
Effect of Climate Change on Agricultural Livelihood: A Qualitative Study

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Abstract

This article investigates the gendered impact of climate change on agricultural livelihoods in rain-dependent villages of Attock District, Rawalpindi Division (Punjab, Pakistan). Drawing on 24 semi-structured interviews with twelve men and twelve women conducted in Domel and Basal, the study shows how unpredictable rainfall, increasing water scarcity, and declining yields undermine household food security and income stability. Women bear disproportionate burdens, including increased water fetching, livestock care, and household resource management, while remaining excluded from major household decision-making. Men and women adopt different coping mechanisms to manage harsh and unpredictable climate conditions; these include livelihood diversification, home gardening, and community cooperation, yet they remain insufficient without structural support. Using a Marxist feminist framework, the study demonstrates how patriarchal and capitalist relations intensify the invisible exploitation of women's reproductive labor, further burdening already overworked women in rural households. The findings highlight the urgent need for gender-inclusive policies, farmer training, and recognition of women's contributions to strengthen climate resilience in Pakistan's vulnerable agrarian communities.

Keywords: Climate change, Agricultural livelihoods, Coping strategies, Gender and climate adaptation, Attock District, Water scarcity, Food security

1 Introduction

For the past few years Climate change has become one of the most dangerous threats globally as well as for rural livelihoods in Pakistan, where agriculture forms the backbone of the economy and sustains over 60% of the rural population. Pakistan is among the world's most climate-vulnerable countries, ranked eighth in the Global Climate Risk Index, facing rising temperatures, erratic rainfall, glacial melt, and water scarcity that directly threaten food security (Express Tribune, 2023). Agriculture contributes 18% to Pakistan's GDP and employs nearly 38% of the labor force, yet it remains highly exposed to climatic shocks (Haq et al., 2021). In this context, smallholder farmers in rain-fed regions face acute risks to their survival and livelihood.

Globally, research shows that climate change will disproportionately effect developing countries where adaptive capacity is limited (Mustafa et al., 2021). For South Asia, increased heat waves, unpredictable monsoon rains, and water shortages are projected to intensify, affecting agriculture and exacerbating poverty. Pakistan with its high dependency on agriculture, limited irrigation infrastructure in barani areas, and weak institutional capacity, faces a particularly precarious future.

Climate change impacts are not gender-neutral. Rural women, who contribute significantly to agricultural labor through crop cultivation, livestock care, and household resource management, experience greater

vulnerability due to pre-existing inequalities. Women's unpaid and often invisible labor sustains families during climate shocks, yet their exclusion from land ownership, credit, and decision-making processes exacerbates gendered burdens (Habib et al., 2022). Studies in Sindh and Punjab show that women disproportionately carry the impacts of water scarcity, heat stress, and resource depletion, often sacrificing their health and well-being to sustain household food security (Kayani, 2017; Khan et al., 2021).

This article presents evidence from Domel and Basal villages of Rawalpindi District, documenting the lived experiences of male and female farmers as they adapt to climate change. It highlights how climate stress transforms household roles and responsibilities, with the main focus on the invisible labor of women. Using Marxist feminist theory, the study examines how patriarchal structures and capitalist relations empower gendered inequalities, rendering women central to adaptation yet marginalized in decision-making.

The study addresses three key questions: (1) How does climate change affect the agricultural livelihoods of men and women in rural Rawalpindi? (2) What coping strategies do farming households adopt in response to climate stress? (3) How do gendered inequalities shape adaptation and resilience?

By empowering local voices, particularly those of women farmers, this article contributes to gender studies and climate change scholarship by providing grounded evidence from Pakistan's rain-fed agricultural zones. It argues for inclusive climate adaptation strategies that recognize women's contributions, address structural inequalities, and build on existing community resilience practices.

2 Literature Review

Research on climate change and agriculture in Pakistan shows major vulnerabilities, particularly in rural communities dependent on rain-fed farming. Rising temperatures, erratic rainfall, and water scarcity have reduced yields of staple crops such as wheat and rice by 15–20% in parts of Punjab (Haq et al., 2021). Livestock productivity has also declined due to fodder shortages, undermining household income and nutrition. Scholars warn that if current trends continue, Pakistan could face a 10% reduction in agricultural productivity by 2040 (Mustafa et al., 2021).

The gendered dimensions of climate change have gained increasing attention. Women's unequal vulnerability stems from disproportionate access to resources, restricted mobility, and cultural norms that exclude them from decision-making (Rao et al., 2019). In rural Punjab and Sindh, women are responsible for fetching water, and food tasks that have become increasingly arduous due to resource depletion (Shah, 2020). Post-disaster contexts, such as the 2022 floods, have also shown heightened risks of gender-based violence, health crises, and displacement for women (Khan, 2023). Despite their central role in farming and household survival, women's contributions remain unpaid, undervalued, and largely invisible in official climate adaptation policies (UNDP, 2021).

Scholars such as Rao et al. (2019) emphasize that gendered Susceptibilities are not only a result of climate impacts but also a direct result of social and cultural inequalities. Women's access to land, credit, and agricultural extension services remains severely limited in Pakistan. According to the Pakistan Social and Living Standards Measurement Survey, only about 2% of women own agricultural land in their own name, even though they contribute nearly 60% of the total agricultural labor in some regions (Habib et al., 2022). This structural exclusion increases their vulnerability to climate change.

From a theoretical perspective, Marxist feminist scholars emphasize the intersection of patriarchy and capitalism in reproducing gender inequalities. Engels (1884) traced women's subordination to the rise of private property and patriarchal control over inheritance and production. Federici (2023) argues that women's unpaid reproductive labor—cooking, caregiving, fetching water, and sustaining households—forms the hidden foundation of capitalist economies. In rural Pakistan, these dynamics are evident as women's unpaid agricultural and domestic labor absorbs the shocks of climate stress without recognition or support (Pearse, 2017).

Yet research gaps remain. While several studies are done on climate change and its impacts on agriculture in

Pakistan, but only a few focus on the qualitative, gendered experiences of small farmers in Rawalpindi's rain-fed region. This article addresses this gap by situating local voices within broader gender and climate debates, demonstrating how adaptation practices are shaped by intersecting structures of inequality.

3 Methodology

This study uses a qualitative research design to capture the lived experiences of farmers in Rawalpindi's rain-fed region. Fieldwork was conducted in Domel and Basal villages of Attock District, where agriculture is heavily dependent on rainfall and vulnerable to climate variability.

Data were gathered through 24 semi-structured interviews with equal representation of male and female farmers (12 each). A purposive sampling approach was adopted to ensure diversity of age, household size, and farming practices. Interviews focused on climate change impacts, coping strategies, household roles, and gendered responsibilities. Open-ended questions allowed participants to narrate personal experiences and community perspectives.

Ethical protocols were strictly observed. Informed consent was obtained from all participants, with assurances of confidentiality and voluntary participation. Pseudonyms are used to protect identities. Cultural sensitivity was prioritized, particularly in discussions with women, ensuring that interviews respected local norms while allowing open expression.

The data was analyzed thematically, guided by both inductive coding and Marxist feminist theory. This approach allowed for the identification of recurrent themes such as rainfall unpredictability, water scarcity, gendered labor, and coping strategies, while situating them within structural critiques of patriarchy and capitalism.

4 Findings

The interviews with 24 farmers from villages Domel and Basal reveal the profound and gendered ways in which climate change effects agricultural livelihoods. The findings highlight several repeating themes.

4.1 Changing Rainfall Pattern

Farmers described how once-reliable rainfall patterns have become erratic, leading to crop failures at sowing and harvest stages. Male farmers recalled how their fathers could predict rain by observing the skies, but today seeds often rot or dry before germination. Women echoed this frustration, recounting how sudden rainstorms destroyed ready crops, forcing families to bear double losses.

4.2 Water Scarcity and Hidden Burdens

Water scarcity emerged as a constant challenge. Men emphasized the financial burden of running tubewells with costly diesel, while women highlighted the hidden labor of fetching water when pumps failed. Older women described health impacts from long hours in the sun, carrying heavy loads. This shows the gendered division of labor, where women's unpaid work sustains households during droughts without recognition or decision-making power.

This burden not only affects women economically but also has health consequences. Longer hours working under the roasting sun expose them to heat related illness and fatigue. Water scarcity increases risks of water borne diseases, while the constant uncertainty around rainfall and food supply has created mental stress and anxiety for many women. These findings show that the gendered burden of climate change is both material and psychological, spreading beyond livelihood losses into women's overall wellbeing.

4.3 Declining Yields and Stressed Livestock

Farmers mentioned declining wheat crops and weaker livestock due to reduced fodder growth. Men lamented the need to purchase wheat from markets, while women linked reduced milk yields to children's nutrition and

household expenses. This burden often fell on women, who managed reducing household resources while continuing care work.

4.4 Gendered Workload and Exclusion from Decisions

Interviews revealed that women's agricultural contributions remain unrecognized. Men described themselves as working longer hours in fields, yet women noted their dual responsibilities of livestock care, cooking, and assisting in farming. Despite this, women reported having little say in decisions about loans, crops, or sales, reinforcing their economic and social marginalization.

4.5 Knowledge Gaps and Lack of Support

Farmers expressed frustration with outdated knowledge and the absence of government support. Training and resources often bypass small farmers, especially women. Many felt left to rely on ancestral practices even as climate pressures increased.

4.6 Coping Strategies and Collective Resilience

In response to climate stress, households expanded livelihoods through wage labor, small home gardening, and livestock sales. Women engaged in sewing, milk sales, and food preservation, while men sought temporary income work in cities. Communities also practiced collective resilience, digging ponds together or share water pipelines.

4.7 Migration as a Last Resort

Many families described migration as a feared but a possible outcome if the climate conditions worsen. While male farmer showed Unwillingness to leave ancestral lands, they acknowledged that persistent crop failures and water scarcity could force relocation. Women worried about survival in unfamiliar urban environments with limited resources.

4.8 Disillusionment with State Promises

Almost all participants expressed doubt toward government programs, describing those programs as inaccessible or limited to urban farmers. Women mainly highlighted the lack of training opportunities that could strengthen their roles. Families reported relying more on community harmony than on government intervention.

5 Discussion

The finding aligns with existing literature on climate change and gender in Pakistan but also provide new insight specific to Rawalpindi rain dependent farming communities. Consistent with earlier studies, farmers reported that unpredictable rainfall and water scarcity undermine agriculture and food security. This study extends those observations by showing how climate-related stresses multiply within households, disproportionately increasing women's unpaid labor.

From a Marxist feminist perspective, the data illustrates how women's reproductive labor fetching water, managing food, and sustaining livestock absorbs the hidden costs of climate shocks. Despite their central role in adaptation, women remain excluded from land ownership, agricultural decision-making, and formal recognition. This finding echoes Federici's (2023) argument that capitalism and patriarchy exploit unpaid labor while denying women power and agency.

The evidence also underscores the fragility of local coping mechanisms. While households engage in livelihood diversification, home gardening, and collective resilience practices, these strategies depend heavily on unpaid labor and social trust networks rather than reliable institutional support. Without targeted interventions, such coping mechanisms remain precarious and unsustainable in the long term.

A recurring theme across interviews was women's voicelessness in household decision-making despite their heavy workloads. Men often emphasized their physical labor in the fields, while dismissing women's contributions as merely "household tasks". This minimization reflects entrenched patriarchal norms in rural Pakistan, where women's labor sustains households but seldom translates into authority or recognition. Finally, the enduring gap between government promises and local realities highlights persistent policy failure. Although climate adaptation programs formally exist, their benefits rarely reach smallholder farmers particularly women. The absence of gender-sensitive training and accessible resources perpetuates inequalities and undermines resilience.

6. Conclusion

This study highlights how climate change is reshaping agricultural livelihoods in Rawalpindi's rain dependent villages, imposing gendered burdens on farming households. Farmers face erratic rainfall, water scarcity, declining yields, and livestock stress, with women disproportionately affected due to their reproductive and domestic responsibilities. Despite their vital role in sustaining families, women remain excluded from decision making and access to resources.

Local coping strategies such as diversification, home gardening, and community cooperation reflect resilience but remain fragile without institutional support. The findings emphasize the need for gender inclusive adaptation policies that recognize women's contributions, provide training and resources, and address structural inequalities in land and credit access. Recognizing and supporting women's labor is not only a matter of equity but also essential for building resilient agricultural communities. For Pakistan's future food security and rural development, placing women farmer at the center of climate adaptation policies is crucial.

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