

**DROUGHT AND FORCED MIGRATION IN THE
MAHABHARAT SHADOW RANGE: A CASE OF
RAMECHHAP, NEPAL**

**A THESIS
SUBMITTED TO
CENTRAL DEPARTMENT OF POPULATION STUDIES
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DEGREE OF MASTER'S
IN POPULATION STUDIES**

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AUGUST 2025**

DECLARATION

Except where otherwise acknowledged in the text, the analysis in this thesis represents my original research.

Dipak Ghising

03 08 2025

RECOMMENDATION

This is to certify that the thesis
submitted by
Dipak Ghising
entitled
**Drought and Forced Migration in the Mahabharat Shadow Range: A Case of
Ramechhap, Nepal**
is recommended for External Examination.

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VIVA-VOCE SHEET

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**Drought and Forced Migration in the Mahabharat Shadow Range: A Case of
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ABSTRACT

The study focused on analyzing the "Drought and Forced Migration in the Mahabharat Shadow Range: A Case of Ramechhap District, Nepal." The drought is also one of the most significant consequences of climate change, which has impacted agricultural livelihoods in rural areas of Nepal. Therefore, the study focused on assessing the effects of drought frequency and intensity on agrarian livelihoods, examining the role of drought as a primary factor influencing forced migration among local households, and analyzing the socio-economic impacts of drought-induced migration on households that migrated. Hence, to measure these objectives, a quantitative research design has been employed through a household survey using a structured questionnaire. The data were collected from Ward No. 4 of Khandadevi Rural Municipality, Ramechhap District, Nepal, from a sample of 197 household respondents. The data were collected using the Kobocollect application between July 10 and 20, 2025, totaling 207.

The study findings indicate that recurrent droughts every year statistically significantly ($p < .001$) influenced household major crop production, with 91.8 percent of household respondents reporting a decline due to scarcity of irrigation water, pests, and diseases. Besides, the animal husbandry business, household food supply, income generation, and school attendance of children have also been severely affected due to drought and its resulting migration. Among the total household respondents, 43.5 percent of households experienced family member migration due to the impacts of drought on the agricultural system. Also, 59.9 percent of respondents reported forced migration. Meanwhile, bivariate and multivariate analyses revealed a statistically significant association ($p < .001$) between drought severity level, high farming costs, and type of migration. Household respondents facing severe drought are 7.78 times more likely to migrate forcibly. The destination of migration has a significant effect ($p < .001$) on school attendance among children and increases social and family responsibilities among households with migrant members. This study concludes that drought is not only an environmental stressor or a result of climate change, but it is also a significant contributing factor to livelihood stress, forced migration, and social change. The findings suggest developing an integrated plan to address drought preparedness and mitigate the risk of frequent drought in the local area. Also, invest in exploring climate-resilient agricultural technologies and diversifying agricultural patterns and cycles.

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ACRONYMS AND ABBREVIATIONS

CBS	Central Bureau of Statistics
CDPS	Central Department of Population Studies
CDS	Community Development Society
DFID	Department of Foreign Investment and Development
FAO	Food and Agriculture Organization
GCM	Global Compact for Safe, Orderly, and Regular Migration
HH	Household
IOM	International Office for Migration
IPCC	Intergovernmental Panel on Climate Change
MoFE	Ministry of Forest and Environment
NAP	National Adaptation Plan
NEC	National Environment Commission
NPC	National Planning Commission
NSO	National Statistics Office
RM	Rural Municipality
SDG	Sustainable Development Goal
TU	Tribhuvan University
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNCHR	United Nations Commission of Human Rights
UNDP	United Nations Development Program
UNDRR	United Nations Disaster Risk Reduction
WMO	World Meteorology Organization

CHAPTER ONE

INTRODUCTION

1.1. Background to the study

The Mahabharat Shadow Range refers to the hilly areas of Nepal, where the Ramechhap district lies in the “rain shadow” of the Mahabharat mountain range. The high hills block monsoon winds; these areas receive less rainfall, making them highly vulnerable to drought conditions (Marahatta et al., 2009). Drought leads to after scarcity, crop failure, and food insecurity, which directly affect people’s livelihoods since most depend on agriculture (Farah et al., 2025). The loss of people's livelihoods leads to forced migration from their birthplace, where people move to other areas without their choice or interest (IOM, 2019).

Climate change has emerged as a crucial driver of environmental degradation and livelihood insecurity worldwide, particularly affecting developing countries (IPCC, 2022; FAO, 2018). Among its many manifestations, drought stands out as one of the most severe and complex phenomena, often resulting in long-term socio-economic consequences. Droughts reduce agricultural productivity, deplete water resources, and weaken rural economies, forcing vulnerable populations to migrate in search of alternative livelihoods to survive and improve their quality of life (UNDP, 2020).

Besides, among the many environmental triggers, drought remains one of the most pervasive and devastating causes of displacement, particularly in rural agrarian societies (Black et al., 2011). Furthermore, human mobility and demographic shifts have undergone significant changes worldwide due to environmental changes. In recent decades, climate-induced hazards, particularly drought, have increasingly disrupted rural livelihoods, particularly in developing countries that depend on rain-fed agriculture (Black et al., 2011; IPCC, 2022). These are all incidents that are occurring due to climate change, a serious issue affecting all living things and the existence of life.

Climate change: Climate change refers to long-term shifts in temperature, rainfall, and other atmospheric conditions on Earth, resulting from both natural hazards and human-induced activities. The primary driving factor is human activities, which encroach on natural resources without a plan and violate the laws of the natural ecosystem. For example, physical development activities affect the natural chain, consume fossil fuels, lead to deforestation, and contribute to the evolution of industries, which harm the surrounding environment (IPCC, 2021). Meanwhile, climate change is defined as a change in the

condition of the climate that occurs in the long term (Over the decade) (World Meteorological Organization, 2024), resulting from natural variability and human-induced activities (NEC, 2011; Rigaud et al., 2018). Different issues are emerging, and human beings are facing challenges related to climate change. The major driving cause is drought, leading to a forced migration or displacement of people. It has had a global impact, with projections indicating that internal climate migrants will number around 86 million in Sub-Saharan Africa, 40 million in South Asia, and 17 million in Latin America by 2050. People experienced severe droughts, which affected their agriculture and livelihoods, prompting them to migrate to urban areas in search of a better quality of life. Similarly, natural disasters like floods, heavy rainfall, and scarcity of natural resources motivate people to leave their original place (Rigaud et al., 2018).

Drought: A drought is an extended period of significantly reduced rainfall compared to a region's long-term average, resulting in water scarcity that negatively impacts ecosystems, agriculture, human health, and the economy. According to the World Meteorological Organization (WMO), 2020, drought is a dry period in the natural climate cycle that occurs worldwide. It is a slow, progressive disaster characterized by a scarcity of water and uncertainty of rainfall during the season, which affects agricultural farming, the ecosystem, regular water supply for living things, and industrial areas.

The United Nations Convention to Combat Desertification (UNCCD) Article 1(c) further explains that: "Drought means the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems (United Nations Convention to Combat Desertification, 1994)."

Force migration: Force migration refers to the compulsory or involuntary movement of people from their home or region due to external factors, such as conflict, persecution, natural disasters, environmental changes, or development projects. Unlike voluntary migration, forced migration occurs when individuals have no realistic option but to move for their survival, safety, or well-being. Similarly, forced migration refers to the movements of refugees, internally displaced people, and those displaced by natural or environmental disasters, chemical or nuclear disasters, famine, or development projects (IOM, 2019). Furthermore, it is a migration movement that includes compulsion, such as threats to one's life and means of subsistence, whether from artificial or natural sources (UNHCR, 2006).

Mahabharat Shadow Range: The Mahabharat Shadow Range refers to the geographic and ecological zone located in the rain shadow area of the Mahabharat Range (also known as the Mahabharat Lekh), a prominent mountain range in Nepal. It has a width of 10-35 km, which is referred to as the Fore Himalaya (Kshetri, 2023). On the other hand, it is also known as the Middle Hills, with elevations ranging from 1,000 to 2,500 meters above sea level and extending across the entire length of the country. Numerous antecedent rivers, including the Koshi, Gandaki, Karnali, and Mahakali, cut through this range. These rivers originate from the northern side of the range and flow southward. The Middle Hills serve as the first significant barrier to monsoon winds, causing heavy rainfall on their southern slopes due to orographic effects (Marahatta et al., 2009). This range spans the central and eastern parts of the country, playing a significant role in shaping local climatic patterns. It is affecting districts such as Ramechhap, Okhaldhunga, and parts of Sindhuli, where the orographic barrier effect of the Mahabharat hills results in reduced precipitation. As the moist monsoon winds from the south rise over the Mahabharat Range, they lose much of their moisture, resulting in less rainfall on the leeward (northern) side, creating conditions of chronic water scarcity, frequent droughts, and poor agricultural productivity.

The Mahabharat Lekh has the following characteristics: low rainfall, fragile ecosystems, and limited irrigation. Those who depend on subsistence-based rural communities are particularly vulnerable to climate shocks, such as drought and food insecurity. Additionally, this ecological zone has been associated with forced migration and shifts in livelihoods, particularly in the face of increasing climate variability.

Local context of the study area: Nepal's context is vulnerable to climate-induced environmental shocks due to its fragile mountainous terrain, poorly diversified rural economy, and limited infrastructural resilience (MoFE, 2021). While the lowland Tarai regions of Nepal have received some attention regarding the impacts of climate change, the mid-hill areas, especially the Mahabharat Shadow Range, remain largely understudied. The Mahabharat Shadow Range, situated on the leeward side of the Mahabharat hills, experiences significantly less rainfall compared to the surrounding regions, resulting in recurring seasonal and prolonged droughts (Mishra, Agrawal, & Gupta, 2017).

The complex topography and microclimatic variability have increasingly disrupted traditional livelihoods, particularly in areas such as the Mahabharat shadow range area of Ramechhap District. This area, situated in the rain shadow of the Mahabharat range, receives limited precipitation, resulting in recurring water scarcity and declining

agricultural productivity (Tiwari et al., 2014). Droughts have led to declining agricultural yields, water scarcity, and deteriorating food security, all of which contribute to increasing migration pressure. Among its various ecological regions, the mid-hills, including districts like Ramechhap, have been particularly vulnerable to changing precipitation patterns, extended dry spells, and associated declines in agricultural productivity (Adhikari, 2018; MoFE, 2019).

Ramechhap District, located in the eastern part of Nepal and part of Bagmati Province, has witnessed a growing trend of outward migration, particularly among the youth, to urban centers and foreign labor markets, as well as a leading position in negative population growth (CBS, 2021). It has historically relied on subsistence agriculture. However, the intensification of droughts, exacerbated by climate change and erratic monsoon patterns, has undermined the region's food security and economic resilience. These environmental stressors have compelled households to migrate temporarily or permanently in search of alternative livelihoods, thereby contributing to a noticeable decline in the local population (Paudel & Andersen, 2013). The process of forced migration not only alters demographic patterns but also has significant socio-economic and cultural implications, especially in marginalized rural communities.

Understanding this nexus is critical, especially as the impacts of climate change intensify. Migration decisions are not solely economic but are also shaped by a complex interplay of environmental, social, and cultural factors (Rigaud et al., 2018). By focusing on the Mahabharat Shadow Range of Ramechhap, this study aims to fill a significant research gap by analyzing how drought conditions influence household-level migration decisions, the nature of that migration (temporary or permanent, voluntary or forced), and the coping strategies adopted by those who remain.

This demographic trend coincides with an increasing number of reports of youth and household out-migration, primarily to urban centers and foreign employment destinations. While migration in Nepal is often associated with economic motives and remittance-driven household strategies (Seddon et al., 2002), emerging evidence suggests that environmental stressors, particularly drought, also function as key push factors driving mobility decisions (Massey, Axinn, & Ghimire, 2010; Gentle & Maraseni, 2012).

1.2. Statement of the problems

The increasing frequency and intensity of droughts, driven by climate variability and change, have become a significant threat to the livelihoods of rural populations in Nepal. In particular, the Mahabharat Shadow Range area of Ramechhap district, characterized by its fragile ecosystem, subsistence agriculture, and limited access to infrastructure, has been increasingly vulnerable to prolonged dry spells. In addition to affecting food security and agricultural output, these climate stressors have also led to patterns of forced migration, as households are compelled to relocate in search of better living conditions, water sources, and alternative means of income.

While migration has long been part of the socio-economic fabric of rural Nepal, there is a growing concern that environmentally induced displacement is becoming more prevalent and severe (Ribot, 2011; Black et al., 2011). In areas like Ramechhap, drought conditions are eroding the adaptive capacity of local communities, particularly among the poor and marginalized groups, who are more dependent on rain-fed agriculture and have fewer coping mechanisms in place. The resulting forced migration raises critical questions about environmental justice, human security, and the sustainability of rural development.

Despite the urgency of the issue, there is a lack of region-specific empirical research that examines the causal link between drought events and migration decisions in the Mahabharat Shadow Range. Existing studies on climate-induced migration in Nepal often generalize across diverse ecological zones, failing to capture the unique vulnerabilities of mid-hill communities such as those in Ramechhap. This research aims to fill that gap by examining how droughts influence forced migration in this region, identifying the socio-economic and environmental factors that mediate this process, and assessing the implications for policy interventions aimed at climate adaptation and rural resilience.

In this context, drought is emerging as a critical environmental stressor that contributes to forced migration, compelling individuals and families to leave their homes out of necessity. While the existing literature has explored environmental change, migration, and demographic transformation as separate issues, much of this research has focused on large-scale disasters (such as floods, cyclones, and sea-level rise) or international migration trends. Nevertheless, few studies in Nepal have examined the impact of prolonged drought and out-migration on rural population growth. However, slow-onset environmental changes, such as droughts, especially in mountainous and ecologically fragile regions like the Mahabharat Shadow Range in Nepal, remain under-researched. In the meantime, the

Mahabharat Shadow Range Area of Ramechhap District is an ideal site for such inquiry due to its high dependence on subsistence farming, history of labor migration, and increasing climatic vulnerability. The study provides a real-world, empirically grounded examination of the inter-sectionality between climate change-induced forced migrations in rural settings.

The drought and migration are equally emerging and prime phenomena in Nepal. At the same time, there is limited empirical research on population mobility at the micro-level due to drought and its consequences. At the national level, studies have focused on economic drivers, labor migration, remittance patterns and utilization, and factors of overseas migration. Additionally, limited studies on the impact of drought on household livelihoods and involuntary migration, leading to internal and cross-border migration, are insufficient for particular rural community settings. Specifically, the Mahabharat Shadow Range Area in Ramechhap District has received minimal academic attention, despite being ecologically vulnerable and socioeconomically at risk. This study fills the gap by exploring the interactive impact of environmental stress (drought) and out-migration on population growth decline in a localized context. Additionally, providing localized, field-based insights into the causal pathways through which drought leads to forced migration. The study aims to inform more targeted climate adaptation, migration governance, and development planning in similar drought-prone regions of Nepal.

Despite growing concerns over climate-induced displacement globally, there is a significant gap in localized studies that explore the specific relationship between drought and migration in geographically and socio-economically vulnerable regions, such as the Mahabharat Shadow Range. Understanding how drought conditions contribute to forced migration and the resulting socio-economic consequences for both sending and receiving communities is essential for informing climate adaptation strategies, local development planning, and migration policy in Nepal. This research aims to fill this gap by examining the complex interplay between drought and migration in the Ramechhap district.

1.3. Research questions

- i. How has the frequency and intensity of drought-affected agricultural livelihoods been in the Mahabharat Shadow Range Area of Ramechhap?
- ii. To what extent does drought act as a primary driver of forced migration among households in the region?

- iii. What are the socio-economic impacts of drought-induced migration on households that have been forced to migrate in Ramechhap?

1.4. Objective of the study

General objective:

To examine the effect of drought on forced migration in the Mahabharat shadow range area of Ramechhap district, Nepal.

Specific objectives:

- i. To assess the effects of drought frequency and intensity on agricultural livelihoods in the Mahabharat Shadow Range Area of Ramechhap.
- ii. To examine the role of drought as a primary factor influencing forced migration among local households.
- iii. To analyze the socio-economic impacts of drought-induced migration on households that have been forced to migrate.

1.5. Hypothesis

- a. Null Hypothesis (H0): There is no statistically significant relationship between drought severity and the likelihood of forced migration.
- b. Alternative Hypothesis (H1): There is a statistically significant relationship between drought severity and the likelihood of forced migration.

1.6. Significance of the study

Drought is one of the most climate change-induced stressors, which is becoming a significant issue in climatic hazards. Particularly, it affects agricultural livelihoods and human mobility worldwide. In the context of Nepal, the Mahabharat Shadow Range of Ramechhap is a prone area to drought due to fluctuating rainfall patterns, dryness in the monsoon season, and desertification. Therefore, it significantly affects agricultural livelihoods and displaces local people due to the scarcity of natural water resources.

Most of the existing literature emphasized a growing connection between climate variability and human migration. Nevertheless, empirical research on drought-induced migration in Nepal's mid-hill regions remains limited, with a focus on climatic disasters. Similarly, climatic migration-related studies in Nepal have focused on the flood-prone mid-hills region and the impact of drought on agricultural livelihoods, rather than the interconnection between drought and forced migration.

Primarily, the study examines the actual socio-economic situation and the impact of drought on migration decisions. It is essential for the formulation of climate adaptation planning and policies, as well as for mitigating disaster risk. Scholars have not previously explored the literature on these contemporary issues in sufficient depth. Therefore, the paper presents data that addresses the knowledge gap in empirical practices in the mid-hill region of Nepal. The significance of this study lies in its contribution to understanding the connection between environmental change, particularly drought, and human migration patterns in the ecologically fragile and socio-economically vulnerable Mahabharat Shadow Range Area of Ramechhap, Nepal. As climate variability intensifies, communities dependent on rain-fed subsistence agriculture are increasingly exposed to environmental stress, with drought emerging as a key driver of livelihood insecurity and forced migration (IPCC, 2022).

However, Ramechhap District, situated in the mid-hill region of Nepal, is highly vulnerable to climate-related hazards, including prolonged dry spells, erratic rainfall, and declining water sources (MoFE, 2021). Inhabitants of the Mahabharat Shadow Zone face compounded challenges due to poor infrastructure, limited access to irrigation, and shrinking agricultural productivity. This study aims to generate localized evidence on how recurring droughts directly or indirectly compel people to migrate in search of alternative livelihoods and survival mechanisms.

Hence, Nepal has been a hotspot for labor migration studies; however, data on environmentally induced migration, particularly in highland and hill regions, are lacking. This study contributes to the limited academic literature on internal displacement and forced migration resulting from slow-onset climate events, such as drought, in the mid-hill areas (Adhikari & Hobley, 2015). While Nepal has extensive studies on labor migration, little is known about environmentally induced migration in the highland and hill regions. Limited research exists on how slow-onset climate events like drought drive internal displacement in the mid-hills. This study fills that gap by focusing on the Mahabharat Shadow Range Area; this research addresses an underexplored but critical geographic and thematic area.

The findings of this study provide policymakers, local governments, and development organizations with evidence-based insights for addressing climate adaptation, rural development, and disaster risk reduction. In particular, the study supports the implementation of Nepal's National Adaptation Plan (NAP), which emphasizes

understanding the linkages between climate change and migration for designing resilient community strategies (MoFE, 2021). By analyzing how drought-induced livelihood disruptions lead to migration, this research will enable local institutions to identify vulnerable households and plan context-sensitive interventions, such as water resource management, sustainable agriculture, and income diversification, thereby reducing pressures on forced migration (IOM, 2020).

The research aligns with broader global concerns over climate-induced migration. It supports the objectives of frameworks such as the Global Compact for Safe, Orderly, and Regular Migration (GCM) and the Sendai Framework for Disaster Risk Reduction, which highlight the need to address environmental drivers of displacement (UNGA, 2018). This study contributes to multiple SDGs, particularly SDG 1 (No Poverty), SDG 13 (Climate Action), and SDG 10 (Reduced Inequalities). It does so by exploring how to minimize the adverse impacts of climate-induced displacement and identifying pathways for sustainable rural livelihoods in vulnerable areas (UNDP, 2020).

1.7. Limitations of the study

The study area is the Mahabharat Shadow Range Area, alongside the Sunkoshi and Tamakoshi River Banks; however, the study will focus on a specific location within Khandadevi Rural Municipality, Ward No. 4, namely the Puchhighat, Rajagau, Madimuhan, and Sanne communities. A quantitative approach, grounded in the positivist paradigm, is employed. The study population consists of households from the drought-affected areas of the site, selected for quantitative data collection. It investigates the linkage between drought and forced migration, aiming to contribute to academic knowledge, disseminate insights among scholars, and fulfill the partial requirement of CDPS to complete the Master's Degree.

1.8. Organization of the study

This study comprises seven chapters, each organized and furnished accordingly. Chapter I consists of an Introduction, Problem statement, Research questions, Objectives, Hypothesis, Significance of the study, Limitations, and Organization of the thesis. Additionally, Chapter II presents the literature Review, which encompasses theoretical, empirical, and conceptual perspectives. Chapter III addresses the methodology, which includes research design, nature of data, Study area, Sample Population, Sample Size, Methods, Techniques, tools/Instruments, and analyses. Chapter IV focuses on the results and discussion of Objective 1: effects of drought frequency and intensity on agriculture

livelihood; Chapter V focuses on the results and discussion of Objective 2: examination of the role of drought as a primary factors influencing forced migration; Chapter VI focuses on the results and discussion of Objective 3: analysis of the socioeconomic impacts of drought-induced migration on household. Chapter VII presents the findings, Conclusion, and recommendations; and a Way Forward, including references and Annexures.

CHAPTER TWO

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

This chapter reviews the relevant literature on drought and forced migration, with a focus on their inter-linkage. It draws from global, regional, and national contexts to situate the study of the Ramechhap District within broader theoretical and empirical findings and policies for combating it. Drought and its impact on population displacement are a crucial and pressing issue in the context of global population management. Such a review draws a clear picture of the existing context and knowledge on this issue. Therefore, it attempted to create a clear roadmap based on existing theories, empirical knowledge, and policies for coping with drought.

2.1. Review of theoretical literature

The study focused on the effect of drought on forced migration; therefore, it explored and discussed relevant theories within the theoretical framework. It concentrated on the Push-Pull Migration theory of Lee, the Environmental Migration Framework of Black et al., and the sustainable livelihoods approach of the Pentagon livelihood model of DFID. These are the core theoretical frameworks to guide this study, which are discussed as follows:

2.1.1. Push–pull migration theory

The Push-Pull Migration theory is a foundational framework in migration studies. The theory provides a comprehensive framework for understanding why individuals and households choose to migrate from their place of origin to a destination. According to Lee (1966), migration depends on push factors from the origin place, pull factors from the destination place, intervening obstacles, and personal characteristics of the migrants.

Push factors refer to unfavorable conditions in a person's place of origin that drive them to leave, such as economic hardship, natural disasters, political instability, inadequate services, or environmental hazards. Similarly, pull factors are the favorable conditions at the destination that attract migrants, such as better employment opportunities, education, healthcare, safety, or social networks (Lee, 1966). Lee also emphasized that migration decisions are not solely based on objective conditions but rather are filtered through individual perceptions, motivations, and resources. Additionally, intervening obstacles such as distance, travel costs, legal restrictions, and social ties can affect whether migration occurs, regardless of the push and pull factors.

However, applying Lee's theory to forced environmental migration also highlights its limitations. Initially designed for voluntary migration, the framework may not fully capture the coercive nature of climate-induced displacement, where migration is not a choice but a necessity. Nonetheless, many scholars have extended the theory to incorporate environmental drivers and structural constraints that shape forced migration in the Global South (Black et al., 2011; Hunter, 2005).

Additionally, according to the Push-Pull theory, environmental elements, such as natural disasters and drought, serve as a push factor from the country of origin. It is also one of the key influences on migration; however, it has not significantly contributed to the decision to migrate (Khalid & Urbański, 2021). In addition, the Push-Pull factor has had a greater influence on the decision to migrate than the pull factor (Urbański, 2022). It means people leave their original place due to natural disasters and environmental degradation, rather than the availability and goodness of natural resources in the destination place.

Similarly, most environmental-related forced migration is driven by the negative consequences of push factors, such as drought, rather than by better opportunities in the pull factor of the environment in the receiving place. Therefore, the push-pull theory is more dominant in negative factors that influence decision-making in migration from origin places. For example, people move from their original place to their destination place for a decent job. It means their original place has no better options for job opportunities and faces hurdles in securing high-class jobs for its people (de Sherbinin et al., 2022). Migration depends on the capability of people to move from one place to another, where they have both positive and negative liberty to determine their destination as agents of migration. Migration depends on financial, human, and social capital; based on this capital, individuals choose their places of residence and migrate voluntarily or forcefully (de Haas, 2021).

On the other hand, forced migration has three types of driving factors: Macro, micro, and meso factors. The macro factors represent the political, demographic, socio-economic, and environmental situation. Micro factors refer to individual characteristics, including age, sex, ethnicity, marital status, religion, language, education, and wealth. The meso factors include the political and legal framework, social networks and diaspora links, the cost of moving, and technology (Castelli, 2018). Furthermore, the push-pull theory is not the ultimate solution to answering why people migrate from their birthplace. There is no single factor or contributing element that influences the decision to leave the place of origin. Similarly, it is not a significant contribution to attracting the receiving places. Ultimately,

the push-pull plus tool only analyzes its root level, including policy initiatives, where the inequality of the political and economic structure remains, affecting the people (Van Hear et al., 2020).

For this study, the Push–Pull Migration Theory serves as a conceptual framework to investigate the motivations behind migration in response to drought in Ramechhap. It enables an exploration of how environmental stressors (push) interact with socio-economic aspirations, networks (pull), and how structural and individual factors mediate the decision-making process.

2.1.2. Environmental migration framework

This framework identifies environmental factors as direct and indirect drivers of migration decisions, shaped by people's exposure, sensitivity, and adaptive capacity. The framework represents a seminal contribution to the field of migration and environmental change. Its framework challenges simplistic causal narratives that attribute migration solely to environmental stressors such as droughts, floods, or sea-level rise. Instead, it conceptualizes migration as a multi-causal phenomenon in which environmental factors interact with a range of socio-economic, political, and demographic drivers (Black et al., 2011).

According to the framework of Black et al. (2011), five key categories influence migration decisions, including (a) environmental factors such as land degradation, water scarcity, or drought, which directly or indirectly affect livelihoods and habitability; (b) economic drivers include poverty, lack of employment opportunities, and income insecurity; (c) political drivers such as governance, conflict, policies, and access to resources; (d) demographic drivers include population density, age structure, and household composition, and (e) social drivers such as education, health services, social networks, and cultural norms. Similarly, according to Warner and Afifi (2014), environmental shocks are more likely to migrate if they lack access to adaptation resources. Additionally, climate variability influences internal migration only when socio-economic vulnerabilities mediate it (Bohra-Mishra et al., 2014). Among the factors of environmental change, water scarcity is a consequence of climate change, which significantly affects the migration of people from their original places. It has an impact on agricultural productivity, livelihood activities, and WASH (Water, Sanitation, and Hygiene) activities of people. Due to the scarcity of water, the pastureland is drying, and the irrigation system is also breaking down, a result of the drought. Ultimately, people must decide whether to leave their original place (Stoler et al., 2022).

Environmental changes and human migration are closely linked, where the slow or rapid effects of environmental variables on migration are evident. Additionally, environmental mediating factors influence the decision to migrate, which is correlated with socio-economic conditions (Cipollina et al., 2024). When the increased scarcity of natural resources and the intervention of development projects in the origin places lead to environmental conflict. Gradually, the conflict evolved into highly adverse outcomes, such as mass migration of people due to poor governance. Ultimately, people decide to migrate, and this decision also depends on the magnitude of the environmental conflict within the nation. Based on this, people are displaced within their own country or leave their country of birth (Environmental Conflicts, Migration, and Governance, 2020). Environmental pollution is another cause of migration, which has a non-linear relationship and complexity with them. The degradation of the environment due to climate change depends on the severity and duration of environmental change, as well as the resilience of local people (Shang et al., 2024). In the meantime, environmental stressors are not essential predictor variables for migration; however, their overall impact is minimal, and the effect of environmental disasters on migration is medium-level. A correlation exists between environmental change and migration (Zhou & Chi, 2024).

Besides, the local people's capabilities are rooted in their ancestral property, social networks, and household experiences with disasters. Therefore, the concept of migration is flawed because climate change does not necessarily force people to migrate from their original places. People cope with disasters; these capabilities are developed from their ancestral heritage, social network, and connections, as well as profound experiences with disasters they have frequently faced. It means non-migration from the effect of climate change or from its consequences like drought, landslides, and floods (Mallick & Hunter, 2023; Mallick & Hunter, 2024)

In the context of drought-induced migration in rural Nepal, this framework is particularly relevant. The Mahabharat Shadow Range Area in Ramechhap district is characterized by limited infrastructure, a high reliance on rain-fed agriculture, and socio-economic conditions that marginalize local communities, rendering them highly vulnerable to climatic stress. Drought may serve as the immediate trigger (environmental driver). However, migration decisions are often made in response to a combination of pressures, including declining agricultural income (an economic driver), weak institutional support (a

political driver), a crisis in the irrigation system due to a lack of water, and limited access to educational or healthcare services (a social driver).

Therefore, the Environmental Migration Framework offers a nuanced, policy-relevant lens through which to analyze forced migration in the face of drought. It emphasizes the importance of multi-scalar interventions, including improving local adaptation capacity, investing in infrastructure, and designing migration-sensitive climate policies.

2.1.3. Sustainable livelihoods approach

This approach views migration as one of several livelihood strategies rural households adopt in response to vulnerability and shocks. It highlights the importance of natural capital, such as water and fertile land, and how its decline necessitates alternative strategies, including migration. The framework highlights the factors that contribute to people's livelihoods, which have both direct and indirect effects on their well-being. To promote sustainable livelihoods, people need both a coping mechanism and the capability. If not, prepare to fight for vulnerability; livelihoods could not be sustained. Among the five assets of the Pentagon, the model's natural capital is more closely related to forced migration. For example, drought affects water sources and causes the degradation of fertile land, which in turn affects the livelihoods of people (DFID, 1999). Therefore, people explore alternative livelihoods and better options for survival, which may cause forced migration from their original places.

2.2. Review of empirical literature

Climate change and its effects are a highly prominent issue globally. Particularly, the pattern of rainfall, rainfall periods, trends, and water scarcity affect agricultural farming and the livelihood activities of local people. Therefore, many scholars investigate and explore the empirical knowledge worldwide, which is discussed in the section.

2.2.1. International context

Numerous studies have linked environmental degradation to population mobility globally. Black et al. (2011) demonstrated that drought, soil degradation, and water stress were crucial in shaping migration flows in sub-Saharan Africa and Asia. In Ethiopia, Gray and Mueller (2012) found that households facing frequent crop failures due to drought were more likely to send migrants to urban areas or abroad. According to Warner and Afifi (2014), explore how vulnerable households in eight countries respond to rainfall variability and food insecurity through migration. The study finds that migration is often employed as

a primary coping strategy, particularly in areas where local adaptive capacities and institutional support are limited. Patterns of migration vary based on the severity of climatic impacts, household livelihood options, and social networks. In some contexts, migration helps households better manage food insecurity and income risk, while in others, constrained mobility exacerbates vulnerability. The research highlights the complex, context-specific relationship between environmental stress, food systems, and human mobility, underscoring the need for integrated policies to support adaptive responses to climate change.

Bohra-Mishra, Oppenheimer, and Hsiang (2014) analyze the relationship between climatic variations and long-term migration patterns in rural Nepal. Using longitudinal data, they find that gradual climate changes, particularly variations in temperature and precipitation, have a significant, non-linear impact on permanent migration, especially among working-age males. However, the study reveals that sudden-onset natural disasters, such as floods and storms, have minimal influence on long-term migration decisions. The findings suggest that slow-onset climate stressors, rather than acute disasters, are more likely to drive sustained migration, emphasizing the importance of climate adaptation strategies that address long-term environmental changes.

Despite these insights, a lack of empirical research persists, particularly in integrating drought, out-migration, and population change within a single analytical framework, especially in geographically distinct areas, such as the Mahabharat Shadow Range Area of Ramechhap, which is particularly vulnerable to water scarcity and livelihood stress. Most migration studies have been concentrated in districts like Chitwan, Kaski, or the Tarai region, leaving significant gaps in our understanding of how these dynamics unfold in more remote hill districts.

2.2.2. Nepal-specific studies

This study investigates the increasing severity of droughts in Ramechhap District and their direct impact on agricultural livelihoods. Utilizing remote sensing data and field interviews, the authors found a declining trend in annual rainfall and an increase in the number of dry months. These climatic changes have led to the drying up of water sources, compelling residents to migrate to areas with better agricultural prospects (Joshi & Dongol, 2018). Similarly, the article examines the impact of climatic variability, specifically declining rainfall, on the livelihoods of rural farmers in Chisapani, a region within Ramechhap District. The study found that reduced rainfall has led to decreased agricultural

productivity, prompting farmers to adopt new practices or consider migration as a coping strategy (Subedi et al., 2018). Another study examines the broader context of environmental change and its influence on migration patterns across Nepal. This article discusses the relationship between environmental degradation and labor migration in Nepal. It highlights how environmental insecurity, including drought, drives labor migration, affecting population dynamics (Bhandari & Chaudhary, 2007).

The study empirically tests the hypothesis that environmental degradation, measured through indicators such as declining land cover, increased time spent gathering firewood, rising population density, and perceived declines in agricultural productivity, significantly influences out-migration patterns in Nepal. Also reveals that the effects of environmental change on migration vary by gender and ethnicity. For instance, women are more affected by changes in the time required to gather fodder, whereas changes have a greater influence on men in terms of the time needed to collect firewood. High-caste Hindus are generally less affected by environmental changes than other groups (Massey, Axinn, & Ghimire, 2010). A critical Nepal-based empirical study by Gentle and Maraseni (2012) investigated the impact of climate change-induced drought on rural livelihoods and migration in the mid-hill region of Nepal, specifically in the Kavre and Lamjung districts—areas ecologically and socioeconomically similar to Ramechhap. The study employed household surveys, focus group discussions, and key informant interviews to assess the impact of reduced rainfall and increased drought frequency on agricultural productivity, water availability, and household food security.

Other studies have explored migration from an economic or demographic perspective. Seddon, Adhikari, and Gurung (2002) highlighted the increasing significance of remittances in Nepal's economy and their implications for rural development. However, they did not focus on the environmental triggers of migration. Paudel et al. (2014) discussed how migration has led to depopulation in certain hill areas, raising concerns over labor shortages and underutilized land.

2.3. Review of policies related to forced migration and climate change

2.3.1. Forced migration and climate change-related international policies

Forced migration has been increasingly recognized in global and national policy frameworks as a critical issue for human rights and development. At the international level, the Global Compact on Refugees (UNHCR, 2018) and the Global Compact for Safe, Orderly and Regular Migration (UN, 2018) aim to enhance international cooperation in

addressing the root causes of forced migration, including climate change, conflict, and economic instability. These compacts emphasize shared responsibility, protection of migrants' rights, and promotion of voluntary return and integration. Regionally, the Sendai Framework for Disaster Risk Reduction (UNDRR, 2015) also acknowledges the link between environmental stressors and displacement.

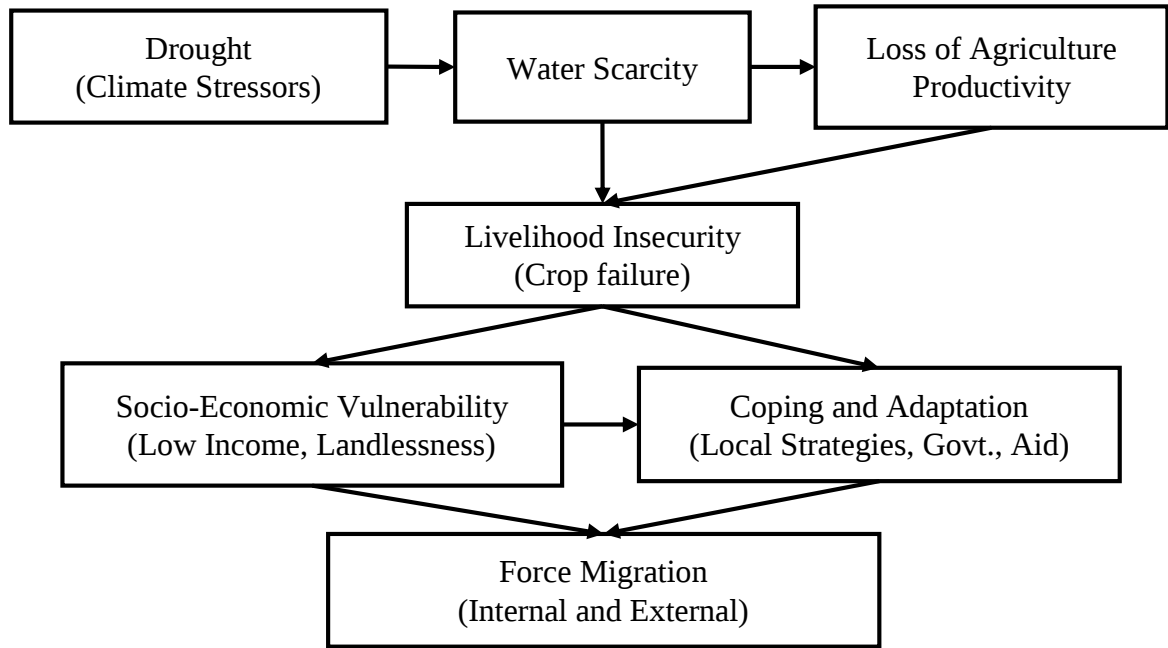
2.3.2. Forced migration and climate change-related national policies

In Nepal, although there is no single policy exclusively addressing forced migration, key national frameworks, such as the National Disaster Risk Reduction and Management Policy (2018) and the National Climate Change Policy (2019), indirectly address migration by focusing on building resilience and reducing risks for vulnerable communities. Additionally, the Foreign Employment Policy, 2012, and the National Population Policy, 2014, contain provisions relevant to internal and international migration trends. However, gaps remain in terms of coordinated implementation and recognition of environmentally induced displacement in formal migration governance structures (IOM, 2021; NPC, 2019).

2.4. Conceptual framework

The study is based on this conceptual framework, which the researcher conceptualized based on the literature review. Climate stressors, such as drought, flooding, and landslides, are major drivers of involuntary human mobility, particularly in vulnerable and resource-

Figure 2.1: Conceptual framework



Source: Designed by Researcher, 2025.

dependent communities. The conceptual framework consisted of push-pull theory, livelihood vulnerability framework, and climate change adaptation models. The figure provides more details about this research idea and the roadmap for the study destination.

The above framework assumes that while an increased drought period is a result of climate change, it also creates water scarcity in the agro-based livelihood of the Mahabharat Shadow Range Area. In that area, most people rely on agro-based livelihoods, and water scarcity affects agricultural productivity, leading to a loss of their primary source of income and food. Gradually, it affected the family's livelihood, and people felt insecure about their financial stability, which led to an economic viability process that also affected their society. Similarly, people have no alternative but to survive in their birthplace. Despite government plans, policies, and relief aid, they plan to leave their original place forcibly, without their consent, or involuntarily.

CHAPTER THREE

RESEARCH METHODOLOGY

This study employed a quantitative explanatory research design, which is appropriate for examining the impacts of drought on forced migration in the Mahabharat Shadow Range Area of Khandadevi Rural Municipality, Ramechhap District, Nepal. The use of quantitative data enabled the identification of trends and correlations between the affected households and drought.

3.1. Philosophical study

Positivism is a research philosophy that posits that knowledge is derived from observable and measurable facts, rather than from subjective beliefs or interpretations. It emphasizes objectivity, quantification, hypothesis testing, and generalizability (Creswell, 2014). Positivists believe that reality exists independently of the observer and can be objectively measured (Saunders et al., 2023). Similarly, information measured with quantification in statistics, and knowledge is acquired through observable, empirical, and measurable facts, often gathered through experiments, surveys, or structured questionnaires (Creswell, 2014). Under this philosophical approach, hypotheses are formulated and tested using statistical tools to measure and identify the causal relationship and explanation between variables (Bryman, 2016). Additionally, it is a value-free inquiry, where the researcher remains detached from the study and strives to remain neutral to minimize bias and subjective influence (Neuman, 2014). It focuses on producing findings that can be generalized to larger populations or other settings.

In the meantime, the study adopted a positivist research philosophy, which posits that social phenomena, such as drought and forced migration, can be objectively observed, measured, and analyzed using quantitative methods. The study employed a household survey approach, and the research seeks to identify and statistically assess the intersection between drought and forced migration decisions, thereby enabling evidence-based conclusions that are replicable and generalizable.

3.2 Study area

The research focused on Khandadevi Rural Municipality, Ward No. 4, in the Mahabharat Shadow Range Area of Ramechhap District, a region characterized by water scarcity, low agricultural yields, and high rates of forced migration. The area lies in the mid-hills of

Nepal and is particularly vulnerable to drought due to its ecological positioning behind the Mahabharat range, which obstructs monsoon rainfall.

Particularly, the study area is the most vulnerable and drought-affected. Similarly, people in the community are migrating from their original place due to the consequences of the drought in this area. Most people depend on agricultural livelihoods, which have been degrading and affected by drought for over a decade. Therefore, people are exploring the sustainability of their livelihoods in their birthplace. The study area is located on the banks of the Sunkoshi and Tamakoshi rivers, within the Mahabharat Range. Therefore, people also experienced the effects of drought on their agricultural livelihoods. Thus, the study area must be genuine and original to explore the new knowledge regarding drought and forced migration.

3.3 Nature of data and source

The study data were quantitative, which measures the objective reality of household respondents. Additionally, the study employed a household survey; therefore, the data were primary, and the household field survey was employed in the respective study area.

3.4 Population and sampling

Study population: The study population consisted of households affected by drought and with at least one member who had migrated from their birthplace. The information was collected from the household, and the respondents were male or female, as available at the house during the survey. In the study area, 718 households were identified, comprising 2 rented and 1 institutional (NSO, 2021). However, in this study, only 715 households had adopted and were excluded from rented and institutional houses in total.

Sampling method: The study employed a convenience sampling method because the affected households from the drought, who had migrated from their birthplace and had low agricultural productivity, were easily accessible.

Sample size: The sample size has been determined using the online sample size calculation software at Raosoft.com. The total sample size of households is 197, with a 5% margin of error, a 90% confidence level, and a response distribution of 50% (Raosoft, Inc., 2004).

3.5 Data collection technique and tool

Technique: Applied a quantitative data collection technique in the household survey at the respective study area based on the research design.

Tool: The study employed a structured questionnaire for collecting quantitative data from the respective area. It has been rigorously reviewed and pilot-tested in a similar community household before being used for proper data collection. It paid close attention to collecting reliable answers from the respondents, so it was tested twice in the field and reviewed accordingly.

Data collection process and application: To collect data from the respective area, data collectors were selected in close coordination with the Community Development Society (CDS) team in Manthali, Ramechhap. Before deploying in the field, I organized a virtual orientation session in the Microsoft Teams app to cover ethical considerations and the questionnaire fill-out process using the Kobo Toolbox application. Animators installed the Kobo Toolbox application on their Android device, and information was collected offline and sent online. For all these processes, CDS has facilitated and managed logistic support to animators during field deployment for data collection.

3.6 Data analysis

Initially, raw data were downloaded in Microsoft Excel form from the Kobo Toolbox application and converted into English from the Nepali language for every variable. Then, they were cleaned and coded as well. The final cleaned data were uploaded to SPSS software version 27, and descriptive statistics, along with correlation analysis, were used to identify the relationship between drought severity and its effect on forced migration. The output of the analysis, presented in the SPSS application, is displayed in a table, figure, and narrative form.

The dependent variables were measured on a nominal scale (Dichotomy): Yes = 1, No = 0. Therefore, cross-tabulation results were used for the bivariate analysis, and logistic regression was applied for the multivariate analysis.

3.7 Validity and reliability

An expert, a second review tool applied in the field and reviewed as well, and an empirical test that established a correlation and led to changes in the questionnaire patterns had tested the structural questionnaires multiple times, including a review. The tools were examined and tested to minimize errors and unwanted options. Finally, the reviewed tools were applied to collect field information from the household survey.

3.8 Ethical considerations

The Research Cell of the Central Department of Population Studies (CDPS), T.U., has approved the study proposal and obtained informed consent from all participants during the field survey. Similarly, the researcher had maintained personal confidentiality and anonymity, and the study avoided any form of pressure or harm to participants. Similarly, coordination with the ward office is required to obtain approval prior to the commencement of the field study. Additionally, conducted an online orientation for field data animators on ethical considerations in research.

CHAPTER FOUR

EFFECTS OF DROUGHT FREQUENCY AND INTENSITY ON AGRICULTURAL LIVELIHOODS

The Frequent and intense droughts undermine agricultural livelihoods by reducing crop yields, degrading land and water resources, threatening livestock, and creating food insecurity that drives households into poverty and migration. This chapter presents univariate, bivariate, and multivariate analyses, incorporating the major dependent, independent, and control variables. Most dependent variables were measured on a dichotomous (nominal) scale, while others were recoded to suit their distribution and interpretation needs. The results are organized under distinct headings, each of which is explained in detail.

4.1. Demographic characteristics of respondents

Table 4.1 presents the demographic characteristics of household respondents, including sex, Age, education level, caste-ethnicity, family size, and number of earning members in the households of respondents. It presented the observed number and their percentage separately. Additionally, these are control variables in the statistical analysis and interpretation of the manuscript.

Table 4.1: Distribution of respondents by selected demographic characteristics

Background Characteristics	Number	Percent
Sex (N=207)		
Male	102	49.3
Female	105	50.7
Age (N=207)		
Minimum	15	-
Maximum	87	-
15-24 Age	11	5.3
25-34 Age	33	15.9
35-44 Age	51	24.6
45-54 Age	34	16.4
55-64 Age	36	17.4
65 & Above	42	20.3
Education Level (N=207)		
Illiterate	79	38.2
Informal Education	53	25.6

Background Characteristics	Number	Percent
Basic Level (1-8 Class)	36	17.4
Secondary Level (9-12 Class) & Above	39	18.8
Caste-Ethnicity (N=207)		
Non Indigenous	78	37.7
Indigenous	129	62.3
Total Family Size (N=207)		
1-5 family size	114	55.1
6 & above family size	93	44.9
The earning population of the family (N=207)		
1 Member	92	44.4
2 Member	65	31.4
3 Member	21	10.1
4 Member	29	14

Source: Field Survey, 2025.

Table 4.1 shows that the sex ratio is almost equal; however, it was not determined during the sampling. Therefore, there seemed to be 50.7 percent females, which is slightly higher than the percentage of male respondents. Similarly, respondent ages were not specified before field deployment, so it was also proposed that the minimum age is 15 and the maximum age is 87. The age group has been recoded to facilitate further statistical analysis in 10-year intervals. Single age groups have not provided a good analysis, with the lowest percentage in the 15-24 age group (5.3%) and the highest percentage in the 35-44 age group (24.6%).

In addition, the education level of respondents has the highest percentage in the illiterate group, at 38.2 percent, and the lowest in the basic level (1-8 Class), at 17.4 percent. As a caste-ethnicity group, there is a higher proportion of indigenous people than non-indigenous household people, with 62.3 percent. Also, family size has been recoded into two groups from the ratio scale, where family sizes of 1-5 are considered high, with 55.1 percent of households having 6 and more family members. Additionally, household respondents were categorized based on the number of earning family members in households, with single-earning member households being the most prevalent, at 44.4 percent, and 4-earning member households accounting for 14 percent of the respondents' families.

The findings reveal that the sex ratio is almost balanced, with a dominance of the 35-44 age group, higher literacy rates, a majority of households from indigenous people, larger family sizes, and a prevalence of single-earning family members.

4.2. Household occupation of respondents

The household occupation is one of the key variables in the analysis of drought and its effects because it is interconnected with or a predictor of forced migration. Therefore, without discussing household occupation, there is a gap in understanding the drought's effect on forced migration. The household occupation influences the decision-making process for choosing a destination based on decent work or benefits.

During the survey, the deployment of multiple-choice answers yielded a high response rate, with most respondents providing accurate answers. Notably, 97.1 percent selected agriculture as the main household occupation, the highest percentage among all responses. The second-highest response in daily wages was selected by 40.6% of respondents as the main occupation of the household. Similarly, only 11.1 percent have a business, 10.1 percent have gone abroad for employment, and 9.2 percent hold a government job.

Table 4.2: Distribution of household occupation.

Household Occupation	Number	Percent
Daily Wages (N=207)		
No=0	123	59.4
Yes=1	84	40.6
Agriculture (N=207)		
No=0	6	2.9
Yes=1	201	97.1
Foreign Employment (N=207)		
No=0	186	89.9
Yes=1	21	10.1
Business (N=207)		
No=0	184	88.9
Yes=1	23	11.1
Government Job (N=207)		
No=0	188	90.8
Yes=1	19	9.2

Source: Field Survey, 2025.

The highest number of respondents depend on agriculture, which is prone to effects from drought and other climate-induced hazards. Therefore, if they have no alternative locally

other than agricultural occupation, they may be forced to displace from their birthplace due to drought.

Findings reveal that nearly half of households are involved in daily wages, the majority of households have agriculture, the least have household members in foreign employment, the majority of households have no business, and the very least have a government job.

4.3. Crop production and declining

In the local area, people have cultivated a diverse range of crops to survive, but the survey focuses on the major crop among the various crops grown in households. It was measured in a ratio scale, but an unbalanced distribution was recoded into two poles: below <1000 KG and above >1001KG. It shows that 59.9 percent of people have less than a thousand kilograms of primary crop production each year. It is also a sign of the decline of crop production or a significant effect of drought on agriculture.

Table 4.3: Distribution of crop production experience and declining reasons

Major crops and reasons for declining	Number	Percent
Major Crops in KG (N=207)		
Below <1000 KG	124	59.9
Above > 1001KG	83	40.1
Experience of declining crop production (N=207)		
No=0	17	8.2
Yes=1	190	91.8
Reason for Drought (N=207)		
No=0	11	5.3
Yes=1	178	86
No response=99	18	8.7
Reason for Pests/Diseases (N=207)		
No=0	5	2.4
Yes=1	184	88.9
No response=99	18	8.7
Reason for Flood (N=207)		
No=0	163	78.7
Yes=1	26	12.6
No response=99	18	8.7
Reason for wild animal problem (N=207)		
No=0	106	51.2
Yes=1	83	40.1
No response=99	18	8.7

Source: Field Survey, 2025.

Similarly, multiple-choice answers were deployed to explore the reasons for crop decline due to drought. The answers were measured on a dichotomous (nominal) scale (yes=1,

no=0). The majority of people experienced declining crop production, with 91.8 percent. Among the reasons, drought was experienced by 86 percent, pests/Diseases by 88.9 percent, and flood by 12.6 percent. Additionally, it is notable that 40.1 percent experienced problems with wild animals affecting crop production.

Findings reveal that the dominance of primary crop production below 1000 kg per year is associated with the highest household experiencing declining crop production. The majority of respondents attributed drought and pests/diseases as the reasons for declining food production, while floods and wild animal problems were not considered as reasons.

4.4. Drought effects on multiple areas of the household level

The impact of drought on multiple areas at the household level is a major concern. Therefore, the study explored the effects of drought on multiple areas. According to Table 4, 89.9 percent of respondents indicated that the effect of drought on crop production.

Table 4.4: Distribution of drought effects on multiple areas

Drought Effects Area	Number	Percent
Crop Production (N=207)		
No=0	6	2.9
Yes=1	186	89.9
No response=99	15	7.2
Livestock (N=207)		
No=0	24	11.6
Yes=1	168	81.2
No response=99	15	7.2
Household Food Supply (N=207)		
No=0	77	37.2
Yes=1	115	55.6
No response=99	15	7.2
Income Generation (N=207)		
No=0	80	38.6
Yes=1	112	54.1
No response=99	15	7.2
Schooling of Children (N=207)		
No=0	162	78.3
Yes=1	30	14.5
No response=99	15	7.2
Health and Nutrition (N=207)		
No=0	148	71.5
Yes=1	44	21.3
No response=99	15	7.2

Source: Field Survey, 2025.

Similarly, 81.2 percent said yes to the effect on livestock businesses, 55.6 percent answered yes to the effect on household food supply, 54.1 percent responded yes to the effect on household income generation, 14.5 percent responded yes to the effect on the schooling of children, and 21.3 percent answered yes to the effect on health and nutrition at the household level.

Findings reveal that the majority of households experienced the effects of the drought in crop production, livestock, household food supply, and income generation, except for the areas of children's schooling, health, and nutrition.

4.5. Faced challenges and coping with adaptation to another drought

Most respondents reported facing complete crop production failure due to drought, with 55.1 percent, while 44.9 percent answered no. Similarly, 10.1 percent changed their cropping pattern to cope with drought, and 59.9 percent are confident in coping with another drought.

Table 4.5: Distribution of crop failures, cropping patterns, and confidence to cope with another drought

Response and thematic area	Number	Percent
Faced complete crop failure (N=207)		
No=0	93	44.9
Yes=1	114	55.1
Changed cropping patterns due to drought (N=207)		
No=0	186	89.9
Yes=1	21	10.1
Confidence to cope with another drought (N=207)		
No=0	83	40.1
Yes=1	124	59.9

Source: Field Survey, 2025.

Findings reveal that the highest household faced complete crop failure and had confidence to cope with another drought. Additionally, most households have not changed their cropping patterns due to the drought.

4.6. Affected factors to continue farming in the local area

Most people were affected in their interest in farming in the local area due to the drought. As Table 6 shows that people have dry crops due to a lack of water on time, where 58.9

percent of people answered yes, 78.3 percent of people were demotivated due to drought occurring every year, and 38.6 percent of people thought of quitting farming due to expensive or high input and low output, 28.5 percent of people have planned to move in the city due to no future in agriculture, 13.5 percent looking alternative livelihood due to increased drought, 6.3 percent of people have migrated abroad their son due to drought and family thought to quit farming.

Table 4.6: Distribution of affected factors to continue farming in the local area

Affected factors	Number	Percent
Crop dry up due to a lack of water (N=207)		
No=0	75	36.2
Yes=1	122	58.9
No response=99	10	4.8
Demotivated due to drought, which occurs almost every year (N=207)		
No=0	35	16.9
Yes=1	162	78.3
No response=99	10	4.8
Expensive to farming, so thinking quit it (N=207)		
No=0	117	56.5
Yes=1	80	38.6
No response=99	10	4.8
No future in farming felt like moving to the city (N=207)		
No=0	138	66.7
Yes=1	59	28.5
No response=99	10	4.8
Increasing drought, so looking at alternative livelihoods (N=207)		
No=0	169	81.6
Yes=1	28	13.5
No response=99	10	4.8
Due to drought, the son migrated abroad and quit it (N=207)		
No=0	184	88.9
Yes=1	13	6.3
No response=99	10	4.8

Source: Field Survey, 2025.

It suggests that many people will soon abandon farming due to drought and its impact on agricultural production. People considered various options and left the agricultural sector due to the direct impact of drought every year. It does not directly affect agricultural production; however, it challenges food security and food sovereignty, as well as population management and distribution.

Findings reveal that almost all households faced a water shortage; the majority of households were demotivated to continue farming. Nearly half of the respondents thought of quitting farming, one-third of household respondents thought of moving to the city, and the smallest portion looked for alternative livelihoods to cope with the drought. Less than ten percent have migrated family members abroad due to drought.

4.7. Problems faced in the animal husbandry business due to drought

Numerous problems are occurring due to the drought in the local area, which directly affects farmers and those involved in agricultural production. As Table 4.7 shows, among the respondents, 83.1 percent faced water shortages for running animal husbandry activities, 86 percent faced a lack of grass, 71.5 percent faced a shortage of pastureland area, and 74.9 percent faced new diseases in animals. Livestock is a crucial component of rural farmers' subsistence livelihood, but it is also highly impacted.

Table 4.7: Distribution of problems faced due to drought in animal husbandry

Affected factors	Number	Percent
Water shortage (N=207)		
No=0	18	8.7
Yes=1	172	83.1
No response=99	17	8.2
Lack of grass (N=207)		
No=0	12	5.8
Yes=1	178	86
No response=99	17	8.2
Lack of Pasture area (N=207)		
No=0	42	20.3
Yes=1	148	71.5
No response=99	17	8.2
Problem of new diseases (N=207)		
No=0	35	16.9
Yes=1	155	74.9
No response=99	17	8.2

Source: Field Survey, 2025.

As findings, the majority of households faced water shortages, a lack of grass, a lack of pastureland, and problems with new diseases due to drought in animal husbandry.

4.8. Bivariate analysis of cross-tabulation results between the sex of respondents and drought intensity and its effects on livelihood

Table 4.8: Results of the sex of the respondent, the drought intensity, and its effect on livelihoods

Response and effects of drought	Sex of Respondents				Total N	Pearson Chi-square
	Male		Female			
	N	%	N	%		
Reason for crop declining-Problem of wild Animals						
No	54	50.9	52	49.1	106	.291
Yes	39	47.0	44	53	83	
Drought's effect on the household food supply						
No	32	41.6	45	58.4	77	2.817+
Yes	62	53.9	53	46.1	115	
Drought's effect on income generation						
No	36	45	44	55	80	.860
Yes	58	51.8	54	48.2	112	
The effect of drought on the schooling of children						
No	80	49.4	82	50.6	162	.075
Yes	14	46.7	16	53.3	30	
Drought's effect on health and nutrition						
No	73	49.3	75	50.7	148	.035
Yes	21	47.7	23	52.3	44	
Faced complete crop failure						
No	46	49.5	47	50.5	93	.002
Yes	56	49.1	58	50.9	114	
Problem of new diseases in Animal husbandry						
No	10	28.6	25	71.4	35	8.273**
Yes	86	55.5	69	44.5	155	
Confident of coping with another drought						
No Confident	41	49.4	42	50.6	83	.001
Confident	61	49.2	63	50.8	124	
Major Crops Production of Household in Kilograms (KG)						
Below <1000 KG	57	46	67	54	124	1.354
Above>1001 KG	45	54.2	38	45.8	83	

Source: Field Survey, 2025. ***=p<.001, **=p<.01, *=p<.05, +=p<.10

As Table 4.8 shows, 47 percent of males and 53 percent of females responded that wild animals are a problem contributing to crop decline, which is not statistically significant. More male than female respondents answered that a problem for wild animals is the

decrease in crop production, but there is no clear interrelation between the two. Similarly, the effect on the household food supply and the respondent's sex appears to have a significant relationship ($p < .10$), but does not strongly influence the dependent variable. However, males answered yes to an effect on the household food supply at a rate of 53.9 percent, while 46.1 percent of females answered yes, which is lower than the rate among males.

Household income generation is also one of the most influential variables for forced migration, due to the impact of drought on agriculture or the livelihoods of local people. There is no relationship between the respondent's sex and the difference, as the difference is not statistically significant. However, 51.8 percent of male respondents answered yes to the effect that drought has on household income generation. Besides, the sex of the respondent and Schooling in children have no significant correlation, but 53.3 percent of females attributed the effect on schooling in children to drought in the local area. In addition, health and nutrition, confidence in coping with another drought, major crop production by the family, and complete crop failure have no statistically significant correlation with the respondent's sex. Meanwhile, new diseases in animal husbandry and the sex of respondents have a strong relationship ($p < .01$). Nevertheless, males have a 55.5 percent response rate, which is higher than that of female respondents.

As a gender, respondents almost equally emphasized the problem of wild animals as a reason for crop decline, but this difference was not statistically significant. On the other hand, household food supply and gender have a very marginally significant and nearly balanced response. Similarly, household income generation, schooling of children, health and nutrition, complete crop failure, household crop production, and coping with another drought were not associated with gender, except for diseases in animal husbandry.

4.9. Bivariate result between the Major crop production of households and the frequent occurrence of droughts every year

As Table 4.9 shows, there is a statistically significant association between household major crop production and the frequency of droughts each year, with $p < .001$. Also, those who have below <1000 kg crop production, 68.5 percent, and above >1001 kg crop production, 90.4 percent, answered that the effect of frequent occurrence of a drought every year, so they plan to quit farming.

Table 4.9: Crosstab result between the household crop production and the frequent occurrence of droughts every year

Response and effects of drought	The frequent occurrence of a drought every year						Pearson Chi-square
	No		Yes		Do not know		
	N	%	N	%	N	%	
Major crop production of the household							
Below <1000 KG	22	17.7	85	68.5	17	13.7	15.077***
Above>1001 KG	7	8.4	75	90.4	1	1.2	

Source: Field Survey, 2025.

***=p<.001, **=p<.01, *=p<.05, +=p<.10

As a finding of bivariate analysis, drought intensity and household crop production have a statistically strong association (p<.001).

4.10. Bivariate result between household major crop production and crop cycle in a year

Table 4.10 shows that household major crop production and the crop cycle within a year have a strong association (p < .001). There were three categories of crop cycle and two categories of major household crop production, where a higher percentage of respondents were those who have cultivated twice yearly, with 66.3 percent of above >1001 kg and 56.5 percent of below<1000kg crop production.

Table 4.10: Crosstab result between the households' crop production and the crop cycle in a year

Major crop production of households	Crops Cycle in a year						Pearson Chi-square
	Once a year		Twice a year		Three times a year		
	N	%	N	%	N	%	
Below <1000 KG	52	41.9	70	56.5	2	1.6	14.022***
Above>1001 KG	19	22.9	55	66.3	9	10.8	

Source: Field Survey, 2025.

***=p<.001, **=p<.01, *=p<.05, +=p<.10

The cross-tabulation findings reveal a statistically strong association between the crop production cycle in a year and household crop production (p < .001).

4.11. Bivariate result analysis between major household crop production and out-migration

Table 4.11 shows a highly significant association ($p < .001$) between farmers' experience of declining crop production in the last 5 years and their dependence on lift irrigation for farming ($p < .001$). In addition, 82.4 percent of respondents were not experiencing a decline in production among households dependent on lift irrigation. Another variable experience of drought in the last 10 years, and the drought effect on household food supply has a significant association ($p < .001$). Households that have experienced a more extended drought of more than 5 years report a higher food supply (85.5%). Besides, farming depends on rain-fed water, and drought effects on household food supply have a significantly strong relation with $p < .001$. Those who farm using rain-fed water are significantly more affected by drought, which reduces their household supply by 91.3 percent.

Table 4.11: Cross tabulation between the Major crop production of households and out-migration due to drought affecting agriculture

Bivariate variables	No		Yes		Pearson Chi-square
	N	%	N	%	
Experience of declining crop production in the last 5 years and dependence on lift irrigation for farming					
No	3	17.6	14	82.4	17.513***
Yes	130	68.4	60	31.6	
Experience of drought in the last 10 years and its effect on Household food supply					
Non	3	60	2	40	24.555***
1-2 years	16	66.7	8	33.3	
3-5 years	50	46.3	58	53.7	
More than 5 years	8	14.5	47	85.5	
Drought affects household food supply, and farming depends on rain-fed water					
No	21	27.3	56	72.7	11.756***
Yes	10	8.7	105	91.3	
Experience of drought in the last 10 years and its effect on income generation					
None	4	80	1	20	16.703***
1-2 years	16	66.7	8	33.3	
3-5 years	47	43.5	61	56.5	
More than 5 years	13	23.6	42	76.4	
Out Migration to Cope with drought impact on agriculture and its effect on the schooling of children					
No	108	90.8	11	9.2	31.391***
Yes	14	46.7	16	53.3	

Source: Field Survey, 2025.

***= $p < .001$, **= $p < .01$, *= $p < .05$, += $p < .10$

Similarly, there is a statistically significant association between drought duration and its impact on household income generation ($p < .001$). Additionally, those who have recently experienced drought are less affected in terms of household income generation. On the other hand, they are severely affected in income generation, particularly with prolonged exposure, at a rate of 76.4 percent. Furthermore, a strong relationship exists between out-migration as a coping strategy and its effect on the schooling of children ($p < .001$). 53.3 percent of respondents reported the effect on children's schooling (53.3%) due to out-migration for coping with drought.

The findings reveal that the highest households experienced declining crop production and were dependent on lift irrigation for farming, a statistically significant finding. In addition, drought affects household food supply, income generation, reliance on rain-fed water, and forced migration, ultimately affecting the schooling of children.

4.12. Bivariate analysis between out-migration and drought-affected agriculture

As Table 12 shows, there is a highly significant association between out-migration due to drought-affected agriculture and household crop production ($p < .001$). 31.6 percent of respondents reported out-migration is a coping strategy of drought-affected agriculture for those who have less than <1000 kg crop production. On the other hand, below <1000 kg and above 1001 kg major household crop production respondents ignore the out migration to a strategy of coping with drought-affected agriculture with 68.4 and 91.7 percent, respectively.

Table 4.12: Cross-tabulation results of out-migration and food aid with household crop production

Response	Major Household Crop Production				Pearson Chi-square
	Below <1000 kg		Above>1001 kg		
Out-migration due to drought affected agriculture					
Yes	25	31.6%	6	8.3%	12.548***
No	54	68.4%	66	91.7%	
Food Aid					
Yes	14	17.7%	1	1.4%	11.231***
No	65	82.3%	71	98.6%	

Source: Field Survey, 2025.

***= $p < .001$, **= $p < .01$, *= $p < .05$, += $p < .10$

Additionally, a statistically significant relationship was found between the volume of major household crop production and the food support received by respondents ($p < .001$). There

are only below <1000 kg and above >1001 kg major household crop production reported receiving food support with 17.7 and 1.4 percent, respectively.

The findings reveal that the prevalence of household crop production resulting from out-migration has an impact on the agricultural sector. Food aid and household crop production have a strong association.

4.13. Multivariate result analysis output of logistic regression

In this multivariate analysis, the results of logistic regression were employed, using three dependent variables, along with the independent variable of household-based sex, and other control variables. Model 1 represented household-based primary crop production, which was measured as high (1) or low (0) crop production. In addition, model 2 measured the drought effect on household food supply, using a scale where 'Effect yes' was assigned a value of 1 and 'Effect no' was assigned a value of 0. Another model 3 problem of new diseases in animal husbandry, which measures in a problem yes=1 and no problem=0 scale.

These three models are statistically significant and associate household sex respondents with other control variables such as education level, caste-ethnicity, family size, and the earning population of the respondent's family. Model 1 has a 27.595 Chi-square and a 0.169 R Square, which explains household major crop production variation moderately well, and the model also fits ($p < .001$). Similarly, Model 2's drought effects on household food supply have a 28.123 Chi-square and an R-squared of 18.4, indicating a strong model fit ($p < .001$) and a significant impact on household food supply due to drought. The Model 3 problem of new diseases in animal husbandry has a 17.710 Chi-square and 14.5 R Square, which is a weak model with $p < .05$, but is less affected by new diseases in animal husbandry.

Sex is a household-based independent variable, which refers to the male category, and a measure of the dependent variable. Based on Model 1, female respondents are significantly less likely to have higher household major crop production compared to males (OR = 0.551, $p < .05$). Model 2 is not statistically significant. However, female household respondents have a less significant effect on food supply compared to male respondents. Also, the Model 3 problem of new diseases in animal husbandry due to drought is statistically significant and associated with the sex of the respondent category, where female respondents are less likely to report new disease problems in animal husbandry (OR=0.313, $p<.01$). Therefore,

gender plays a significant role in agricultural vulnerability, particularly in households' major crop production.

Table 4.13: Results of Multivariate logistic regression among the drought effects

Measures (N=207)	Model 1	Model 2	Model 3
Chi-square	27.595***	28.123***	17.710*
R Square	16.9	18.4	14.5
Sex (Reference: Male)			
Female	0.551*	0.621	.313**
Education Level of Respondents (Reference: Illiterate)			
Informal Education	0.592	0.456+	.701
Basic Level (1-8 Class)	0.444**	1.868	.811
Secondary Level and above	0.445**	0.517	.343
Caste-Ethnicity of Respondents (Reference: Non-Indigenous)			
Indigenous	0.364***	2.515**	1.491
Family Size of Respondents (Reference: 1-5 Members)			
6 & above family member	0.572	0.950	1.236
Earning population of the family (Reference: 1 Member)			
2 Member	2.233*	1.749	.796
3 Member	1.741	0.042*	3.628
4 Member	3.078*	2.083	0.811

Source: Field Survey, 2025.

***=p<.001, **=p<.01, *=p<.05, +=p<.10

Note: Model 1: Major crop production of the Household, Model 2: Drought effect on household food supply, Model 3: Problem of new diseases in animal husbandry

The respondents' education level influenced the dependent variables. The Model 1 informal education has not been statistically significant, but it is less likely to reduce crop production than it is for illiterate respondents. On the other hand, statistically significant differences exist between the basic (1-8 class) and secondary (9-12 class) levels, with $p < .01$. Nevertheless, they are less likely to experience low crop production compared to illiterate respondents. In Model 2, the effect is marginally statistically significant ($p < .10$), and the remaining education level categories are not necessary. Model 3 has no statistically significant relationship with household food supply due to drought. As a conclusion, the

education variable contributes to improving resilience in household major crop production. However, it does not affect household food supply or the problem of new diseases in animal husbandry.

Caste-ethnicity is also a control variable, which is categorized into indigenous and non-indigenous groups. In Model 1, the result is strongly significant ($p < .001$), but less likely to have primary household crop production compared to non-indigenous respondents (OR = 0.364). Model 2 is also moderately significant ($p < .01$), where indigenous respondents are 2.515 times more likely to have an affected household-based food supply compared to non-indigenous respondents. Model 3 shows no statistically significant association, but indigenous respondents have a food supply that is affected 1.491 times more.

The family size of respondents is not statistically significant in all models, and it is not a strong predictor in the analysis of drought effects on agricultural production, food supply, and new diseases in animal husbandry. An earning member in the respondents' household is another control variable. In Models 1, 2, and 4, earners in the family seem statistically moderately significant ($p < .05$). They are more likely to report higher major household crop production (2-OR=2.233, 4-OR=3.078) as compared to 1 earner in the family. Model 2 has 3 earners in the family, and it has a statistically significant effect ($p < .05$), but its odds ratio is very low. Model 3 is not statistically significant.

The findings of multivariate logistic regression show that Model 1: Major crop production of the Household, Model 2: Drought effect on household food supply, and Model 3: Problem of new diseases in animal husbandry are model fit. Females have a higher likelihood compared to males, and the level of education of household respondents affects the outcome variables. Indigenous household respondents are more dominant than non-indigenous household respondents. Earning family members are influential on the outcome variable than a single earning family member.

CHAPTER FIVE

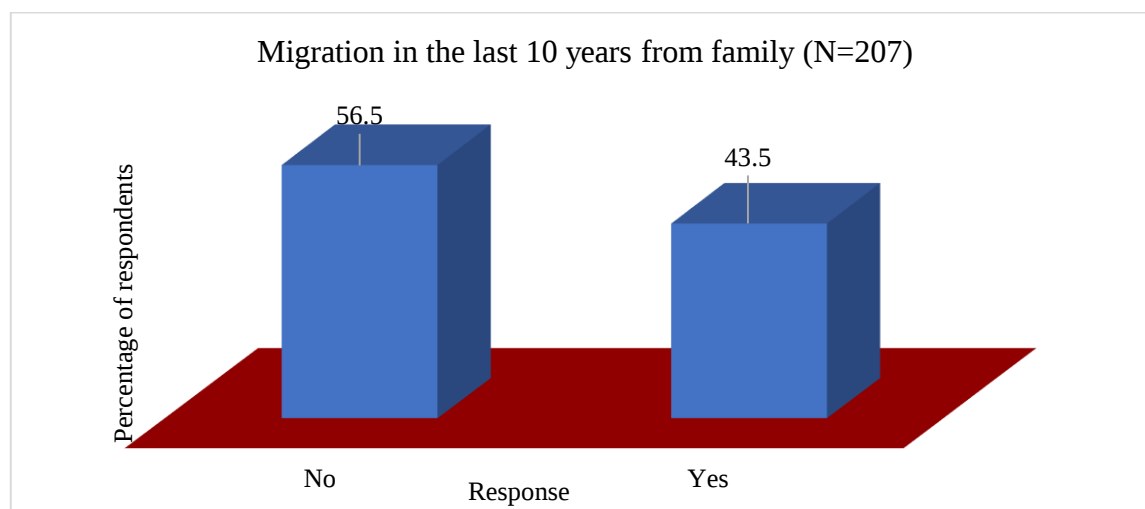
EXAMINATION OF THE ROLE OF DROUGHT AS A PRIMARY FACTOR INFLUENCING FORCED MIGRATION

Drought stressors influence the force migration, which has evolved as an emerging issue. Therefore, it examines the role of drought in forced migration, playing a vital role in this process. This chapter examines the role of drought as a primary factor influencing forced migration. Mainly univariate, bivariate, and multivariate results analysis were presented accordingly. The data were presented in a figure and table, showing observed numbers and percentages in univariate analysis, cross-tabulation, and Chi-square tests in bivariate analysis, as well as logistic regression in multivariate analysis.

5.1. Univariate result analysis

As Figure 5.1 illustrates, most respondents do not have a family member who has migrated in the last decade. Although 56.5 percent of respondents answered 'no' and 43.5% responded 'yes', men reported that at least one family member had migrated from their family in the last ten years.

Figure 5.1: Distribution of migration in the last ten years



Source: Field Survey, 2025.

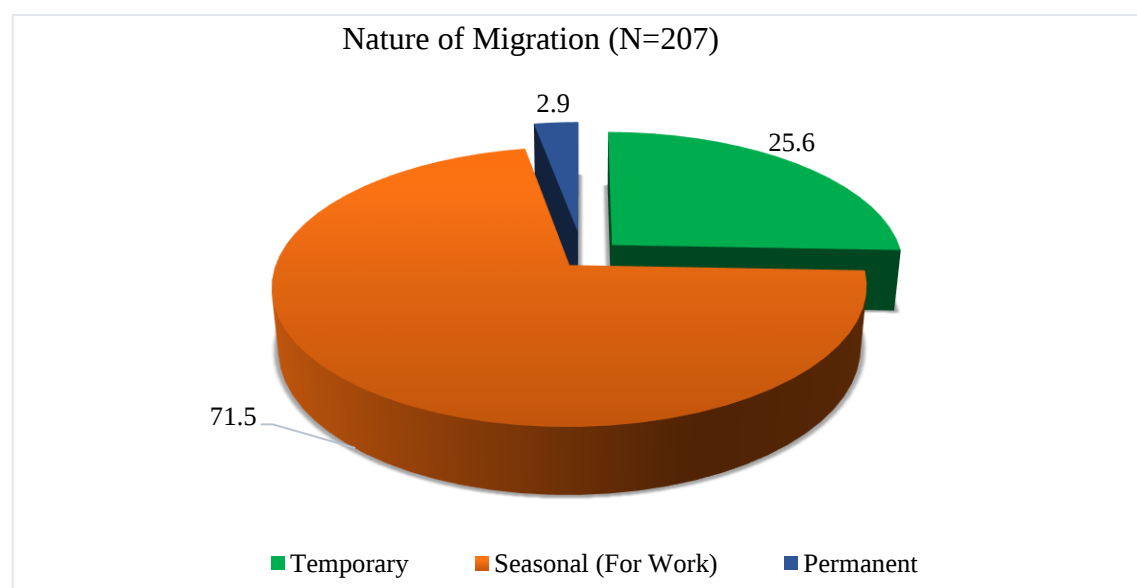
As findings, nearly fifty percent of household respondents have migrated family members within the last 10 years.

5.2. Nature of migration due to drought effects

As per Figure 5.2, most people move to other places from their birthplace. During the household survey, respondents reported seasonal migration for work at a rate of 71.5

percent, the highest rate among all respondents. Additionally, 25.6 percent of the participants migrated temporarily, and 2.9 percent migrated permanently.

Figure 5.2: Nature of migration due to the effect of drought



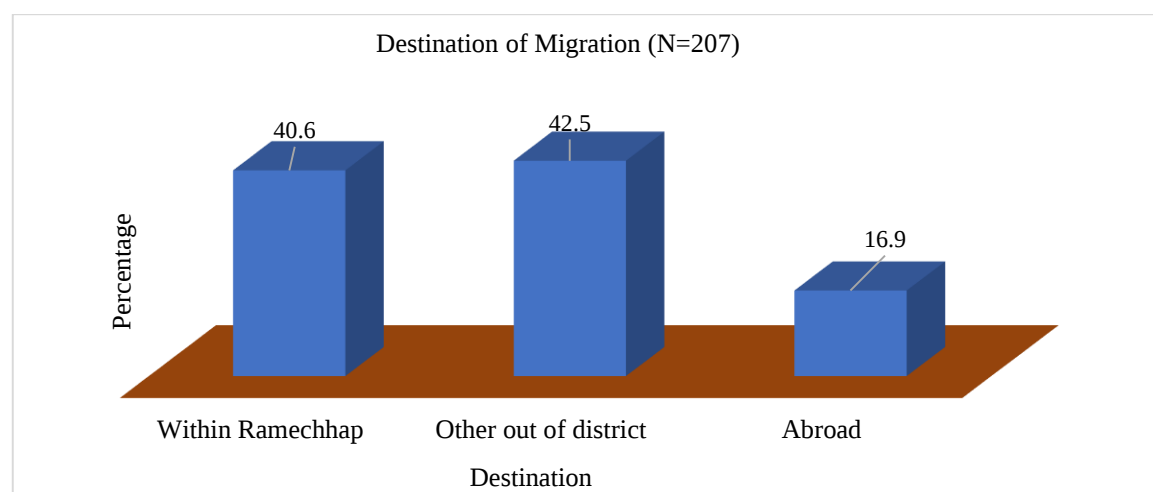
Source: Field Survey, 2025.

The findings reveal that the highest portion of household respondents have migrated for seasonal work, followed by temporary migration.

5.3. Migrants' destination

Figure 5.3 shows that 42.5 percent of respondents' family members migrated to other districts from their birthplace, the highest ratio within the district and abroad. Similarly, 40.6 percent were within the district, and 16.9 percent migrated abroad.

Figure 5.3: Distribution of migrant's destination



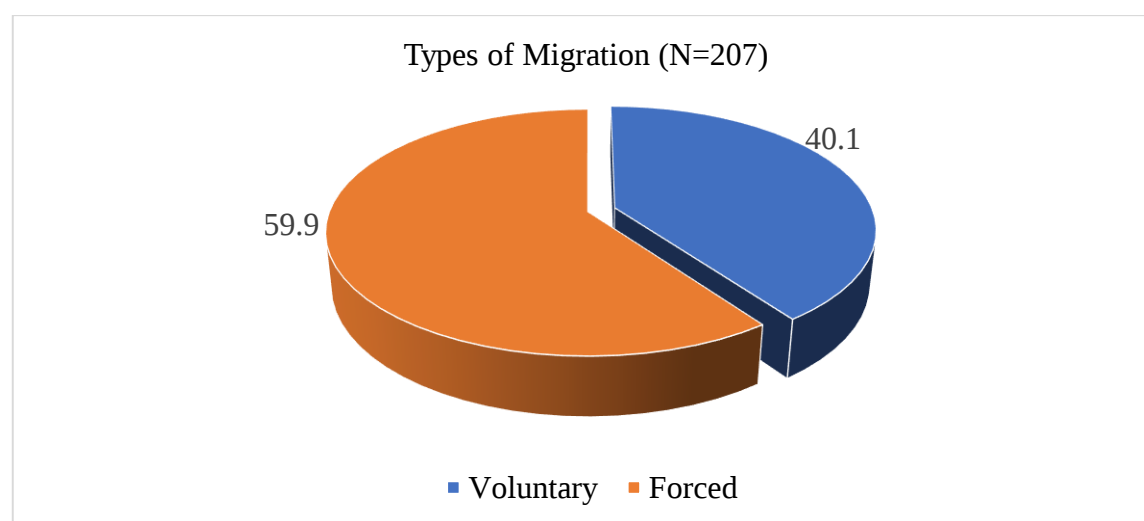
Source: Field Survey, 2025.

The findings reveal that the majority of household respondents migrated to another district or out of their birthplace.

5.4. Types of migration

Figure 5.4 shows that 59.9 percent of respondents' family members migrated forcefully or involuntarily. It means they are not willing to move or leave their birthplace. Additionally, 40.1 percent migrated voluntarily, indicating that they had a clear goal in mind and moved from their birthplace.

Figure 5.4: Distribution of migration type



Source: Field Survey, 2025.

The findings reveal that more than half a percent of household respondents have forced migration.

5.5. Bivariate analysis among the predictors and types of migration

As shown in Table 5.1, bivariate analysis was employed for cross-tabulation output, where the cross-tabulation was conducted using types of migration, including predictors of severe drought and high input in farming. The level of drought and types of migration appear to have a strong association ($p < .001$), as indicated by a Pearson's Chi-square of 17.994. Those who faced severe droughts in multiple years migrated forcibly, at a rate of 81 percent, and those who faced mild or severe droughts migrated voluntarily, at a rate of 59.1 percent. The high costs in farming and types of migration are both strongly associated ($p < .001$, Pearson Chi-Square = 37.616). Those who faced high costs in farming, 86.3 percent, migrated forcibly. Similarly, those who did not face high costs in farming migrated voluntarily, at a rate of 57.3 percent.

The consequences of drought have severely affected migration, with forced migration being higher than interest or volunteer migration.

Table 5.1: Cross-tabulation results of severe drought, high input in farming, and types of migration

Response	Voluntary %	Forced%	Pearson Chi-Square
Severe drought years (N=207)			17.994***
Mild (Some rainfall deficit, manageable)	59.1	40.9	
Moderate (Major crop loss, some food insecurity)	43.8	56.2	
Severe (Widespread crop failure, water scarcity, income loss)	19	81	
High input but low output, so quit farming			37.616***
Yes	13.8	86.3	
No	57.3	42.7	

Source: Field Survey, 2025.

***=p<.001, **=p<.01, *=p<.05, +=p<.10

The findings reveal that higher-level drought influences forced migration among local household respondents. Also, those who have a deficit in agriculture farming have led to forced migration.

5.6. Multivariate result analysis of types of migration with predictors

Table 5.2 shows the multivariate result analysis of types of migration, including control variables. Model 1 represents the level of drought severity, Model 2 involves high farming costs, and Model 3 indicates a bleak future for agriculture. The level of drought severity (Model 1) and types of migration have a strong statistical association ($p < .001$, OR = 22.4) with a Chi-square of 37.566. The high cost of farming (Model 2) and types of migration are highly associated ($p < .001$, OR = 32) with a Chi-square of 53.156. Similarly, "No future in farming" (Model 3) and types of migration have statistically significant associations ($p < .01$, OR = 17.6) with a Chi-square of 27.375.

Moderate drought-exposed households were associated with types of migration ($p < .10$) and were 2.148 times more likely to migrate compared to households experiencing mild drought. Similarly, a household exposed to a severe drought is statistically significant ($p < .001$) and 7.780 times more likely to migrate compared to households exposed to mild droughts. Additionally, respondents who considered quitting farming due to the effects of drought are 8.389 times more likely to migrate than those who continue farming, indicating a statistically significant association with the dependent variable ($p < .001$). Additionally,

respondents who believe there is no future in farming are 3.056 times more likely to prefer moving to a city or urban area. Gender, females are more likely to prefer than males, but not all models are statistically significant.

Table 14.2: Results of logistic regression of types of migration with the predictors

Measures (N=207)	Model 1	Model 2	Model 3
Chi-square	37.566***	53.156***	27.375**
R Square	22.4	32.0	17.6
Severe drought years (Reference: Mild-Some rainfall deficit manageable)			
Moderate (Major crop loss, some food insecurity)	2.148+	-	
Severe (Widespread crop failure, water scarcity, income loss)	7.780***	-	
High cost in farming, so thinking of quitting it (Ref: No)			
Yes	-	8.389***	
No future in farming, so move to the city (Reference: No)			
Yes	-	-	3.056**
Sex (Reference: Male)			
Female	1.355	1.529	1.370
Education Level of Respondents (Reference: Illiterate)			
Informal Education	1.476	1.150	1.365
Basic Level (1-8 Class)	2.058	1.654	2.026
Secondary Level and above	5.297**	3.389	3.927+
Caste-Ethnicity of Respondents (Reference: Non-Indigenous)			
Indigenous	1.375	1.239	1.403
Family Size of Respondents (Reference: 1-5 Members)			
6 & above family member	.936	.680	.763
Age of Respondents (Reference: 15-24 Age group)			
25-34 Age group	3.598	.148	.191
35-44 Age group	.404	.250	.289
45-54 Age group	.616	.177	.277
55-64 Age group	.642	.303	.478
65 & above age group	.974	.425	.757

Source: Field Survey, 2025.

***=p<.001, **=p<.01, *=p<.05, +=p<.10

Note: Model-1: Severity of drought year, Model-2: High input-low outcome, so quit it, Model-3: No future in farming, so move to the city

Respondents with higher levels of education are more likely to prefer migration in Models 1 and 3. The rest of the model and the education level are not statistically significant. Caste-ethnicity is also not statistically significant, but indigenous respondents are more likely to

be the outcome variable. Family size and age group have also not been associated with the outcome variable.

The multivariate analysis results reveal that all models are fit. Also, the severity of drought year effects includes widespread crop failure, water scarcity, and income loss. Strongly influenced to leave agricultural farming due to the high cost of inputs compared to output. People are planning to move to the city because they have seen the future in agricultural farming. At the same time, gender, age group, education level, and family member size did not affect the local household respondent.

CHAPTER SIX

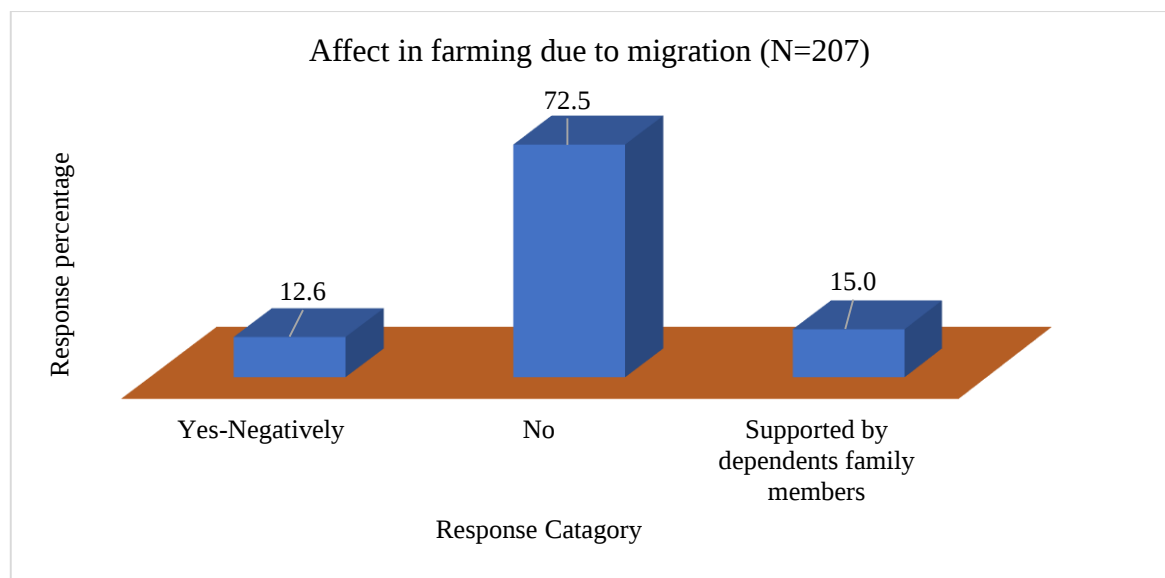
ANALYSIS OF THE SOCIO-ECONOMIC IMPACTS OF DROUGHT-INDUCED MIGRATION ON HOUSEHOLDS

Climate change induces risks and hazards that are being challenged to address globally. Mainly, it affected those dependent on agricultural households. It is heavily influenced by various agricultural practices, which are directly linked to the socio-economic status of people. Therefore, chapter six examines the socio-economic impact on households resulting from drought-induced migration. The results were presented in univariate analysis as observed and percentage values in figures and tables, bivariate analysis through cross-tabulation outcomes, and multivariate analysis using logistic regression.

6.1. Affect in farming due to migration

Figure 6.1 shows that 72.5% of respondents reported being unaffected by the migration of family members. Similarly, 15 percent of dependent family members were supported in their farming activities, and only 12.6 percent were negatively impacted by farming.

Figure 6.1: Distribution of affect in farming



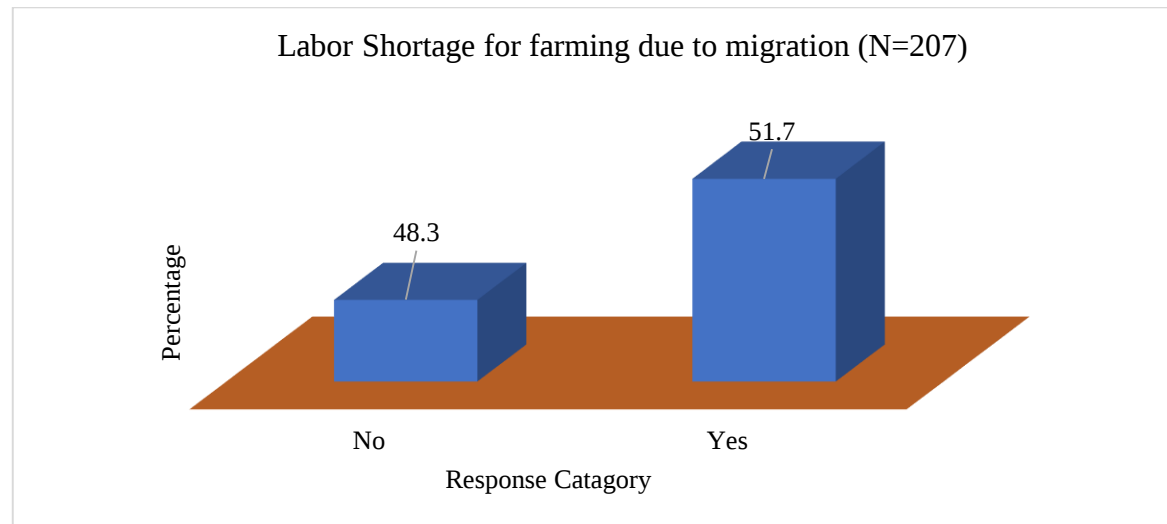
Source: Field Survey, 2025.

The findings reveal that the highest households have not been affected by the migration of a family member. Additionally, they seemed to be supported by their dependent elderly family members for agricultural farming activities.

6.2. Drought-induced impacts on migration and labor shortage

Figure 6.2 illustrates the response to the labor shortage resulting from migration, with 51.7 percent of respondents answering yes and 48.3 percent answering no. That means most of the respondents faced labor shortages in local farming.

Figure 6.2: Distribution of labor shortage due to migration



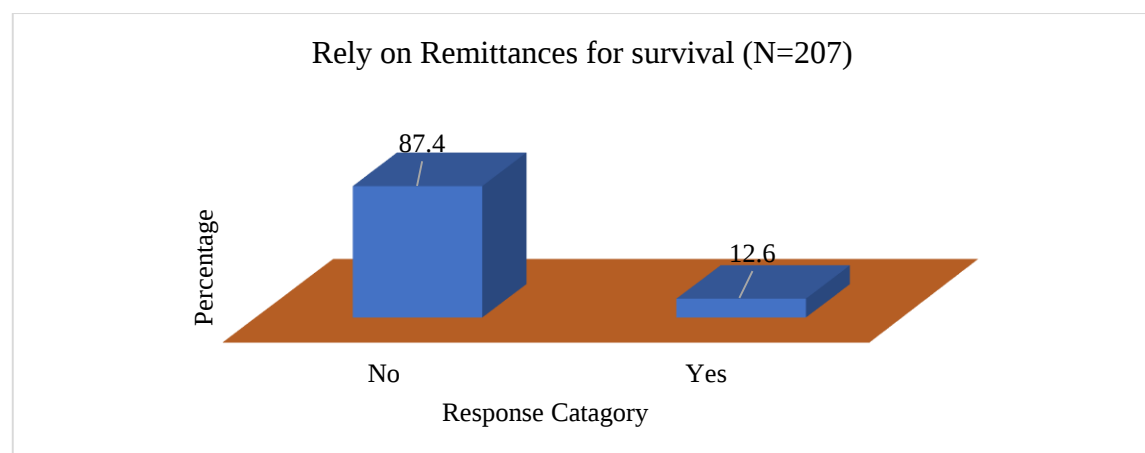
Source: Field Survey, 2025.

The findings reveal that the majority of households faced a labor shortage for farming due to migration. It directly affected the household-level economic condition.

6.3. Rely on remittances to survive (Source of livelihood)

Figure 6.3 shows that at least 12.6 percent of respondents depend solely on remittances for their household livelihood, with the remaining respondents answering "yes". Most of the respondents have other sources of livelihood and income for their households.

Figure 6.3: Distribution of respondents by remittances for survival



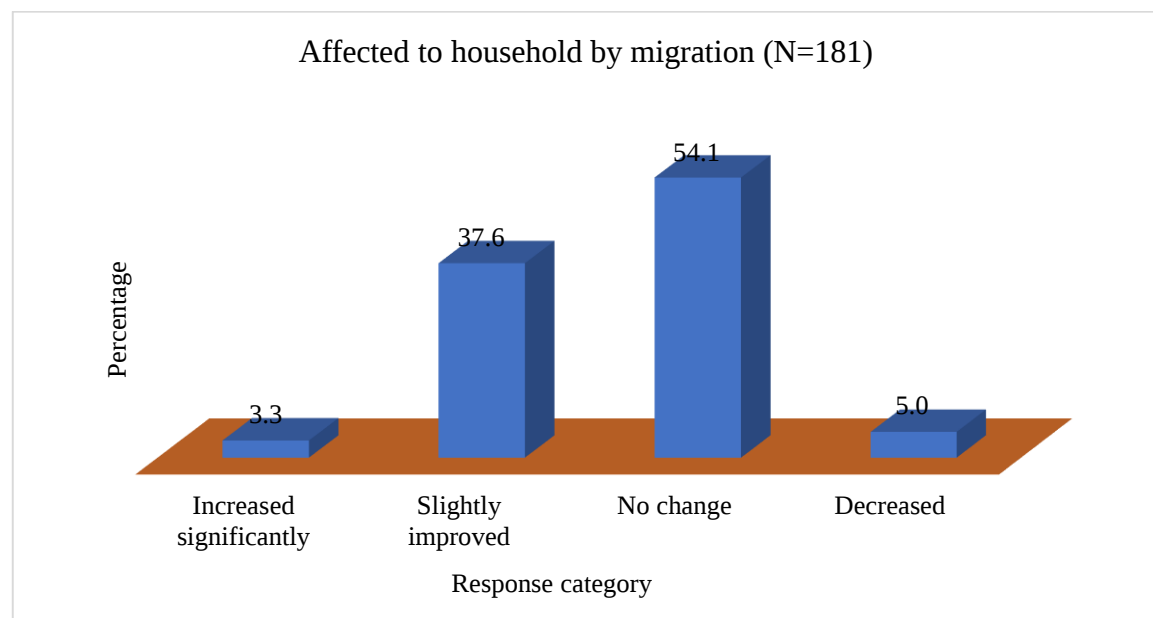
Source: Field Survey, 2025.

The findings reveal that at the very least, household respondents depend on remittances as a major livelihood.

6.4. Impacted in the household condition by the migration of a family member

Figure 6.4 shows that the impacted households by migration, where most respondents (54.1%) reported no change in their household due to the migration. On the other hand, 5 percent of respondents answered that household conditions decreased due to migration. Similarly, 37.6 percent of respondents reported a slight improvement in their household condition as a result of migration, while only 3.3 percent experienced a significant increase in their household condition; however, the study did not explore other factors that may have contributed to these changes.

Figure 6.4: Distribution of the response of the impacted households to migration



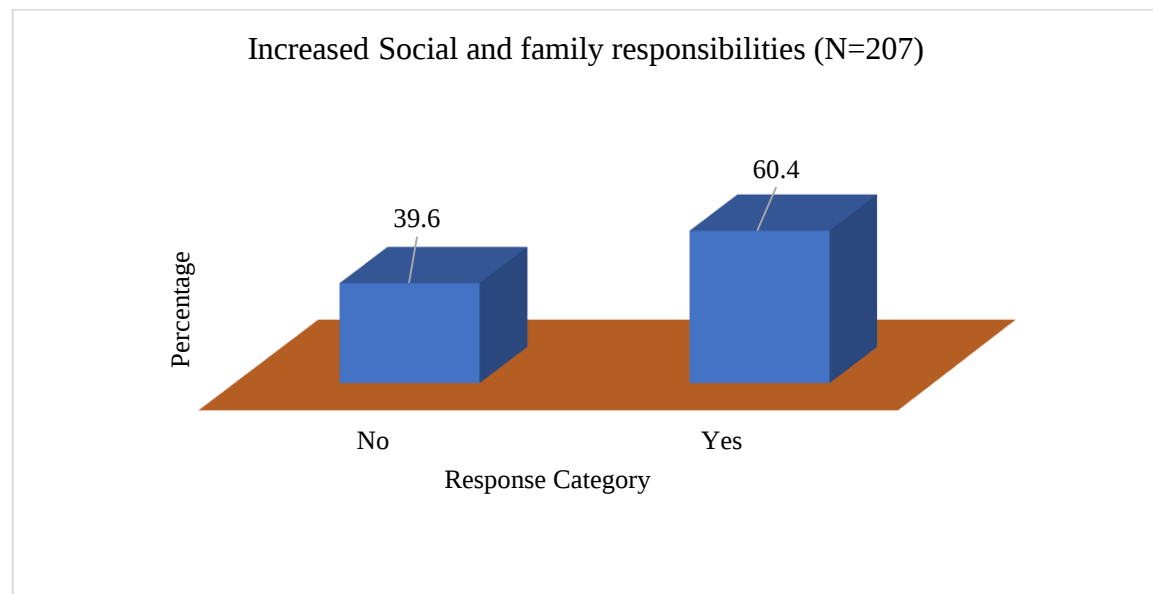
Source: Field Survey, 2025.

The findings reveal that the majority of household respondents have not changed their household condition, and at least some households have a decreased socio-economic condition due to the migration of family members.

6.5. Increased social and family responsibility due to migration

Figure 6.5 illustrates that an increase in social and family responsibilities resulting from the migration of family members affected by drought-induced consequences. Among the respondents, 60.4 percent reported an increase in social and family responsibilities, while 39.6 percent stated that they did not take on any additional responsibilities due to a family member migrating.

Figure 6.5: Distribution of increased social and family responsibilities due to migration



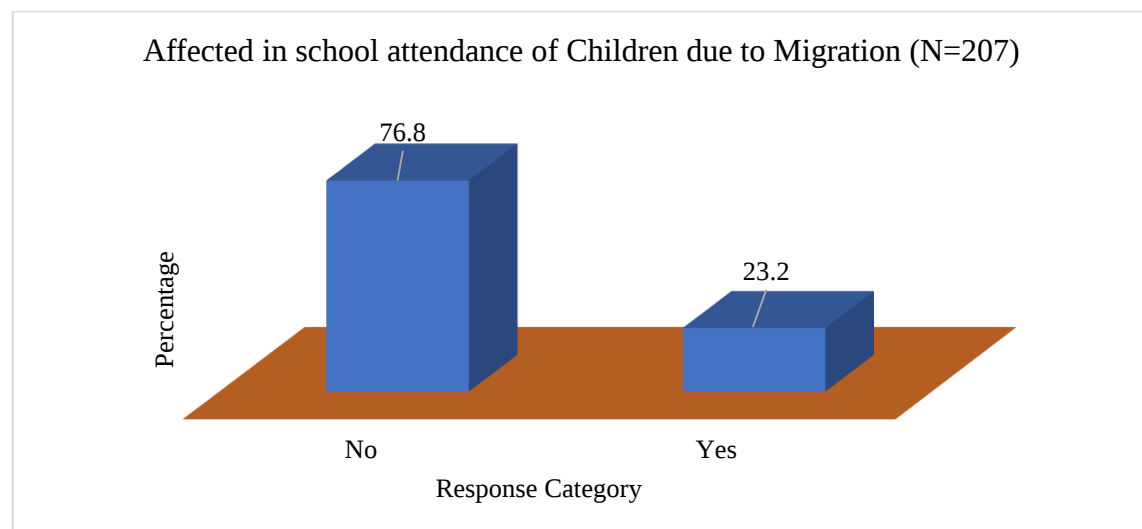
Source: Field Survey, 2025.

The findings reveal that the highest number of respondents have increased social and family responsibilities due to the migration of a family member.

6.6. Migration affected the school attendance of children

Figure 6.6 shows that 76.8 percent of respondents have not faced a problem in school attendance of children, and 23.2 percent have experienced a problem in school attendance of children.

Figure 6.6: Distribution of the effects on school attendance of children due to migration



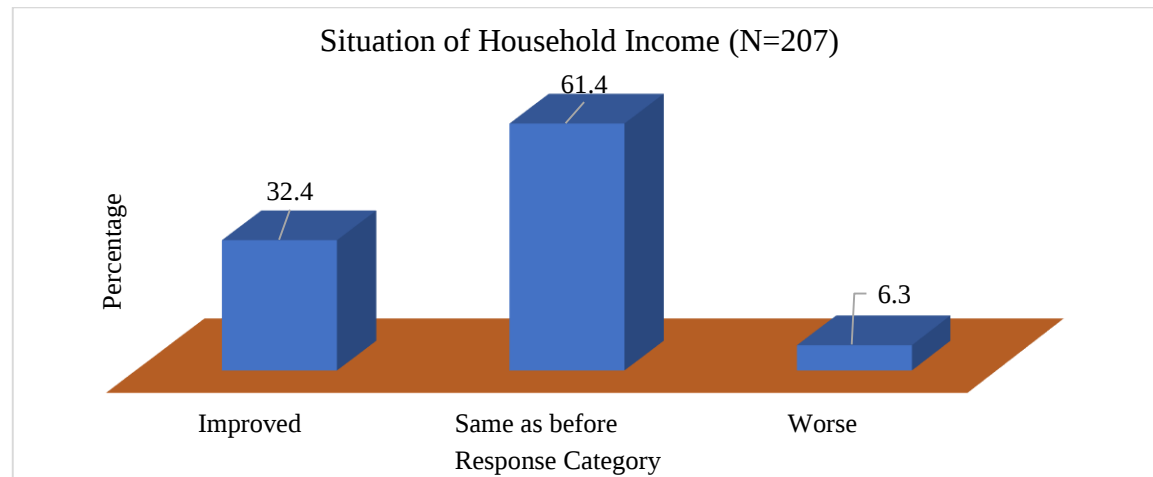
Source: Field Survey, 2025.

The findings reveal that very few household respondents have affected the school attendance of children's education.

6.7. Condition of household income after family member migration

Figure 6.7 illustrates the impact of family member migration on household income, showing that 32.4 percent of respondents have experienced an improvement, 61.4 percent have remained unchanged, and 6.3 percent have seen a decline in their income.

Figure 6.7: Distribution of household income condition



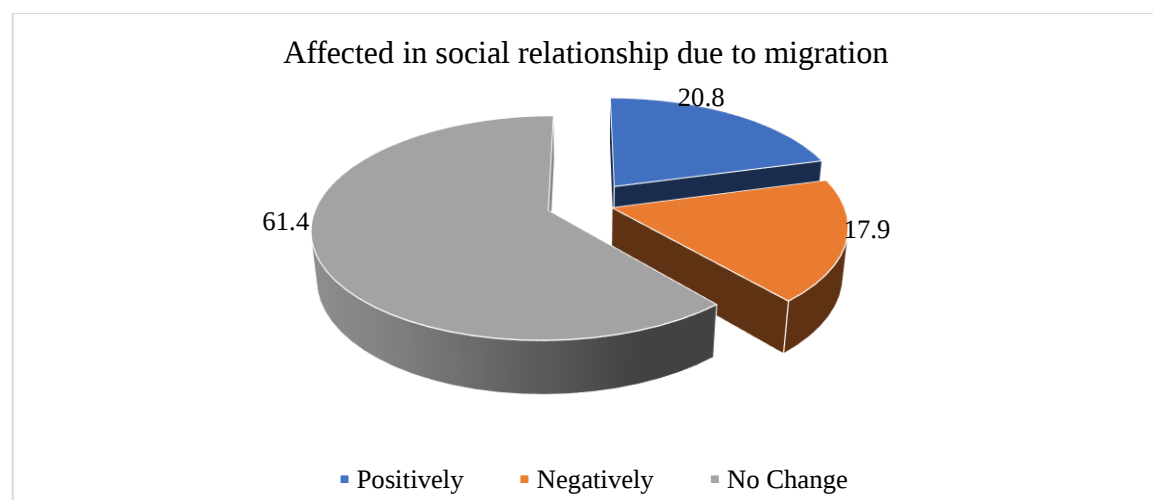
Source: Field Survey, 2025.

The findings reveal that the majority of household respondents have the same household income as before their household income changed after a family member migrated.

6.8. Situation of social relationships due to migration

Figure 6.8 shows changes in social relationships due to migration. Among the respondents, 61.4 percent reported no change in social relationships, 20.8 percent experienced positive changes, and 17.9 percent reported negative changes in social relationships due to migration.

Figure 6.8: Distribution of the affected in social relationships due to migration



Source: Field Survey, 2025.

The findings reveal that the majority of households have not changed their social relationships as a result of family member migration. Besides, nearly an equal household respondents were affected positively and negatively.

6.9. Analysis of the association between migration and its consequences

Table 6.1 shows that migrated family member households and labor shortages in farming have a strong association with $p < .001$ (Chi-square value 26.879)—most of the 60.7 percent of respondents whose family member migrated faced labor shortage. Similarly, a statistically significant association was found between increased social and family responsibilities and migration of family members ($p < .001$, Chi-square 28.590). Those who have migrated with family members (58.4%) reported facing a labor shortage in farming.

Table 15.1: Cross-tabulation result between predictors and Migration variables

Family Member migration	Migration		Pearson Chi-Square
	Yes%	No%	
Faced labor shortage for farming (N=207)			26.879***
Yes	60.7	39.3	
No	25	75	
Increased Social and Family responsibilities (N=207)			28.590***
Yes	58.4	41.6	
No	20.7	79.3	

Source: Field Survey, 2025.

***= $p < .001$, **= $p < .01$, *= $p < .05$, += $p < .10$

The findings reveal that migration led to a labor shortage for farming and increased social and family responsibility.

6.10. Association between the effect on school attendance of children and migration destination

Table 6.2 shows a strong association between migration destination and its effect on children's school attendance, with $p < .001$ (Chi-square = 33.781). At least 8.3 percent migrated within the district (Birthplace), 14.6 percent migrated abroad, and the highest portion, 77.1 percent, migrated to other districts. Those who migrated within the district (Ramechhap) were not affected in school attendance, with 50.3 percent. On the other hand, those who migrated out of the district reported no effect on the school attendance of children.

Table 6.2: Cross-tabulation between the effect on school attendance of children and the migration destination

Effect on school attendance of children (N=207)	Destination of migration			Pearson Chi-Square
	Within Ramechhap	Other districts	Abroad	
Yes	8.3	77.1	14.6	33.781***
No	50.3	32.1	17.6	

Source: Field Survey, 2025.

***=p<.001, **=p<.01, *=p<.05, +=p<.10

The bivariate analysis reveals that the majority of households affect the school attendance of children due to out-of-district migration. It has a strong influence on the output variable.

6.11. Multivariate result analysis of migration and its consequences

Table 6.3 presents the results of the logistic regression analysis. Model 1 is faced with labor shortage for farming, Model 2 increased social and family responsibilities, and Model 3 affected children's school attendance. Models 1, 2, and 3 are statistically significant at $p < .001$. Additionally, model fit and explanation of the predictor variable in relation to the outcome variable are required.

Migrated families and labor shortages in farming have a strong association ($p < .001$), and migrated families are 4.259 times more likely to face labor shortages in farming. There was a significant association between increased social and family responsibilities ($p < .001$), with individuals being 4.634 times more likely to face increased family and social responsibilities due to a family member migrating. Additionally, a significant association ($p < .001$) was found between the destination of migration and the attendance of schoolchildren. Those who migrated out of the districts are 15.517 times more likely to report being affected in attendance of school children than those who migrated within the district. Similarly, households that have migrated abroad also have a significant association ($p < .05$) and are 5.258 times more likely to be affected in terms of school attendance compared to those within the same district. Gender is not statistically significant in Model 1 and Model 3; however, Model 2 is substantial, with $p < .05$, and female respondents are 0.064 times less likely to report increased family and social responsibilities compared to male respondents.

Table 6.3: Multivariate result analysis of migration and its consequences

Measures (N=207)	Model 1	Model 2	Model 3
Chi-square	53.623***	49.329***	49.373***
R Square	30.4	28.7	32.1
Migrated from family in the last 10 years (Reference: No)			
Yes	4.259***	4.634***	-
Destination of Migration (Reference: Within Ramechhap District)			
Other District	-	-	15.517***
Abroad	-	-	5.258*
Sex (Reference: Male)			
Female	.760	.510*	.936
Education Level of Respondents (Reference: Illiterate)			
Informal Education	1.031	1.191	.777
Basic Level (1-8 Class)	1.183	.927	1.788
Secondary Level and above	.541	.670	1.616
Caste-Ethnicity of Respondents (Reference: Non-Indigenous)			
Indigenous	1.018	.447*	1.692
Family Size of Respondents (Reference: 1-5 Members)			
6 & above family member	.564	1.008	.728
Earning Population in the family (Reference: 1 Member)			
2 Member earning	3.964***	3.152**	1.854
3 Member earning	3.225*	2.202	2.167
4 Member earning	11.085***	2.120	4.776*

Source: Field Survey, 2025. ***=p<.001, **=p<.01, *=p<.05, +=p<.10

Model 1: Faced a labor shortage for farming due to family member migration, Model 2: Increased social and family responsibilities due to family member migration. Model 3: Affected school children's attendance due to migration destination

Education level does not affect any model and is not significant in it. Caste-ethnicity has no considerable effect, except in Model 2, where p <, and is 0.553 times less likely to report increased family and social responsibilities due to the migration of a family member compared to non-indigenous people. Also, the family size of respondents' households is not statistically significant. Earning family members and a labor shortage for farming due to migration have statistically significant effects. A more economically secure family

population faced a labor shortage, and a family with four earners was 11 times more likely to experience a labor shortage in farming than a single-earner family. Also, a 4-member family reported being affected in attendance at school due to the migration destination, and 4.776 times more likely to report being affected in attendance. It is marginally significant with $p < .05$.

In conclusion, migration raises significant concerns for household dynamics, particularly in terms of labor shortages in farming, increased social and family responsibilities, and its impact on the attendance of school-age children. Additionally, a noteworthy aspect of migration destinations is that they have an impact on household dynamics outside of the destination. Those with a more economically productive population have faced labor shortages, which in turn affect school education.

CHAPTER SEVEN

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents the summary, conclusion, and recommendations derived from the field study and analysis results. It tries to summarize the results and draw conclusions based on the data. In addition, I made recommendations based on the findings and organized them by theme, which will assist academics, independent researchers, policymakers, planners, and development practitioners.

7.1. Summary

The study collected quantitative data from 207 household respondents through a household survey, comprising 50.7% female and 49.3% male household representatives. The respondents' ages range from 15 to 87 years old, and they were recoded into 10-year interval age groups. The majority of households of respondents aged 35-44 in the household survey, with 24.6 percent, followed by households of respondents aged 65 and above (20.3%). The majority of household respondents were literate and indigenous. Most respondents have an ideal family size, which is consistent with the national average. Similarly, among the respondents, the highest number were from a single-earning population, which accounted for 44.4 percent, followed by those with two earners, at 31.4 percent. While increasing the number of earning family members, their representative households are fewer than those of low-earner family members.

In addition, among the respondents, 40.6 percent worked on a daily wage basis, 97.1 percent engaged in agriculture, 10.1 percent went abroad for employment, 11.1 percent were in business, and 9.2 percent held a government job as their household occupation. The highest respondents, 59.9 percent, produce a major household crop below <1000 kg, and only 40.1 percent have above >1001 kg per year. Also, excluded from other crop production except for the major household crop. 91.8 percent of households experienced declining crop production due to drought, with various reasons such as drought 86 percent, pests/Diseases 88.9 percent, flood 12.6 percent, and problem of wild animals 40.1 percent.

Household respondents reported the effects of drought on multiple areas, including a decline in crop production by 89.9 percent, livestock by 81.2 percent, household food supply by 55.6 percent, Household income generation by 54.1 percent, children's schooling by 14.5 percent, and health and nutrition by 21.3 percent. The challenges faced by household respondents in the event of complete crop production failure were as follows:

55.1 percent reported complete crop production failure, 10.1 percent changed their cropping patterns, and 59.9 percent reported a lack of confidence in coping with another drought. Household respondents reported a contributing factor of drought affects in dry crop due to lack of water 58.9 percent, demotivated to continue farming due too occurred every year drought 78.3 percent, high cost for farming so think to quit it 38.6 percent, no future in farming so plan to move in city 13.5 percent, due to drought looking alternative livelihood 13.5 percent and migrated family member so quit farming 6.3 percent. Household respondents reported challenges in animal husbandry, including water shortages (83.1 percent), a lack of grass (86 percent), insufficient pastureland area (71.5 percent), and problems with new diseases (74.9 percent).

Among the total 207 household respondents, 43.5 percent have a migrated family member in the last 10 years. Among them, as per types of migration, the highest percentage, 71.5 percent, migrated for seasonal work, and the lowest percentage, 2.9 percent, for permanent settlement. Similarly, as a migration destination, 42.5 percent migrated to other districts, 40.6 percent to the same district, and 16.9 percent to another country. Besides, 59.9 percent migrated forcibly from their birthplace due to climate change and its effect on their agricultural livelihood as well. Those who have reported family member migration within the last 10 years have been affected in the farming process and system. Also, out of the total 207 household respondents, 51.7 percent faced labor shortage for farming due to migration, and 12.6 percent of household respondents rely on remittances for their livelihood. The respondents reported that 54.1 percent of household respondents have no change in their livelihood after the migration of family members. On the other hand, those who have migrated family members, 60.4 percent, have increased social and family responsibilities. Due to the migration of family members, 23.2 percent of household respondents have been affected in the school attendance of children. 6.3 percent of household respondents have a worse situation of household income, and 32.4 percent have improved. Most respondents have the same views as before. Among the total respondents, 17.9 percent have been negatively affected in their social relationships, 61.4 percent have experienced no change, and 20.8 percent have had positive relationships because of migration.

The gender of household respondents had a significant impact on household food supply, which is an interconnected and significant association with $p < .10$. Similarly, gender is associated with household respondents reporting new diseases in animal husbandry

businesses with $p < .01$. Frequent droughts occurred every year, resulting in major crop production losses for 90.4 percent of households, a statistically significant association ($p < .001$). Crop cycle in a year and frequent drought in every year have a strongly significant and interrelation with $p < .001$, and those who have a once a year crop cycle 49.9 percent have below <1000 kg primary crop production, and 66.3 percent of respondents have a twice a year crop cycle with above >1001 kg per year major crop production. Those household respondents depend on lift irrigation for farming, rain-fed water, Drought effects on household food supply, drought effects on income generation, and impact on the schooling of children. The experience of declining crop production in the last 5 years has been strongly associated with $p < .001$. Out-migration due to drought affected agriculture and food aid, particularly in households with major crop production, and has a statistically significant association ($p < .001$). The level of drought severity and types of migration have a significant association ($p < .0001$). Additionally, among household respondents who experienced a moderate level of drought severity, 56.2 percent migrated forcibly, while those who experienced a mild level of drought migration, 59.1 percent, were voluntary. Types of migration and those who have felt the cost of farming have been significantly associated ($p < .001$). Among them, those who faced high costs for farming forcibly migrated at a rate of 86.3 percent, while those who did not face high costs for farming migrated voluntarily at a rate of 57.3 percent. There was a statistically significant relationship between labor shortages in farming and family member migration ($p < .001$). Those who had family members who had migrated faced a 60.7 percent labor shortage in farming. Similarly, those who have a family member who has migrated have 58.4 percent of respondents reporting increased social and family responsibilities. Migration destination significantly affected school attendance among children ($p < .001$), and those who migrated out of the same district had a highly significant impact on children's education (77.1%).

As a multivariate result analysis of primary crop production by households, the effect of drought on household food supply, and the problem of new diseases in animal husbandry are model fit ($p < .001$), with strong likelihoods of 27.595 (OR = 16.9), 28.123 (OR = 18.4), and 17.710 (OR = 17.710), respectively. Types of migration are statistically significant, associated with influential variables such as the level of drought severity, the high cost of farming, and the lack of a future in farming, which leads to their decision to quit ($p < .001$). Those household respondents who experienced a severe level of drought are 7.780 times more likely to experience forced migration due to a lack of livelihood than those who

experienced a mild level of drought. This finding is statistically significant ($p < .001$). Similarly, those household respondents who faced high costs for farming have a significant association with types of migration ($p < .001$). Respondents who faced high costs for farming households are 8.389 times more likely to experience forced migration than those who did not face them. Respondents who do not see a future in farming and plan to move to the city, and types of migration have a statistically significant and close association with $p < .01$) Respondents who do not see any future in farming have 3.056 times more likelihood. Migration from families in the last 10 years has significantly contributed to the labor shortage ($p < .001$). Those family members who migrated to a new household are 4.259 times more likely to experience no labor shortage among their migrating family members. This finding is statistically significant ($p < .001$). Migration from families in the last 10 years has been statistically significant ($P < .001$) due to increased social and family responsibilities. Migration destination significantly affected schoolchildren's attendance, with a 15.517 times higher likelihood of non-attendance. This finding is statistically significant ($p < .001$).

7.2. Conclusion

This study comprehensively explored and analyzed the demographic characteristics, agricultural livelihoods, and migration patterns of households affected by drought in the Mahabharat Shadow Range Area of Ramechhap, Nepal. Based on household survey data from 207 households, the findings reveal a clear and concerning interlinkage between recurrent droughts, rural livelihood interruption, socio-economic vulnerability, declining agricultural productivity, and an increased incidence of forced migration.

Particularly, a demographic perspective was presented, with respondents from diverse age groups (Minimum age 15 to Maximum 87 years), where a slight female majority was observed. Most of the Indigenous household representatives participated in the household survey, which had a limited educational attainment and predominantly consisted of small to medium-sized families. Additionally, most families relied on one or two earning family members. Most respondents (97.1%) indicated that agriculture is the primary source of their livelihood. However, the agricultural sector showed extreme vulnerability, with 91.8% of households experiencing declining crop production, primarily attributed to drought, pest infestations, and water scarcity. Livestock farming, food supply, household income, and children's schooling were also significantly affected by prolonged droughts.

Migration emerged as both a response and a consequence of these stressors. Among the surveyed households, 43.5% had at least one family member migrate in the past ten years. Most of these migrations were internal and seasonal, with 59.9% categorized as forced migrations resulting from deteriorating farming conditions. Bivariate and multivariate statistical analyses confirmed that severe drought, high farming costs, and a lack of perceived future in farming significantly increased the odds of forced migration. Specifically, severe drought increased the likelihood of forced migration by 7.78 times, high farming costs by 8.39 times, and perception of no future in farming by 3.06 times.

Migration also triggered a cascade of household-level impacts: 51.7% reported labor shortages for farming, 60.4% experienced increased social and family responsibilities, and 23.2% saw a decline in school attendance among children. Additionally, migration destination significantly influenced educational outcomes, with those migrating outside their district being 15.5 times more likely to report disruptions in schooling.

These findings highlight that drought functions not simply as a climatic challenge but as a catalyst for socio-economic transformation in rural Nepal. The cumulative effects of climate variability, fragile agricultural livelihoods, and systemic neglect contribute to a cycle of vulnerability, adaptation, and displacement.

7.3. Recommendations

Based on the findings and conclusions of this study on the drought and forced migration in the Mahabharat Shadow Range: A Case of Ramechhap, Nepal, the following recommendations are furnished for policy formulation, program intervention & planning, and upcoming research areas:

Development of a drought preparedness plan and mitigation strategies in close cooperation with federal, provincial, and local governments, as well as the thematic development-working group. To minimize the hazard of climate-induced stressors, promote drought-resistant crop seeds and sustainable agricultural cultivation practices. Additionally, it is essential to pay attention to managing and utilizing natural local water resources effectively to mitigate the effects of drought. Besides, the most important thing is to identify and mark the highly drought-severe areas and intervene accordingly. To utilize local resources and promote sustainability, explore drought mitigation alternatives, and revive natural resources, such as ponds (Natural water reservoirs). Should change the traditional cropping system and ensure the subsistence for agriculture-related interventions. Government or

other line agencies investigate the technological farm system, promote it to them, and ensure the seeds and fertilizer are delivered on time and as seed money to farmers. Similarly, to develop the market chain to ensure the value added of agricultural goods. Also, ensure the pastureland and specific territory for livestock-based livelihood. Support the technical and financial sub-seedy to cope with drought-related consequences. Coordinate and deploy resources to stakeholders to address the local impact of drought. We still need to study this issue longitudinally and measure the gender-based impact of climate stressors.

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APPENDICES

Effects of Drought on Forced Migration in the Mahabharat Shadow Range Area of Ramechhap, Nepal

Household Survey Questionnaire 2025

I am and conducting this household survey for academic research as required by the Master's Degree award. The title of my research is "Drought and Forced Migration in the Mahabharat Shadow Range: A Case of Ramechhap, Nepal". Your responses to the following questions are essential to shape this study's results. While responding to the statement below, please answer the statements based on your experience. This questionnaire is an integral part of the research as it is an essential tool for data collection, which helps to get analytical findings for this study. I want to state that this research is purely for academic purposes, and I am simply interested in your valuable and honest opinion. I assure you that data confidentiality and privacy will be maintained and that your information will be used only for academic purposes. It will take about 10 minutes to complete this questionnaire survey. If you agree and are ready to answer, I will proceed; otherwise, I will stop here.

a. **Yes-** Proceed ahead.

b. **No-** Stop here.

Date of Interview:

Section A: Household Demographic Information

A1. Respondent Name: _____

A2. Gender: ☐ Male-1 ☐ Female-2 ☐ Other-3

A3. Age: _____

A4. Ward No. of Respondent _____

A5. Name of Tole

A6. Education Level of the Respondent

- Illiterate (Unable to read and write Nepali letters)0
- Informal Education1
- Basic Level (1-8 Class)2
- Secondary Level (9-12 Class).....3
- University (Bachelor & above level)4

A7. Ethnicity/Caste:

- Brahmin/Chhetri1
- Janajati2

- Dalit3
- Other:4

A7.1 If other, please specify it

A8. Relationship with Household Head

- Self (Please go to ques no A11).....1
- Husband2
- Father-in-law.....3
- Mother-in-Law.....4
- Other5

A8.1 If other, please specify it

A9. Name of Household

A10 Education Level of Household Head

- Illiterate (Unable to read and write Nepali letters)0
- Informal Education1
- Basic Level (1-8 Class)2
- Secondary Level (9-12 Class).....3
- University (Bachelor & above level)4

A11. Total family member A11.1 Total MaleA11.2. Total female

A12. No. of Earning Members

A13. Main occupation of the family

- Agriculture1
- Daily wages2
- Foreign Employment3
- Business4
- Government Job5
- Other6

A13.1. If other, please specify it

Section B: Effects of Drought on Agricultural Livelihoods

B1. Do you or your family have cultivated agricultural land?

- Yes1
- No0

B1.1 If yes, how much land do you cultivate? _____ (Mention in Ropani)

B2. Ownership type of land:

- Own with a land certificate1
- Rented /Bidding.....2
- Without a land certificate3
- Both (1 and 3)4
- Cultivate in free5
- Other6

B2.1 If other, please specify it

B3. What is the major source of water for farming?

- Rain-fed1
- Lift irrigation2
- Canal irrigation3
- Other4

B3.1 If other, please specify it

B4. Which is the main crops grown by your family?

- Paddy1
- Maize2
- Millet3
- No grown4
- Other5

B4.1. If other, please specify it

B4.2. Total amount of main grown crop in kg

B5. How many times do you plant in a year of the crop cycle?

- One1
- Two2
- Three3
- Other4

B5.1. If other, please specify it

B6. Have you experienced of crop production decline in the last 5 years?

- Yes.....1
- No0

B6.1. If yes, what was the primary cause of crop production decline? (*Tick all that apply*)

- Drought

- Pests/Diseases2
- Flood3
- Problem of Wild Animals.... 4
- Other5

B6.1.1. If other, please specify it

B7. How many years have you experienced significant drought in the last 10 years?

- None1
- 1–2 years.....2
- 3–5 years3
- More than 5 years4
- Other5

B7.1. If other, please specify it

B8. In those drought years, how severe were the droughts generally?

- Mild (some rainfall deficit, manageable)1
- Moderate (major crop loss, some food insecurity).....2
- Severe (widespread crop failure, water scarcity, income loss)3

B9. Did the drought affect the following areas? (Please, tick all that apply)

- Crop production1
- Livestock2
- Household food supply3
- Income generation4
- Schooling of children5
- Health and nutrition6
- Other7

B9.1. If other, please specify it

B10. Did you face complete crop failure in any recent drought year?

- Yes1
- No0

B11. Do you have access to irrigation for your land?

- Yes1
- No0

B11.1. If yes, what is the source of irrigation?

- Canal/Drain1

- River2
- Rainwater harvesting3
- Groundwater4
- Other5

B11.1.1. If other, please specify it

B12. Has the availability of water for farming changed in the last 5 years?

- Full scarcity of water1
- A little decreased than past/previous years2
- A little improved.....3
- No change4

B13. Have you changed cropping patterns due to drought?

- Yes.....1
- No.....0

B13.1. If yes, how? _____

B14. What measures have you taken to cope with drought impacts on agriculture?

(Choose all that apply)

- Crop diversification.....1
- Reduced planting2
- Livestock sale3
- Use of drought-tolerant seeds4
- Switching to wage labor5
- Outmigration6
- Loan borrowing7
- Food aid8
- Other9

B14.1. If other, please specify it

B15. Have you received any agricultural support from the government or NGOs during drought years?

- Yes1
- No0

B15.1. If yes, specify: _____

B16. How confident your household can cope with another drought season?

- Very confident1

- Somewhat confident2
- Not confident0

B17. Do you think droughts have become more frequent in your area?

- Yes1
- No0
- Don't know2

B18. How has drought affected your interest to run farming in this area? (Tick all that apply)

- *The crops dry up due to a lack of water*1
- *Demotivated due to drought occurs almost every year*2
- *High input but low outcome, so thinking of quitting farming*3
- *No future in farming, so feel compelled to move to the city*.....4
- *Because of the drought, started looking into alternative livelihoods*.....5
- *Due to the drought, my son migrated abroad, so we also quit it*6

B19. What kind of problems are you facing due to drought in your animal husbandry business?

- Water shortage1
- Lack of grass2
- Lack of pasture area3
- The problem of new diseases4
- Other5

B19.1. If other, please specify it

B20. Do you think the government or I/NGO/CBOs are doing enough to help farmers during the droughts?

- Yes1
- No0
- Not sure2

Section C: Drought and Forced Migration

C1. Has anyone from your household member migrated due to drought-related reasons in the past 10 years?

- Yes1
- No0

C1.1. If yes, how many members have migrated? _____

C2. What was the nature of the migration?

- Temporary1
- Seasonal (For work)2
- Permanent3

C3. What was the Destination of the migration?

- Within Ramechhap1
- Other out-of-district2
- Abroad3

C3.1. If abroad, please specify country

C4. What was the main reason for migration? (Choose all that apply)

- Crop failure1
- Water scarcity2
- Food insecurity3
- Job search4
- Education5
- Conflict 6
- Loan pressure7
- Other8

C4.1. If another reason, please specify

C5. Have any of your household members migrated in the past 10 years due to drought?

- Yes.....1
- No0

C6. How long after the drought did the migration occur?

- Immediately1
- Within 6 months2
- After 1 year3
- More than 1 year4
- Other5

C6.1. If other, please specify

C7. Was migration voluntary or forced due to a lack of livelihood options?

- Voluntary1

- Forced (No choice due to drought)2
- Other3

C7.1. If other, please specify it

Section D: Socio-Economic Impacts of Drought-Induced Migration

D1. If household members migrated, did this affect your agricultural production?

- Yes (negatively).....1
- No2
- Supported by dependents' family members.....3

D2. Have you faced labor shortages for farming due to migration?

- Yes.....1
- No0

D3. Who takes care of agriculture after the migration of a household member?

- Women 1
- Elderly2
- Wages labor3
- No cultivation done4

D4. Do you rely on remittances for survival and livelihood?

- Yes.....1
- No0

D5. Average monthly income from remittances (if applicable): NPR _____

D6. How has migration affected your household income?

- Increased significantly1
- Slightly improved2
- No change3
- Decreased4

D7. Do you have increased social and family responsibilities due to household member migration?

- Yes1
- No0

D7.1. If yes, who is most burdened?

- Women1
- Elderly2

- Children3

D8. What kind of support would help reduce drought-related migration in the upcoming days? (Tick all that apply)

- Irrigation support1
- Employment opportunities2
- Financial aid/loans3
- Climate-resilient crops4
- Migration alternatives5
- Other6

D8.1. If other, please specify it

.....

D9. Has school attendance of children been affected by migration-related stress?

- Yes1
- No0

D10. How would you describe your household's economic status after migration?

- Improved1
- Same as before2
- Worse3

D11. Has migration affected your social relationships or community ties?

- Positively.....1
- Negatively.....2
- No change3

Section E: Community and Institutional Support

E1. Have you received any government or NGO support during the drought?

- Yes.....1
- No0

E1.1. If yes, what kind?

- Seeds/fertilizer1
- Food2
- Cash3
- Water access4
- Training5
- Other6

E1.1.1. If other, please specify it

E2. Have you ever been migrated from your birthplace due to drought?

- Yes.....1
- No0

E2.1. Did you receive any support during or after the migration process?

- Yes.....1
- No0

E2.1.1 If yes, from whom?

- Local government1
- NGOs2
- Relatives3
- Community4
- Others5

E2.1.2 If other, please specify it

E3. What kind of support do you think would reduce the need for migration in the future?

- Irrigation facilities1
- Climate-resilient farming2
- Income generation programs3
- Employment in the local area4
- Crop insurance5
- Other6

E3.1. If other, please specify it

Section F: Final Comments

F1. What is your opinion on the future of agriculture in this area under increasing drought conditions?

F2. Do you expect to migrate in the next 5 years due to drought-related hardship?

- Yes.....1
- No0

F3. Do you intend to migrate again due to ongoing climate or livelihood stress?

- Yes.....1
- No0

F4. What is your opinion about continuing agriculture under current drought trends?

- Planning to stop farming1
- Will continue with support2
- No change3

Enumerator Observations (Optional)

1. Visible signs of drought impact (dry fields, abandoned houses, water scarcity):

2. General livelihood condition: ☐ Good-1 ☐ Moderate-2 ☐ Poor-3
3. Any further notes.....

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