age group (below 25) and the oldest age group (above 55) have equal representation at 11.1% each, making them the smallest segments.

The pie chart titled "Primary Occupation" (Fig. 2) shows the distribution of individuals based on their main occupations. The largest proportion, 38.9%, falls under "Other" occupations, indicating that many respondents are engaged in jobs outside the listed categories. Household work is the second largest category at 27.8%. Both agriculture and self-employment account for 16.7% each, reflecting moderate participation in these sectors. Notably, no respondents reported livestock or forest-based work as their primary occupation. Overall, the data indicates significant occupational diversity, with a substantial share of individuals involved in "Other" types of work. Traditional sectors such as agriculture show moderate involvement, while livestock and forest-based occupations are not represented in this dataset.

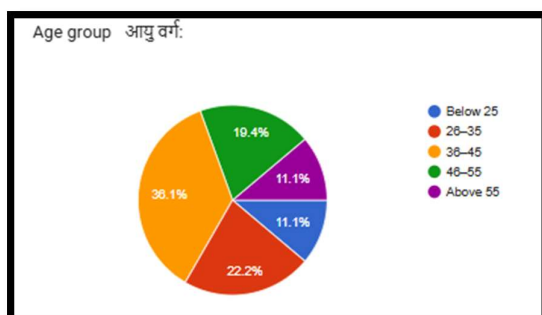


Fig -1 Age Group

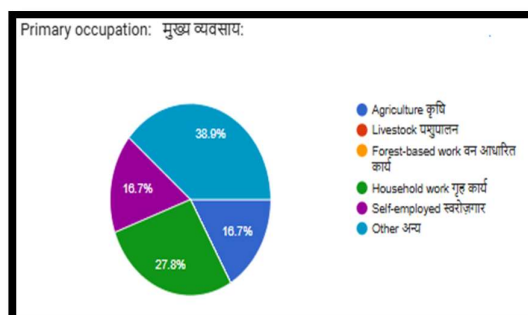


Fig -2 Primary Occupation

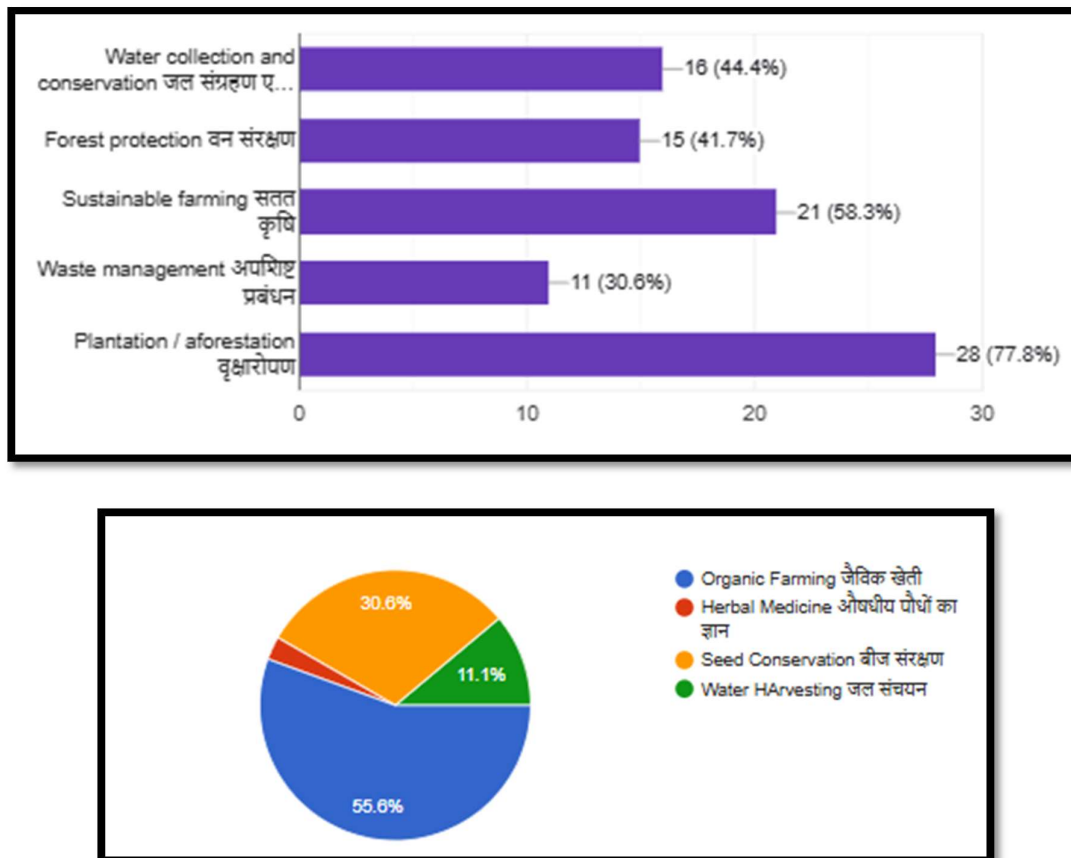


Figure 3 illustrates the various environmental activities in which women participate, along with the number of participants and their percentage of involvement. Women are most actively engaged in plantation and afforestation, demonstrating a strong commitment to environmental improvement. Their participation is also significant in sustainable farming, highlighting their role in eco-friendly agriculture. There is moderate involvement in water conservation and forest protection, while waste management shows comparatively lower participation, though it still reflects meaningful engagement. The data clearly indicates that women play a crucial role in environmental conservation, particularly in tree planting and sustainable agricultural practices, contributing significantly to ecological sustainability and community development.

The study reveals that 78% of women are actively involved in tree planting and afforestation activities, reflecting strong engagement in enhancing green cover and environmental restoration. Additionally, 58% of women participate in environmentally friendly agricultural practices, which include organic farming, soil conservation, and eco-friendly cultivation methods. This underscores women's significant role in promoting sustainable agriculture.

Furthermore, 55% of women engage in water-related environmental activities, such as rainwater harvesting, water storage, and efficient water use, indicating a growing awareness of water scarcity and conservation. Many women also participate in forest protection activities, which may involve preventing deforestation, monitoring forest resources, and managing community forests, thus contributing to biodiversity conservation. Finally, some women are involved in waste segregation, recycling, and cleanliness initiatives. While this participation is comparatively lower, it still demonstrates their commitment to maintaining environmental hygiene.

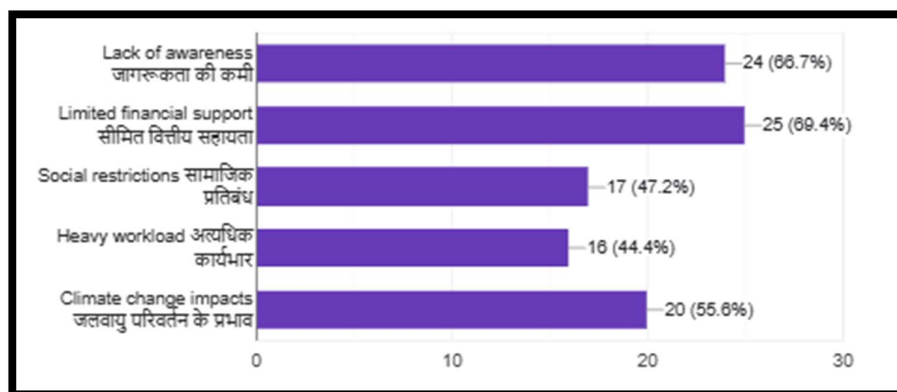


Figure 5 highlights the key challenges women face in participating in environmental action, along with the number and percentage of respondents reporting each issue. The most significant challenge is the lack of funds, which restricts 69.4% of women from investing in sustainable practices, tools, training, or environmental projects. A large proportion of women also lack sufficient knowledge about environmental programs, climate issues, or available support schemes, limiting their effective participation and informed decision-making.

Moreover, more than half of the women surveyed experience direct impacts of climate change, such as irregular rainfall, droughts, or crop loss. These environmental stresses make it harder for them to sustain their livelihoods and engage in conservation efforts. Many women are already balancing household responsibilities alongside their work, and time constraints further limit their ability to actively participate in environmental initiatives.

The data indicates that economic and informational barriers are the biggest obstacles women face, followed by environmental and social factors. While women are willing to participate in environmental action, their efforts are primarily hindered by financial constraints, lack of awareness and training, climate-related challenges, and social and workload pressures.

Addressing these challenges through financial support, awareness programs, skill development, and gender-inclusive policies can significantly strengthen women's roles in environmental conservation.

Conclusion

The overall analysis clearly shows that women are key drivers of environmental sustainability. The data indicates that women actively engage in important environmental activities such as tree planting and afforestation, sustainable agriculture, water conservation, and forest protection. Their significant participation in tree planting and eco-friendly farming practices underscores their deep connection to natural resource management and community well-being.

Despite facing substantial challenges—including limited financial resources, lack of awareness, the impacts of climate change, social restrictions, and heavy workloads—women continue to make meaningful contributions to environmental conservation. These obstacles do not diminish their commitment; instead, they highlight the urgent need for greater institutional support, financial inclusion, education, and gender-sensitive policies.

Women's roles within families and communities uniquely position them to influence sustainable practices, resource conservation, and climate resilience. When equipped with knowledge, resources,

and decision-making authority, women can enhance environmental protection efforts and promote long-term ecological balance. Thus, strengthening women's participation is not just a matter of equality; it is essential for achieving sustainable development and building a resilient, environmentally responsible society.

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