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Climate stress and rural livelihoods in Zimbabwe: Unpacking the nexus between agricultural decline and migration

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Abstract: Climate variability is severely threatening rural livelihoods in Zimbabwe, where smallholder farmers rely predominantly on rain-fed crops. Altered precipitation patterns, persistent drought, and episodes of extreme weather have disrupted agricultural schedules, compromised food security, and increased socioeconomic vulnerability. This research assesses the correlation between climate-induced decline in agricultural output and trends in rural–urban and cross-border migration, concentrating on the districts of Mutoko, Gutu, and Chimanimani, which collectively offer a range of agro-ecological environments and significant vulnerability to climatic threats. The study employed a qualitative methodology, utilizing semi-structured interviews and focus group discussions with 36 respondents. The sample included smallholder farmers, female-led households, youth, traditional leaders, and agricultural extension agents. Thematic analysis was utilized to analyze data. The findings indicate that declining harvests, animal mortality, and reduced cropping periods have progressively eroded traditional subsistence, leading to increased out-migration, especially among youth and economically engaged male farmers. The paper recommends the enhancement of agro-ecological resilience via increased smallholder irrigation, the promotion of drought-resistant seed types, and revitalized extension services. Investment in vocational training, along with accessible microfinance and gender-sensitive social protection, can substantially improve adaptive capacity among at-risk groups.

Keywords: *Agricultural decline, Climate change, Migration, Rural livelihoods, Zimbabwe.*

1. Introduction

Climate stress, characterized by erratic precipitation, prolonged droughts, and increasing temperatures, has become a significant danger to rural livelihoods throughout Southern Africa [1, 2]. In a region where agriculture serves as the economic foundation of rural communities and the primary source of sustenance for most households, these climatic changes produce effects that permeate the social and economic structure [3]. Rural communities mostly depend on smallholder, rain-fed agricultural systems that are highly sensitive to minor fluctuations in climatic conditions [4]. As the incidence and severity of climatic extremes increase, communities face growing challenges in maintaining productive agriculture and overall well-being. The deterioration of the agricultural sector due to climatic stress has transitioned from theoretical forecasts to current realities for many [5, 6]. Decreased harvests, soil degradation, reduced moisture availability, and increased prevalence of pests and diseases collectively undermine food security and income stability [7].

Internal and cross-border migration have become strategies for coping and adaptation [8] as workers, particularly young men of statistically optimal working ages, increasingly leave rural areas in search of alternative livelihoods in urban centers or neighboring countries [9]. Despite increased exposure to these movement patterns, the research remains inadequate regarding the intricate interrelations among climate stress, agricultural decline, and migration in the Southern African context. This research, therefore, presents a comprehensive analysis, examining the mechanisms through which

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climatic stressors undermine agricultural viability and, therefore, influence household migration decisions. The research argues that migration, viewed from this perspective, is a purposeful and robust response rather than a passive result of vulnerability. The paper clarifies the dynamics of household-level adaptation and resilience by untangling the feedback loops between environmental deterioration, livelihood destabilization, and migration. Understanding these interconnections is essential for developing coherent policy instruments that strengthen sustainable rural livelihoods and manage migration in a way that benefits both outgoing migrants and the communities they temporarily vacate.

1.1. Problem Statement

Southern Africa is increasingly facing significant climate unpredictability, which is directly undermining the largely rain-fed agricultural systems upon which the region relies [9]. Despite agriculture being fundamental to the livelihoods of a substantial portion of the rural populace, Mugambiwa and Rapholo [10] argue that ongoing reductions in crop yields and livestock productivity, characterized by inconsistent rainfall patterns, frequent droughts, and an increase in extreme weather events, have become pervasive. This agricultural retrenchment presents a complex danger to food security, financial stability, and the overall well-being of millions who rely on farming as their primary economic activity [11].

Migration has become a significant livelihood adaptation strategy in rural Southern Africa [12]. Rural households have integrated mobility into their survival strategies by diversifying risk through remittances and pursuing other employment possibilities [13]. Recent studies on the climate-migration nexus tend to either compartmentalize environmental and socio-economic factors or propose linear causal pathways that neglect the complex and context-specific realities faced by rural households [9]. Current studies frequently neglect the aggregate impact of intersecting stressors such as poverty, limited market access, and insufficient institutional support that rural households concurrently endure [14].

2. Literature Review

2.1. Climate Variability and Agriculture in Southern Africa

Southern Africa is distinguished as one of the globe's most climate-sensitive areas, with its agricultural sector significantly impacted by modified precipitation patterns, rising temperatures, and increased frequency of extreme weather events [2]. Over the years, there has been an increase in average temperatures and a trend of both decreasing and erratic rainfall, resulting in an increased frequency of droughts and floods [15]. These alterations have diminished the dependability of rain-fed agricultural calendars, resulting in irregular planting schedules, poor seedling establishment, and reduced overall yield [16]. The predominant smallholder population, frequently reliant on rain-fed subsistence systems, lacks irrigation infrastructure, initial funding, and access to climate-resilient crop varieties, hence exacerbating their susceptibility to transient climatic disturbances [17].

The agricultural impacts of climatic variability are regionally diverse and contingent upon agro-ecological zones, agricultural technologies, and the overarching socio-economic environment [16]. In the semi-arid urban areas of Zimbabwe, the increased occurrence of prolonged dry spells undermines maize and staple crops' output [2]. In contrast, humid regions experience broader and more erratic precipitation, leading to saturation, runoff, and heightened soil erosion, which similarly impacts agricultural cycles [18]. Research indicates that climatic extremes exacerbate existing structural impediments, particularly unstable land tenure systems and poorly integrated output markets, thereby limiting both short-term and long-term adaptive responses [2, 19, 20].

2.2. Migration Patterns in the Region

Migration has been crucial for the socio-economic organization of Southern Africa, influenced by wage demand, kin-based diasporas, and diverse state mechanisms [21]. Intra-country migration, primarily from commercial farms and townships to urban centers, has been driven by the pursuit of

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wage work, educational opportunities, and improved living standards. In addition, seasonal and circulatory migration persists in relocating persons between rural residences and urban employment places, allowing them to diversify their livelihood strategies and mitigate risks to agricultural revenue [22, 23]. Nonetheless, changing economic structures, increasingly sprawling urban areas, and modified legal frameworks are disrupting these established networks, leading to settlement stability for some individuals and the growing utilization of unofficial migration pathways for others.

Recent studies highlight the increasing significance of environmental factors, particularly climatic variability, in shaping migratory decisions throughout Southern Africa [21, 23]. Data indicate that ongoing drought, flooding, and associated climate stressors intensify rural poverty and unemployment, primarily acting as "push" factors of human migration [2, 14, 24]. Individuals of economically active age, both male and female, currently constitute the majority of mobile populations, motivated by enhanced transportation infrastructure and their role as principal income generators [25]. Gendered trajectories demonstrate that women often enter domestic employment and caregiving roles, whereas men are attracted to mining, construction, and informal market sectors [20, 26].

3. Methods and Materials

3.1. Research Design

This study utilized a qualitative research design to elucidate the interconnected and context-specific processes that define the climate-agriculture-migration nexus in Zimbabwe. This approach effectively captures the situated experiences, adaptive responses, and personal significances that rural inhabitants associate with climatic changes, the decline of agricultural viability, and the decision-making process regarding migration. The study adopted the interpretivist framework, which prioritizes analytical depth over numerical generality, focusing on understanding rather than quantification [27]. It is based on the belief that knowledge arises from intersubjective dialogue, culturally situated practices, and the contingencies of daily life.

3.2. Study Area

The research was conducted in selected rural districts of Zimbabwe, namely Mutoko, Gutu, and Chimanimani, characterized by significant climatic variability, reliance on smallholder agriculture, and rising out-migration rates. The districts were intentionally chosen to illustrate diverse agro-ecological environments, varying levels of exposure to climatic stresses, and a significant reliance on rain-fed agriculture, coupled with economic contributions from remittances of migrant households.

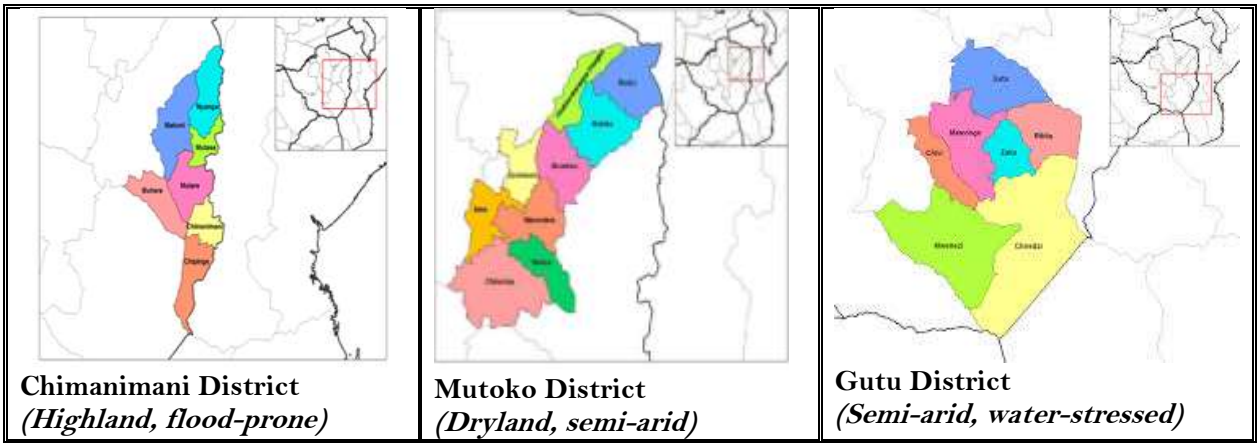

Figure 1.
Study Area.

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3.3. Data Collection Methods

Data was collected through qualitative methods to provide a comprehensive account of community life. Semi-structured interviews were conducted with agricultural extension officers, local chiefs, experienced farmers, and returnee migrants to investigate changing perceptions of climate variability, alterations in agricultural practices, and the decision-making processes related to migration. Gender-segregated focus group discussions with women, men, and youth revealed the intersections of climate-related stress, livelihood pressures, and migration motives with identity and life stage, fostering a community-oriented understanding of adaptation pressures and responses. The dialogues provided participants with opportunities for collaborative analysis and emphasized common narratives, culturally specific heuristics, and collective coping strategies. During the fieldwork, the researcher conducted participant observation by traversing fields, visiting markets, and attending social gatherings to observe the temporal dynamics of farming practices, kin exchanges, and livelihood diversification. Handwritten field notes documented gestures, pauses, and ritual symbols that were not captured through verbal expression in interviews.

3.4. Sampling Techniques

The study utilized purposive sampling methods to recruit participants possessing significant, context-relevant expertise. Purposive selection identified key informants whose formal roles, extensive local knowledge, or direct experiences with climate variability and migration made their contributions especially significant. Agricultural extension officers and village leaders were selected for their comprehensive understanding of food security and governance, whereas returnee migrants offered specific instances of livelihood disruption and adaptation. Focus group participants were selected to represent a diverse range of ages, genders, and socio-economic categories, highlighting the varying impacts of climate shocks on local households.

3.5. Data Analysis

Thematic analysis was employed to examine qualitative data. Interviews and focus groups were transcribed verbatim, and the accompanying field notes were analyzed thoroughly. NVivo software enabled the coding, thematic categorization, and identification of significant patterns within the data. The analysis identified several interconnected themes: perceptions of climate and interpretations of risk; gender-specific labor burdens in agriculture; youth disengagement from farming careers; and migration viewed as both a compulsion and a source of hope. The analysis explicitly addressed contradictions, omissions, and the contextual meanings inherent in participants' narratives.

4. Findings and Discussion

4.1. Climate Stress Impacts on Agriculture

The findings show that climate-related pressures have notably reduced agricultural output in the rural villages of Mutoko, Gutu, and Chimanimani. Each locale, characterized by distinct agro-ecological features, faces climate-induced challenges that, although unique to each area, are collectively interrelated. Mutoko has experienced increased variability in rainfall timing and quantity, undermining the reliability of the traditional dryland maize schedule, resulting in more frequent harvest failures and increased soil erosion. In contrast, Gutu has experienced prolonged dry periods that diminish the volume of available water, thereby limiting crop irrigation and reducing pasture availability for livestock. Moreover, Chimanimani, which is already susceptible to significant meteorological disturbances, experienced a stark reminder of its vulnerability during Cyclone Idai in 2019. Since that event, recurrent flash flooding has consistently flooded agricultural fields and necessitated the temporary relocation of farming families.

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Table 1.
Climate Stress Impacts on Agriculture in Mutoko, Gutu, and Chimanimani.

District	Agro-Ecological Features	Main Climate Stressors	Key Impacts on Agriculture
Mutoko	Dryland, semi-arid	- Rainfall variability - Soil erosion	- Frequent maize harvest failures - Increased soil degradation - Decreased pasture quality
Gutu	Semi-arid, water-stressed	- Prolonged dry Periods - Limited water sources	- Reduced irrigation and pasture - Increased livestock mortality
Chimanimani	Highland, flood-prone	- Flash floods (e.g. Cyclone Idai) - Landslides and storms	- Field flooding - Temporary displacement - Livestock drownings and pasture loss
Cross-Cutting	Across all three districts	- Rainfall anomalies - Shortened moist periods - Drought-induced stress	- Shift to drought-resilient crops (sorghum, millet) - Declining financial returns - Nutrition insecurity and food poverty

Farmers in the three districts (see Table 1) reported rainfall anomalies and reduced moisture periods that have negatively affected yield and seasonal patterns. A Gutu farmer remarked,

> "The seasonal rains have ceased to behave as they once did; they arrive tardily or in violent surges that scour the furrows of newly sown seeds. Previous generations relied on the rains as constancy itself; planting coincided with the steady advance of gentle showers, and our calendars, labor, and every measure of sustenance were charted to the calm pulse of the weather…."

The study established that maize can no longer be relied upon as it once was. Farmers in various districts have started to prefer drought-resilient cereals, such as sorghum and millet. However, these crops provide lower financial returns and do not possess the cultural significance associated with staple crops. Focus groups in Mutoko indicated that maize previously supported both household subsistence and market income; however, the shift towards more resilient species has resulted in decreased cash earnings. One participant had this to say;

> "Farmers know that sorghum can survive dry spells, but it also produces lower yields and smaller portions of sadza, which is a thickened porridge made from a variety of pulverized grains and is considered Zimbabwe's staple food. This puts them in a position between making enough money to survive and having the chance to make more money…."
>
> *[Agricultural extension officer- Mutoko]*

In addition to significant crop loss, traders and farmers reported increased livestock mortality associated with diminishing water sources and deteriorating pastures, particularly in the arid regions of Gutu and Mutoko. In Chimanimani, farmer diaries recorded storm-related drownings and landslips that devastated grazing regions. An elder from Mutoko, observing the pastures, stated,

> "The number of animals dying is rising because of the long-lasting drought and the damage it is doing to pastures and water supplies. The seasonal streams and waterholes have dried up much faster than usual, and the daily flow from boreholes, which allowed for extra water, has dropped to a level that cannot fill more than a dozen containers…."
>
> *[Elderly farmer- Mutoko]*

The findings established that boreholes produce only a minimal flow. The cumulative agricultural effects demonstrate the ecological vulnerability of the study districts and highlight the need for tailored climate-smart agriculture practices that are contextually appropriate and socially acceptable. The findings are supported by Beyene [28], Brenya et al. [20], and Tackie et al. [25], who argue that climate change acts as a moderator affecting socio-economic outcomes linked to insufficient nutrition and exacerbating food poverty. Agricultural systems face significant challenges due to erratic climate conditions, leading to reduced food production, higher food prices, and greater difficulty in accessing nutritious food. The most vulnerable and impoverished populations, who lack the resources to endure

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climatic shocks, experience these effects disproportionately. The challenge of improving food security to enhance health outcomes is significant, despite existing research on food security and health in Africa.

4.2. Erosion of Livelihoods and Rising Insecurity

Climate-induced stressors are systematically undermining the foundations of agricultural subsistence, exacerbating precarity in rural areas. These effects are unevenly distributed, revealing significant gender and age disparities based on fieldwork observations. In Gutu, older women reported that the migration of younger family members has led to increased physical burdens and the deterioration of mutual aid networks. An elder recounted:

> "The village and its demands have been all on me ever since my kids moved to the city to make their lives better. Every morning, I get up while the stars are still out, and the only thing I have with me is a hoe. I walk along the dusty roads to the fields, and the chill only goes away when the sun rises. The earth used to be kind, but now it questions my knees because they are getting old. But I still plant seeds and pull weeds, even though my bones hurt like the heart of the dry season.…"
>
> *[Elderly female farmer- Gutu]*

In Gutu, women have increasingly assumed the dual roles of subsistence agriculture and caregiving, a shift occurring in response to men's migration to urban areas for employment opportunities. Respondents across the three study sites noted the breakdown of collective labor arrangements historically referred to as *nhimbe*, wherein the community comes together and assists one another in working individual families' fields. Interviewees collectively expressed regret over the decline of traditional networks that previously facilitated the distribution of labor for planting and weeding among households and communities, now diminished due to the lack of youth and able-bodied men. Community leaders in Chimanimani indicated that labor shortages were particularly severe during the crucial climatic periods of cultivation and harvest, exacerbated by uneven slopes and recurrent hazards that undermine agricultural viability. A leader expressed concern, stating,

> "The important farming season suffers major setbacks when young people aren't involved. There is a noticeable lack of energy and hard work that young people usually bring to the plots. During important times like planting, picking, and getting the land ready for planting, there aren't enough hands to do everything that needs to be done. As a result, many terraces stay tilled or are carelessly managed, which leads to lower harvests and the threat of food insecurity. The field was recently alive with coordinated work and mutual support, but now it is still, and no one is there to care for it. In addition, the effect can be felt in the homes...."
>
> [Traditional leader- Chimanimani]

The deficit of farm labor across all surveyed districts has exacerbated hunger, leading many families to rely predominantly on remittances from migrant members. In both Mutoko and Gutu, interviewees highlighted the variability, unpredictability, and insufficiency of these incoming funds. A widowed mother living in Chimanimani stated, *"We rely on the transfers, but they seldom meet our needs. When rainfall adversely affects crop yields and assistance is unavailable, the threat of hunger transitions from a concern to a tangible reality".*

The findings highlight that climate-induced livelihood insecurity is not merely ecological; it is deeply intertwined with social and spatial factors associated with migration, household composition, and the deterioration of traditional safety nets. Climate change intensifies food and water scarcity, thereby worsening health outcomes, especially for marginalized groups. The correlation is evident in regions like South Asia and sub-Saharan Africa, where poverty, governmental instability, and high disease burdens exacerbate climate-induced health emergencies [29]. The assessment by the Intergovernmental Panel on Climate Change (IPCC) reveals that climate change has substantially impacted public health in Africa, especially among vulnerable groups such as women, children, and marginalized communities [30]. Severe weather events, temperature variations, and changes in precipitation patterns are the main factors contributing to health challenges in Africa. These factors lead

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to water scarcity, food insecurity, vector-borne diseases, malnutrition, and mental health consequences [4, 31].

4.3. Migration Trends and Motivations

In the districts of Mutoko, Gutu, and Chimanimani, the movement of individuals has emerged as the primary adaptive strategy in response to the cumulative stresses associated with climate change and the degradation of rural livelihoods. Significant differences in migratory routes and destinations illustrate the local specificity of climatic and market shocks. Mutoko demonstrates a significant connection to South Africa's construction sector, Gutu retains robust ties with Harare and its surrounding informal mining areas, whereas migration from Chimanimani is predominantly directed towards intra-Manicaland movements and the plains of Mozambique. A 29-year-old respondent from Mutoko clearly expressed the need for transnational movement:

> "It's not enough to just farm to feed us now. The rain has stopped being consistent, and crops don't grow as well as they used to. Our amounts have been decreasing every year, and selling extra food has almost completely stopped making us money. It was clear that my family would continue to suffer just to stay alive if I stayed. Because of this, I made the tough choice to go to Johannesburg in search of work and a steady income. I finally got a job in construction. The work is hard and the hours are long, but the pay is better than what we could ever make farming back home...."
>
> *[Young Migrant- Mutoko]*

Increasing temperatures and unpredictable precipitation have rendered agriculture an uncertain source of nutrition and income, significantly undermining food security and earnings from excess sales. Faced with adverse circumstances and the incapacity to support his family, the participant reluctantly resolved to relocate to Johannesburg in pursuit of secure employment. Despite the physically demanding nature and extended hours of the construction job he obtained, it offers a more reliable income than he ever achieved through farming in his rural residence. This transition exemplifies a rising disruption of livelihoods due to climate change, wherein agriculture fails to sustain families, resulting in heightened rural-to-urban migration.

Further, the feminization of migration in Chimanimani exhibits distinct structural characteristics. Women, especially those of reproductive age, are increasingly pursuing roles in domestic service in Harare and Mutare. This migration often results in the division of households between sites of production and reproduction. A 33-year-old female migrant described her situation: "I left my children with my mother and traveled to Harare to work as a housemaid. The income I generate supports their education and ensures they have adequate nutrition."

Factors influencing migration extend beyond mere considerations of income diversification. A growing, shared perception of climate despair, characterized by diminishing confidence in agriculture as a reliable source of livelihood, has surfaced in Gutu's public discourse. Youth no longer engage in discussions regarding agrarian strategy; they express a desire to leave.

This migration represents both forced adaptation and voluntary movement, driven by deteriorating environmental conditions and changing socio-economic aspirations. Recent years have seen initiatives aimed at developing more inclusive concepts to express the complexities of migration. Examples include "complex mixed migration" [32], "transit migration," and "survival migration" [32]. It is important to acknowledge that these may include both international and national migration patterns, such as internally displaced persons and rural-urban migration flows. The causes and motivations for migration can change during an individual's migratory journey, particularly in extended displacement situations. Recent studies have started to investigate these heterogeneous migratory patterns.

4.4. Gendered and Generational Dimensions

Climate-induced stress has intensified existing gender and generational inequalities in Mutoko, Gutu, and Chimanimani. In all three districts, women undertake the majority of agricultural tasks yet

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often lack access to land ownership and extension services. In Gutu, a young female farmer reported, *"My husband left for South Africa four years ago, and I have managed the entire farm independently since then. The property is registered under his name, thus I am unable to assert ownership…"* The extended lack of male decision-makers does not lead to increased agency for women when traditional tenure systems limit their rights. In Chimanimani, widows and female-headed households experienced systematic exclusion from government agricultural interventions. A widowed female farmer stated,

> "Extension officers don't often ask us to help out. They don't often ask the women to their talks and training when they go to the village. Men are the only ones they talk to most of the time, as if women don't know anything important or can't learn. Still, we are the ones who get up early to work in the fields, carry water, and take care of the small home gardens. We know more about the land, the changing seasons, and the pests that come back year after year than anyone in a textbook, but we often forget about it…"
>
> *[Widowed female farmer- Chimanimani]*

Further, youth in Mutoko and Gutu reported a growing disconnection from agriculture, characterizing it as laborious and economically unviable. Informal urban economies present greater opportunities for young men compared to potential prospects in rural areas. A 24-year-old man from Mutoko stated,

> "There is no future in farming. I departed from the village to Beitbridge, where I now engage in the sale of second-hand clothing. It offers better financial compensation, allowing me to retain the earnings for personal use."
>
> *[Migrant participant- Mutoko]*

Further, in numerous rural regions of Zimbabwe, female-headed households (FHHs) have transitioned from being anomalies to a demographic norm, influenced by widowhood, divorce, separation, migrant labor trends, and the inconsistency of male financial assistance. These families exhibit considerable diversity, including single mothers, grandmothers rearing grandchildren, and women providing care for a combination of relatives and non-relatives, including wholly non-kin individuals. Despite the increase in their numbers, the structural obstacles confronting these homes persistently adhere to conservative principles, mirroring entrenched gender stereotypes, cultural prejudices, and disparities in resource distribution. Women responsible for households are consistently marginalized in local administration, denied access to agricultural extension programs, and subjected to a stigma that undermines their power as caregivers and asset managers. This study focuses on the daily experiences of female-headed households, examining the interplay of gender, resource accessibility, and resilience in rural environments influenced by patriarchy.

> "The demise of my husband five years prior burdened me with sole responsibility for our household. Initially, our little savings and the small plot of land we farmed were enough, but adversity quickly exceeded my expectations. I am responsible for my two sons and my elderly mother, and all obligations such as meals, educational expenses, and healthcare rest upon me. In this town, the responsibility of providing for the family predominantly falls to men, and my neighbors, however well-intentioned, whisper that it is unwise for a woman to lead a household…"
>
> *[Widowed female farmer- Mutoko]*

Female-headed households (FHHs) refer to household units that are managed and maintained by women, typically arising from circumstances such as single parenthood, widowhood, marital separation, or insufficient financial support from a husband Saad et al. [33] and Handayani et al. [34]. Saad et al. [33] categorized the fundamental demographics of female-headed households (FHHs) into several groups: FHHs consisting solely of children, FHHs with women living independently, FHHs without a husband but including other adults (both male and female) and children, FHHs with a husband and children, FHHs with extended family members such as grandparents and siblings, and FHHs with non-relatives, including friends and children [35]. In various Sub-Saharan African countries, families led by women face considerable challenges stemming from societal norms and cultural perspectives that

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undermine female leadership and gender equality [36]. As a result, female-headed households often encounter disadvantages due to discrimination, gender stereotyping, and unequal access to resources [33].

5. Recommendations

5.1. Strengthen Climate-Resilient Agriculture

The decline in agricultural yields in Mutoko, Gutu, and Chimanimani necessitates the urgent implementation of climate-resilient agricultural practices. The primary strategy should involve the expansion of drought-tolerant crop cultivation, specifically millet and sorghum, which are well adapted to the local agro-ecological conditions. In addition, strategically located small-scale solar-powered irrigation systems in Chimanimani's highlands and Mutoko's drylands can effectively address rainfall variability and safeguard agricultural yields. Revitalizing agricultural extension services is essential; these services should be equitable, involving women as both knowledge users and providers, while also providing timely, site-specific climate forecasts and agroecological recommendations.

5.2. Support Adaptive Livelihoods

Addressing rural out-migration and strengthening community resilience necessitate livelihood diversification initiatives that acknowledge local contexts. Equipping vocational training centers to provide instruction in carpentry, solar technology, and agro-processing can enhance non-farm income opportunities. Targeted outreach to female-headed households is essential. Supplemental social protection measures, such as conditional cash transfers, food vouchers, and access to microloans, can enhance household enterprises and improve educational pathways, thereby amplifying the advantages of livelihood diversification.

6. Conclusion

This study has presented the complex and interrelated dynamics linking climate-induced stress, agricultural decline, and cross-border migration in the rural districts of Mutoko, Gutu, and Chimanimani, Zimbabwe. Field observations indicate that alterations in rainfall patterns, soil degradation, and increased climatic variability are progressively diminishing agricultural productivity and transforming established rural economies, with the most significant impact on female smallholders and younger populations. The study advocates for policy frameworks that are comprehensive and integrative, functioning coherently across local, national, and regional levels. The paper cautions that without cohesive policy and institutional backing, such adaptability may engender new challenges, including rural labor shortages, social fragmentation, and unregulated, expansive urban development. The findings emphasize the need for integrated policy frameworks that simultaneously coordinate agricultural support, climate adaptation measures, and migration policies, thus ensuring the sustainability of rural livelihoods in the face of escalating climate-related challenges. Establishing climate-resilient agro-ecosystems, maintaining adaptive and equitable livelihoods, managing migration as a long-term development strategy, and fostering innovative, inclusive governance structures are essential actions for achieving sustainable rural resilience.

Transparency:

The authors confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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