

Review Article

Gender differentiated impacts of climate change on agriculture in Nepal: A review

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ABSTRACT

Gender disparities' sensitivity to climate change impacts in agriculture is a major source of concern. This review investigates the gender-specific effects of climate change on the agricultural sector. The study is based on a meticulous review of over sixty-seven published reports, documents, articles, and presentations by the Government of Nepal (GoN) and numerous international organizations active in the domains of gender, climate change, and agriculture. We also examine the experiences of men and women regarding the impacts of climate change on agriculture in Nepal, encompassing their respective roles, duties, and vulnerabilities. This study actively contributes to the ongoing international discourse on gender and climate change. The literature review reveals that while climate change affects both men and women, it disproportionately increases the workload for women due to their limited access to reliable weather prediction information, crop and livelihood diversification alternatives, and decision-making authority. Incorporating gender considerations into initiatives for climate change adaptation and mitigation can result in enhanced and enduring solutions. This study concludes that climate change impacts have the potential to exacerbate existing gender inequalities and recommends the adoption of gender-responsive approaches when addressing climate change challenges.

INTRODUCTION

Agriculture, a fundamental pillar of Nepal's economy, sustains the livelihoods of a significant portion of its population [1,2,3], with approximately 60% of the workforce engaged in this sector, contributing to one-fourth of the Gross Domestic Product (GDP) [4]. However, the agricultural landscape in Nepal is poised at a critical juncture, facing multifaceted challenges exacerbated by the relentless impacts of climate change [5]. Nepal, situated in South Asia, possesses distinctive topographical features, including the Himalayan mountain range, which significantly influences its climate and agricultural practices [6]. Agriculture in Nepal primarily relies on monsoon rainfall, owing to limited irrigation infrastructure. This dependence on weather patterns makes agriculture particularly vulnerable to the erratic climatic changes induced by global warming [7,8]. According to the Intergovernmental Panel on Climate Change (IPCC), Nepal has experienced a warming trend at a rate exceeding the global average, leading to increased frequency and intensity of extreme weather events such as floods, landslides, and droughts [9]. The earth's average temperature has risen by 1.10°C over the past decade, and projections indicate a potential increase of 1.30°C to 5.70°C by the end of the century [9]. In Nepal, this temperature rise has manifested as an alarming increase of 0.06°C per year [10], and it is anticipated to reach 1.3°C to 1.5°C by 2050 [11]. The agriculture sector is impacted by climate change and also plays a role in contributing to it [7,8].

Climate change is a global issue that exerts its influence across a wide spectrum of sectors, agriculture being one of them [12]. The repercussions of climate change on agriculture are multifaceted and profound. Climate variability and extreme weather events pose significant threats to global food security [8]. The consequences of climate change on agriculture may result in a potential reduction of 10% in global crop yields by the year 2050 [13]. Climate change has significant effects on agricultural productivity, especially in developing countries where agriculture is a primary source of livelihood for most people. In Nepal, floods and landslides resulting from erratic precipitation have claimed lives and led to the loss of fertile land due to shifts in

geographical structures [8]. Notably, the impacts of climate change are expected to be more pronounced in mountainous and Himalayan regions, where agricultural productivity and food security are crucial for the sustenance of the population [6]. Climate change exacerbates the vulnerability of farmers to various hazards such as droughts, floods, and pests. Paradoxically, while rising temperatures and increased CO₂ emissions may benefit certain crops through improved photosynthetic processes, enhanced water use efficiency, and shortened growth periods [8], they also give rise to negative consequences such as increased insect pest populations, desertification, soil erosion, and malnutrition [14].

Climate shocks, nevertheless, exert disparate impacts on men and women, attributable to their socially prescribed roles, responsibilities and resource access [15-18]. The impact of climate change has a more adverse effect on women in comparison to men [3,19]. This review underscores the pivotal role of gender in shaping the experiences of individuals and communities facing climate change effects. Gender disparities in access to resources, decision-making power, and societal roles result in differential impacts of climate change on men and women [17]. Women, in particular, often bear a disproportionate burden of the challenges associated with climate change [19]. Their limited access to weather forecast information, constrained options for livelihood diversification, and lack of financial resources hinder their ability to adapt effectively to climate variability and weather-related shocks [20-22]. Women often exhibit a greater capacity to adjust to climate change due to their experience in managing natural resources and their role in ensuring food security [23]. However, their ability to respond is limited by social and cultural norms that restrict their access to resources and decision-making power [24].

While the interconnectedness of climate change, agriculture, and gender is evident, there is a critical research gap in understanding the gender-differentiated impacts within the context of Nepal. This review aims to bridge this gap by providing a comprehensive examination of the distinct vulnerabilities and capacities of male and female farmers



in Nepal. The objectives of this study are to elucidate the roles, responsibilities, and challenges faced by both genders in the agricultural sector and to contribute to the global discourse on gender and climate change. Ultimately, this review advocates for the adoption of equitable and gender-responsive strategies within the resilience and mitigation efforts of the agricultural sector.

The subsequent sections of this review paper provide an in-depth examination of gender-specific impacts, adaptation approaches, and policy considerations within the framework of climate change and agriculture in Nepal. Through the exploration of these essential dimensions, the research seeks to furnish valuable perspectives aimed at guiding more comprehensive and efficient measures for enhancing resilience and alleviating the consequences of climate change on agriculture in Nepal and in a broader global context.

METHODOLOGY

In this comprehensive review, a systematic approach was employed to investigate the gender-differentiated impacts of climate change on agriculture in Nepal. The methodology involved an exhaustive search of academic databases and relevant sources to identify studies and resources pertaining to the subject, covering the period from 2001 to 2023. Keywords and phrases such as "gender," "climate change," "agriculture," and "Nepal" were utilized in constructing search queries, and Boolean operators were employed to refine search criteria. The inclusion criteria encompassed sixty-seven peer-reviewed articles, reports, policy documents, presentations, and publications by the Government of Nepal (GoN) and international organizations, with a focus on English-language materials. Some of the documents included were relatively older, reflecting the evolving understanding of this complex topic, while the majority consisted of more recent contributions. Excluded were studies not directly addressing the nexus of gender, climate change, and agriculture in Nepal, along with non-English documents. Data extraction involved systematically gathering information relevant to the study's objectives, including gender-specific impacts, adaptation strategies, policy implications, and stakeholder roles. Qualitative synthesis and categorization of extracted data were performed to identify key themes and trends. Quality assessment ensured the reliability of reviewed documents by evaluating factors such as methodology and data validity. This methodological framework facilitates a comprehensive and contemporary analysis of the gender-specific facets of climate change impacts on Nepalese agriculture, drawing from a diverse array of scholarly and non-scholarly sources, spanning a range of publication dates to capture the evolving nature of this field.

Women in agriculture in Nepal

In Nepal, although agriculture is often seen as the primary occupation for 60.4% of the population [25], it is women who dominate this sector [26], playing a pivotal role in the national economy by their relentless efforts within their households. With a large number of males leaving the nation in quest of more lucrative work options, the feminization of agriculture has emerged as a prominent trend in Nepal [27,28]. Women play a significant role in agriculture in Nepal, accounting for 43% of the agricultural labor force in developing countries and even up to 70% in some countries [29]. They are responsible for various tasks, including seed selection, planting, weeding, harvesting, and processing. Despite their significant contributions, women face several challenges in agriculture, including limited access to land, water, credit, information, education, and technology [30]. Positive community effects may result from facilitating women farmers' access to resources and helping them develop their capacities [31,32]. Over the past 24 years, the percentage

of households headed by women has increased from 12.4% in 1998 to 32.4% in 2022, as illustrated in Fig. 1 [33,34].

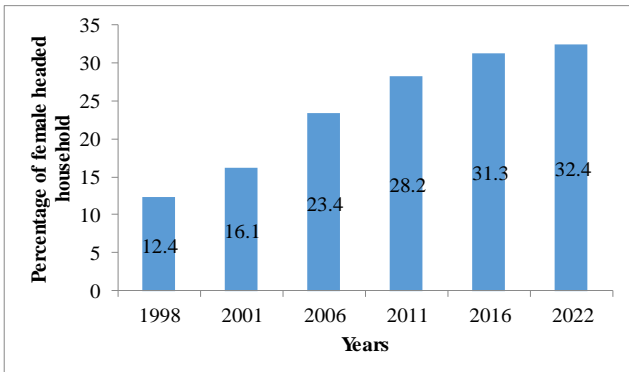


Fig. 1. Trend of percentage of households headed by women in Nepal.

Distributed gender roles and responsibilities

There are distinctions in the roles and obligations, expertise, and decision-making processes between men and women when it comes to overseeing agriculture and household affairs [35], as in Fig. 2.

Gendered differences in vulnerability to climate change impacts on agriculture

Gendered differences in vulnerability to climate change impacts in agriculture are a critical concern. Due to the socially imposed roles and obligations that they have, it is clear that the effects of climate change affect men and women in distinct ways [36]. As an illustration, in developing nations, climate change impacts the accessibility of surface water. Consequently, rural women, who are typically responsible for water collection, are compelled to traverse longer distances to secure this vital resource, thereby further augmenting their already significant workload [37]. Research has also demonstrated the profound connections between climate-induced disasters and female mortality. During such disasters, women, boys, and girls face a mortality risk over 14 times higher than that of men [38].

Women frequently face more restricted entitlements compared to men, constrained movement, reduced availability of timely meteorological updates, and a deficiency in autonomous revenue streams. This is exacerbated by poverty-induced insufficiencies in adaptation resources [39], and decision-making authorities [40]. When it comes to acquiring and utilizing agricultural technologies, women frequently confront institutional, social, and cultural impediments [41–44]. As a result, they are considerably more susceptible to the repercussions of climate change [45]. When it comes to acquiring and utilizing agricultural technologies, women frequently confront institutional, social, and cultural impediments [46,47].

Another element that adds to gender-based disparities in susceptibility to the effects of climate change in agriculture is the gendered allocation of roles and responsibilities. In Nepal, the gender distribution of roles and responsibility is notably skewed. Women owned land and property in only 19.71% of families in the nation as per the 2011 census [48]. In Nepal women undertake 6.3 to 6.6 times the agriculture work that men carry out. In Nepal, for instance, where there is a sizable male rural outmigration, women now work six times as many hours in agriculture as men do. While their husbands work as wage laborers in cities, they have taken over as the main farmers [49]. Women in many regions are increasingly susceptible to climate unpredictability and shocks due to the rising participation of women in both commercial and subsistence agriculture.

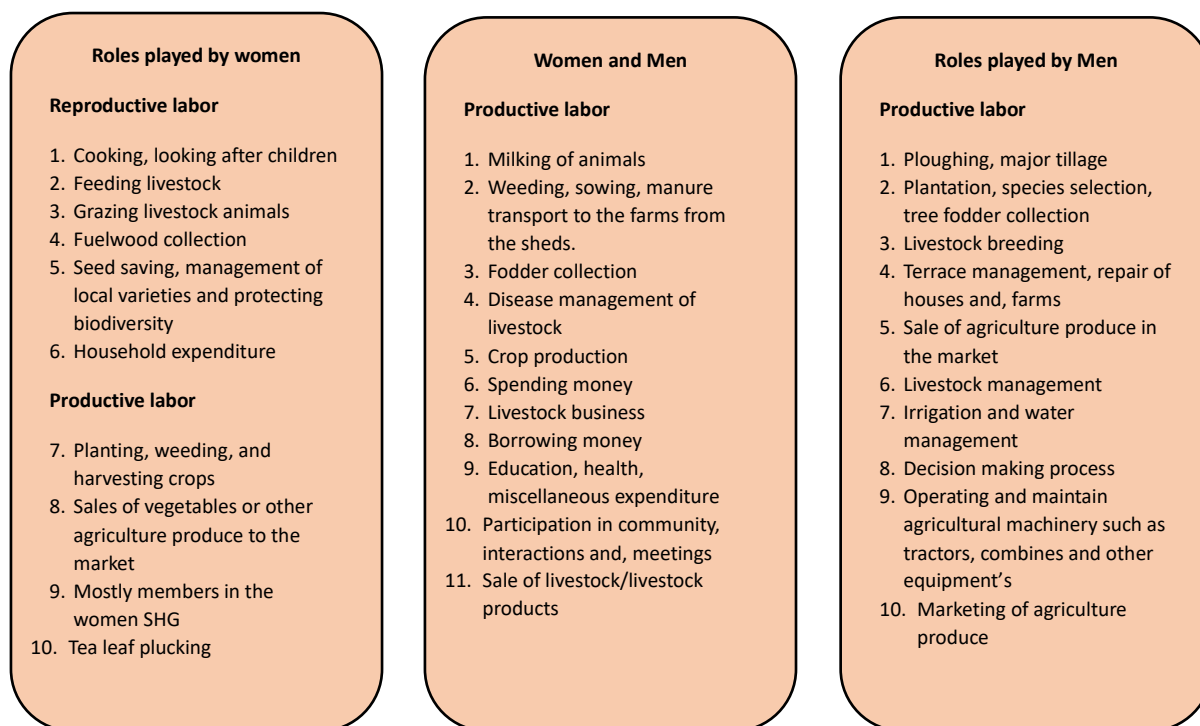


Fig. 2. Gendered distribution of roles and responsibilities in agriculture and the domestic sector.

Case studies illustrating the gender-specific consequences of climate change on agriculture

Women frequently experience the negative effects of drought, floods, storms, extreme rainfall events, and sea level rise more acutely than males due to social expectations of gender roles and systematic gender inequality. Women and disadvantaged communities are more prone to enduring the enduring adverse effects of climate change, primarily stemming from an intricate interplay of societal elements. The impacts of extreme weather events induced by climate change disproportionately affect women and girls, impeding their ability to carry out their daily responsibilities. In some regions, women and girls have traditionally been tasked with the collection of firewood and water. However, the negative effects of climate change have made it necessary for these women and girls to travel further from their

homes to fulfill these jobs and support their families. They are thus exposed to gender-based violence outside the house more due to the lengthier commutes [50,51]. Climate change is influencing the availability of water and soil moisture, potentially causing adverse repercussions on food production and heightening food insecurity, particularly among impoverished and marginalized households [8], as shown in Fig. 3. Longer droughts will also reduce the quality and quantity of natural resources, making it more difficult for women to collect water, wood for fires, and feed [8]. This will make women work harder and have an impact on the entire family [52]. Likewise, the departure of men from their home regions has emerged as a significant livelihood strategy for a growing number of rural households in numerous low-income countries, Nepal included. Fig.4 illustrates the interrelationships among agriculture, climate change, and gender (modified from Paudyal et al. [53]).

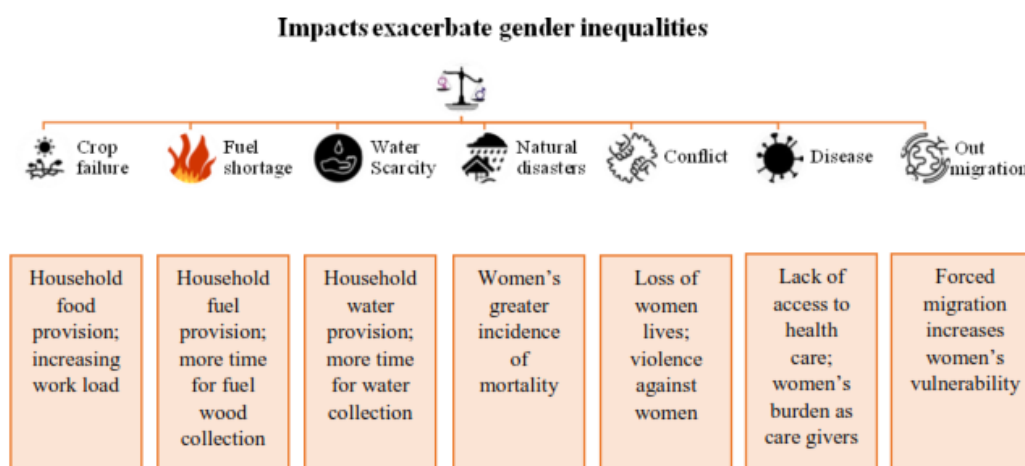


Fig. 3. Interrelationships among agriculture, climate change, and gender.

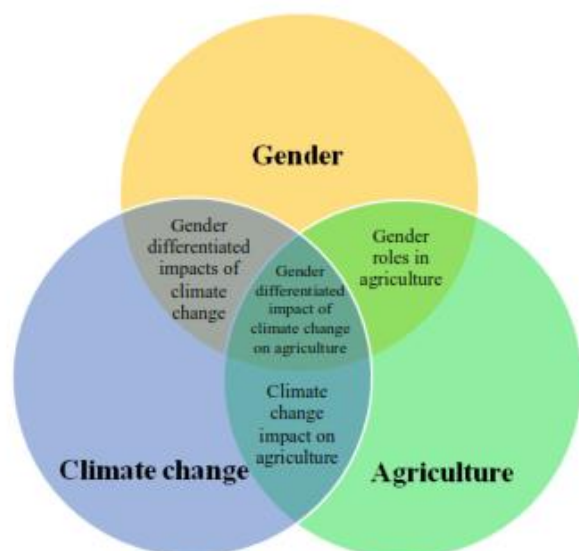


Fig. 4. Conceptual diagram on gender, agriculture and climate (modified from Paudyal et al. [53]).

Current policies gaps to address the gender related issue

Gender is a vital cross-cutting element in the agriculture sector, as gender-based disparities in the access to and management of natural resources have impeded the effective implementation of developmental programs within the national agricultural policy framework over the years. For the formulation and execution of developmental programs, it is essential to take into account gender considerations, and integrating these considerations can enhance the effectiveness of policies from a gender perspective [54]. This section will analyze the various policy initiatives that exist for the marginalized groups within the agriculture sector and evaluate their responses in the context of gender. While Nepal has made significant strides in recognizing the importance of gender mainstreaming in agricultural policies, there are still critical policy gaps that need to be addressed to effectively tackle gender-related issues exacerbated by climate change impacts on agriculture.

Agriculture Development Strategy (ADS)

On July 26th, 2015, the GoN adopted the ADS. There are four strategic frameworks that have been designed to help Nepal realize the ADS vision. By tackling concerns relating to food and nutrition security, poverty, and inequality among the most disadvantaged rural people, these frameworks—governance, productivity, commercialization, and competitiveness—seek to enhance social and geographic inclusion. Minority ethnic groups, Janajati, individuals impacted by widespread emigration, older people, and pregnant and nursing women farmers are among the beneficiaries.

However, despite the recognition of women as significant stakeholders in agricultural development within the ADS policies, there remains a major gap between policy intent and practical implementation. The ADS has suffered from a significant mismatch between its vision, plans, and actions from the outset [55]. The final report of the ADS in Nepal identified the lack of support to ensure that women have equitable access to land, can claim their rights, and live a dignified life. It emphasizes that considering gender issues is crucial for achieving the main priority of agricultural development under the ADS. Furthermore, the ADS recognize the multi-dimensional and complex links between agriculture development and the issue of out-migration.

Agriculture Perspective Plan (APP)

A important policy, the APP (1995–2015), recognizes the critical contribution of women to raising agricultural output. It focuses on the necessity of fostering women's leadership in agriculture and raising their level of empowerment by involving them in enhancing rural infrastructure and the environment. Despite acknowledging the significance of women's involvement, it fell short in mainstreaming gender and gender relations throughout its implementation process [56].

APP aimed to achieve agricultural growth through active women's participation. However, in Nepal, women, particularly those left behind by male migrants, often lack the opportunities to access natural resources like land. Gender dynamics play a critical role in agricultural development, and it has a strong positive correlation with food security and household welfare for those who are considered "left behind." APP provided limited priority to women's issues and neglected key land-specific issues. This indicates the inefficiency of the program in empowering women and addressing the problem from a gender perspective.

National Agricultural Policy (NAP)

The GoN has implemented several genders mainstreaming programs, including the NAP (2004), which is a crucial policy plan that includes key gender strategies. NAP places a priority on enhancing women's entry to agricultural assets and knowledge by delivering essential training programs. The government is making efforts to promote women's participation in agriculture projects by enhancing their capacity and involvement in cooperatives and farmer's groups and strengthening their leadership roles in the development of agricultural policies. Specifically, the government aims to ensure that women participate in agriculture projects at a rate of 50% or more.

Roles of NGO/INGO working on gender, climate change and agriculture

Non-Governmental Organizations (NGOs) and International Non-Governmental Organizations (INGOs) play multifaceted roles in addressing the complex and interconnected challenges of gender, climate change, and agriculture [57,58]. Through advocacy, capacity building, research, program implementation, policy advocacy, partnerships, monitoring and evaluation, knowledge sharing, resource mobilization, and community empowerment, these organizations contribute to a more gender-inclusive and climate-resilient agricultural sector. Their collective efforts empower women as key agents of change, enabling them to adapt to and mitigate the effects of climate change while improving their livelihoods and food security [57,59].

NGOs and INGOs are instrumental in advocating for gender-responsive climate change policies within the agricultural sector. They play a crucial role in raising awareness about the unique challenges faced by women in farming communities [59]. These organizations work tirelessly to ensure that climate change initiatives and agricultural policies take into account gender equity and female participation. By acting as vocal advocates, they highlight the importance of integrating gender considerations into climate action plans, thereby fostering more inclusive and effective strategies. NGOs like the International Centre for Integrated Mountain Development (ICIMOD), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) Nepal, Karnali Integrated Rural Development And Research Centre (KIRDARC) Nepal, Local Initiatives for Biodiversity, Research, and Development (LI-BIRD), Center for Environment and Agricultural Policy Research, Extension, and Development (CEAPRED), Women for

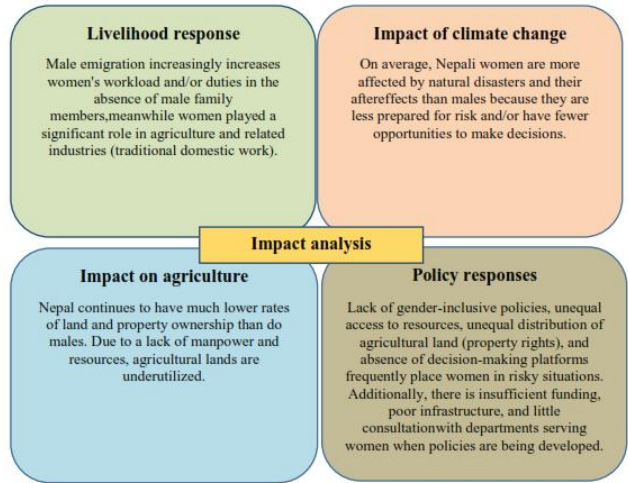
Human Rights (WHR), CARE Nepal, Helvetas Nepal, Oxfam in Nepal, Plan International Nepal, World Food Programme (WFP) and the Partnership Aid Center (PACE) Nepal are recognized for their significant contributions to extension support within the study area. These NGOs collaborate with communities to address agricultural challenges, offer training, and facilitate capacity-building programs. This multi-faceted approach, involving government and non-governmental entities, reflects a comprehensive effort aimed at improving agricultural practices and enhancing the livelihoods of women in the region [60,61]. NGOs and INGOs are committed to empowering women farmers through comprehensive capacity-building programs. These initiatives provide women with the knowledge and skills necessary to adapt to the impacts of climate change while improving agricultural practices. These organizations enhance their resilience, enabling them to overcome the challenges posed by changing environmental conditions by equipping women with the tools they need. The research efforts of NGOs and INGOs are invaluable in understanding the gender-specific impacts of climate change on agriculture. These organizations conduct rigorous studies to collect data and evidence that shed light on how women in agricultural communities are uniquely affected. This research informs policy and decision-making processes, ensuring that climate strategies are tailored to the specific needs of women farmers. By contributing to knowledge generation, these organizations drive positive change in the agricultural sector.

NGOs and INGOs take action on the ground by implementing practical projects that promote climate-smart agricultural practices with a focus on gender inclusion [62]. These initiatives encompass a wide range of activities, from sustainable farming practices to water management and income-generation projects for rural women. They facilitate the adoption of climate-resilient agricultural techniques, improving food security and livelihoods by directly engaging with communities. These organizations are active in advocating for policy changes at local, national, and international levels [62]. They leverage their expertise to ensure that gender considerations are integrated into agricultural and climate change strategies. By engaging with policymakers and advocating for gender-responsive policies, NGOs and INGOs contribute to the creation of a policy environment that prioritizes gender equity and women's empowerment in agriculture and climate action. NGOs and INGOs recognize the importance of collaboration and partnerships. They work hand in hand with government agencies, research institutions, and local communities to create synergies that maximize the impact of gender-responsive climate change and agricultural programs. NGOs and INGOs strengthen the collective effort to address the complex challenges at the intersection of gender, climate change, and agriculture by fostering collaboration. To ensure the effectiveness of their initiatives, NGOs and INGOs monitor progress and evaluate the impact of their projects. Continuous assessment helps fine-tune strategies and ensure that projects meet their intended goals and outcomes [63]. These organizations adapt and improve their approaches over time, increasing their effectiveness in addressing gender-specific climate change challenges. NGOs and INGOs serve as hubs for knowledge sharing and the dissemination of best practices [64]. They facilitate the exchange of information, lessons learned, and successful models in gender-responsive climate change adaptation and sustainable agriculture. This knowledge sharing benefits a wide range of stakeholders, from women farmers to policymakers, fostering a more informed and collaborative approach to addressing gender and climate change issues in agriculture. To support their initiatives, NGOs and INGOs actively mobilize funds and resources from various sources [65-67]. These resources are channeled into projects that address the

unique needs and challenges faced by women in climate-resilient agriculture. They ensure the sustainability of their efforts and expand their reach to benefit more women in agricultural communities. NGOs and INGOs are dedicated to empowering women at the community level. They facilitate the active participation of women in decision-making processes related to agriculture and climate resilience. Such organizations enhance women's agency and influence in shaping their own futures and the well-being of their communities by empowering women and amplifying their voices.

CONCLUSION

The gender-specific impacts of climate change on agriculture are increasingly recognized as a significant concern. Men and women play distinct roles and bear different responsibilities within the agricultural sector, experiencing varying effects due to climate change. In Nepal, several policy measures target marginalized groups in the agriculture industry, such as the Agriculture Perspective Plan (APP), National Agricultural Policy (NAP), and Agriculture Development Strategy (ADS), assessing their effectiveness in addressing gender-related issues. It is crucial to adopt a gender-sensitive approach that systematically considers the unique requirements and perspectives of both women and men to effectively address these disparities. Political and institutional frameworks promoting gender-sensitive policies and strategies for adaptation and mitigation in the agricultural sector need to be developed. In Nepal, women still have a significantly lower likelihood of owning land compared to men. Agricultural lands often remain underutilized due to a lack of manpower and resources. Empowering women could serve as a comprehensive solution to address these challenges.



AUTHOR CONTRIBUTION STATEMENT

All authors listed have significantly contributed to the development and the writing of this article.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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