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Adaptation to climate change in agriculture: A multi-level analysis of climate change adaptation among farming communities in Nepal

Lokendra Karki

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Science Policy Research Unit (SPRU)
University of Sussex Business School
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Declaration

I hereby declare that this thesis has not been, and will not be, submitted in whole or in part to another University for the award of any other degree.

Signature

Lokendra Karki

09.06.2021

Abstract

Climate change is threatening the livelihoods and food security of farmers worldwide, particularly in developing countries. Adaptation to climate change is vital to minimise its negative impacts on agriculture. Despite increased awareness of this issue, efforts and outcomes related to adaptation to climate change vary widely across developing countries. This research explores how the adaptation practices of small farmers are affected by various factors at multiple levels: household, community, and policy. In this regard, at the household level, the research investigates psychological and situational factors that influence adaptation to climate change. At the community level, the study examines farmers' everyday lives to identify how farmers in these Indigenous communities use and convert capital in their adaptation efforts and what the outcomes of these efforts are. Finally at the *policy level*, this study explores how multiple (local, national, international) actors with differing interests and power, interact in the climate adaptation policy process and how these interactions affect policy outcomes. To fulfil the aims, the research used a mixed method approach to collect data through household survey (546), semi-structured interviews (36), Focus Group Discussion (FGD) (6) and Participant Observation (PO) (8), for an in-depth understanding of the adaptations to climate change made by the three Indigenous farming communities - Tharu, Gurungs and Yolmo - in Nepal.

The findings of the study showed that adaptation decision at the household level is influenced by subjective beliefs and situational factors. Given that decisions are not made in isolation, but within their social contexts exploring capitals and how different groups of farmers at the community level access, control as well as convert capitals is important to understand adaptation behaviour. While an adaptation practice can be an opportunity for privileged groups due to their ability to utilise their position and privilege, the same adaptation can trap disadvantaged groups with limited access to capitals. Considering that privileged groups are better able to access adaptation programmes and funds, the policy level analysis showed how different interests, and narratives of dominant policy actors inadvertently affect the effective participation of most vulnerable farmers. These findings provide a nuanced understanding of climate change adaptation by Indigenous farmers and emphasise the need to consider and address community level differences and the dynamics of policy process on adaptation. Not considering these will lead to repeated failed implementation of adaptation interventions.

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List of Abbreviations

ADB	Asian Development Bank
CBOs	Community based organisations
CCA	Climate change adaptation
CCC	Climate Change Council
FGD	Focus group discussion
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
INGOs	International non-government organisations
MoFALD	Ministry of Federal Affairs and Local Development
MoFE	Ministry of Forests and Environment
NAPA	National Adaptation Plan of Action
NAPs	National Adaptation Plans
NCCSP	Nepal Climate Change Support Program
NGOs	Non-government organisations
PO	Participant observation
PPCR	Pilot Project for Climate Resilience
SEM	Structural Equation Modelling
TPB	Theory of Planned Behaviour
UNFCCC	United Nations Framework Convention on Climate Change
WWF	World Wide Fund for Nature

1. Introduction

1.1 Research Background

Climate change is recognised as a serious threat to the livelihoods and food security of agricultural households in both developed and developing countries (Osbaahr et al. 2008, Wood et al. 2014). Different climate change impact projections suggest that, compared to other sectors, agriculture will be affected disproportionately (Thornton et al. 2011, Harrison et al. 2016). The 2007 Intergovernmental Panel on Climate Change report (IPCC, 2007), forecasts a decline in crop yields in Asia, of up to 30% by 2050 compared to the 1990s, and it has been predicted that, in South Asia alone, wheat crop production could decrease by around 50% (IPCC 2014). This persistent climate change problem will have adverse impacts on large numbers of farming households and on those in developing countries, in particular, due to their low levels of technical and financial capacity and weak infrastructure (Morton 2007, Heltberg et al. 2009). This is highlighting the issue of food security for the whole world since almost 83% of the world's farmers are small farmers with less than two hectares of land (Lowder et al. 2016). Hence, appropriate adaptations at the farm, community and national levels are needed to minimise the negative impact of climate change on resource-poor farmers in developing countries (IPCC 2007, Jerneck and Olsson 2008, Hisali et al. 2011).

Climate change adaptation refers to adjustments made by households or communities, in response to changing climatic conditions (Smit and Wandel 2006). IPCC (2001) describes adaptation as adjustments made to ecological, social and economic systems in response to existing or expected climatic stimuli, in order to minimise or tackle the adverse impacts of climate change and exploit new opportunities. Adaptation to climate change in agriculture involves adjustments to lifestyles and behaviour, including shifts in farming practices and livelihoods to reduce the impact of climate change (Heltberg et al. 2009). Adaptation can be autonomous, conducted by individuals and communities, or planned and implemented by development agencies (Forsyth and Evans 2013). Despite an increase in climate policies and programmes and governance structures, progress in adaptation to climate change varies widely across developing countries. Proper planning and implementation of adaptation programmes would reduce the gap related to implementation and secure the socioeconomic development of households and communities (Chinvanno 2011). To provide the most appropriate assistance and contribute to combating the challenges related to climate change, it is crucial to have a good understanding of the adaptation decisions being made by farmers (Below et al. 2012, Wise et al. 2014). However,

farmers' adaptation decisions depend on social, economic, cultural, institutional and technological factors, all of which are complex (Wood et al. 2014).

Knowledge about climate change has increased in recent years and is extending debate about better management of climate change risks through successful adaptation. Most research on the factors determining appropriate adaptation measures at the household level use an asset based approach which tends to focus on financial resources, technology, information, skills, infrastructure, networks and institutions (Deressa et al. 2009, Wood et al. 2014), leaving the psychological factors that influence farmers' adaptation behaviours mostly overlooked (Dang et al. 2019). To date, there are no studies that try to analyse the relative importance of psychological and situational factors in adaptation behaviour of farmers. Also, more methodological advancements are needed to address the gap in the adaptation literature related to the lack of theory-based studies. Similarly, the existing body of work does not explicitly examine the changes related to the livelihoods of the rural poor or how farmers might use or change their resources to improve their living conditions. Individuals use their capitals through interactions, which include customs, cultural codes and local politics, in their lived reality in the community. How they manage these interactions can improve or hinder the pace of their adaptation efforts (Nielsen and Reenberg 2010, Jones and Boyd 2011, McCarthy et al. 2014). The individual decision to adapt is a product of the individual's interactions within the community. However, the extant literature tends to put too much emphasis on the importance of individual capitals but overlook the convertible nature of economic and non-economic forms of capitals. Empirically, little is known about how, while adapting to climate change, farmers use and convert their available capitals to alternative forms.

The growing number of adaptation policies and programmes in developing countries has resulted in a better understanding of how policy initiatives translate into practice to achieve adaptation and development goals. The literature focuses mainly on types of initiatives and programmes and the implementation gap related to climate change policies (Stringer et al. 2014, Ampaire et al. 2017). Some studies highlight that poor governance results in poor outcomes (Nagoda 2015, Di Gregorio et al. 2019). However, it is important, also, to understand how actors with different interests and different opportunities for influencing and shaping the policy process at the national level (Brock et al. 2001), so that certain interests of some actors' interests are taken into account whereas others are ignored are addressed or overlooked (Dewulf et al. 2009). Climate change adaptation

should be analysed in terms of who benefits from policy and how, by examining the interactions of different actors at different levels (Wolmer et al. 2006, Naess et al. 2015). Most studies investigate only national and local actors affected by climate change adaptation policies and programmes and ignore international actors.

The body of work on farmers' adaptations to climate change tends to emphasise a top-down approach to planned interventions to implement adaptation decisions, and focus on a single measure or level such as individual economic or technical capacity (Ampaire et al. 2017, Vincent and Colenbrander 2018). Attention only on adaptation policy-decisions and planning to respond to climate change, may be ineffective and could increase the inequities in communities (Eriksen et al. 2015). For example, in the absence of a better understanding of the different and multiple level factors that explain the adaptations of diverse farmers' groups, adaptation interventions imposed by planners and development agencies, can create mismatches between adaptation needs and adaptation options (Adger et al. 2013). Thus, farmers' adaptation decisions need to be understood in terms of how different factors at the household, community and national levels can enable or hinder their implementation and outcomes (Eriksen et al. 2015).

1.2 Research aim and questions

The main objective of this research is to understand adaptation to climate change by Indigenous farmers in three different agro-ecological zones of Nepal. In order to identify measures for effective and fair adaptation outcomes for vulnerable communities, the multilevel analysis focuses at three different levels – individual, community and policy level - exploring farmers adaptation behaviour, role of capitals in contributing to adaptation and the adaptation policy process guiding adaptation programmes and the consequences of such policies.

Following specific questions will guide the main research aim:

- i) Which factors influence farmers' adaptation behaviour in response to climate change?
- ii) What roles do the different economic and non-economic forms of capitals play in adaptation to climate change ?

- iii) How do international actors, national governments and local actors with different interests interact in the climate adaptation policy process and what is the impact of their interactions on policy outcomes?

1.3 Thesis structure

This chapter (Introduction) describes the research background, aim and questions; it provides an overview of the context of the study and describes the research methodology. The **second chapter** (Paper 1) focuses on the household level and investigates the factors influencing the farmer's intention to adapt and farmers' subsequent adaptation behaviours at the household level. This chapter extends the Theory of Planned Behaviour (TPB) (Ajzen 1991) by including farm and farmer characteristics in the analysis. It investigates the influence of both psychological and situational factors (farmer and farm characteristics) on farmers' intentions and actions to adapt to climate change. The **third chapter** (Paper 2) focuses on the community level and assumes that individual decisions are not made in isolation, but rather that individuals perceive and respond to climate change within the context of their community (Xue et al. 2014). This chapter draws on Bourdieu's (Bourdieu and Nice, 1977) work on conversion of capital, to explore the roles of economic and non-economic (cultural, social, and symbolic) capitals in shaping adaptation by Indigenous communities. The **fourth chapter** (Paper 3) focuses on the policy level and applies a policy process framework (Keeley and Scoones, 1999; Naess et al., 2015; Wolmer et al., 2006). It analyses actors and their narratives and the decision-making politics that shape adaptation policies and explores the consequences of these interactions for farmers. The chapter highlights how the most vulnerable groups have been further marginalised as a result of the interests of powerful international and national actors in the climate policy process. Finally, the **fifth chapter** presents the main findings and discusses the empirical, theoretical and policy contributions of this thesis. It also highlights some limitations of this research and directions for further work. It concludes the thesis with some final remarks.

1.4 Context of the study

1.4.1 Indigenous people and climate change

Globally, there are around 370 million Indigenous people, constituting 5% of the global population and 15% of the global extreme poor (World Bank 2021). They reside in or live nearby of 85% of the world's protected areas and maintain 80% of world biodiversity and 95% of the world's cultural diversity (Sobrevila 2008). These Indigenous people are deeply connected with nature, including land, forest, water, animals and plants, which shape their traditions, culture and identities (World Bank 2021). However, climate change, along with policies and actions against Indigenous people's rights, have contributed to a deterioration and dispossession of ancestral lands and have undermined the customary land tenure and natural resources management systems (IWGIA 2020). However, few studies focus on global environmental change and its effect on Indigenous groups (Ford et al. 2015).

Climate change threatens the livelihoods of Indigenous peoples across the world many of whom are highly dependent on natural resources in climate sensitive ecosystems – ranging from the Arctic, Himalayan and hill regions, arid and semi-arid regions- to tropical forests. Indigenous people are suffering from various extreme climatic events including erratic rainfall, drought, high rainfall, floods and typhoons, which reduce crop yields, and affect availability of water resources and grazing areas (IPCC 2014). These changes to the natural environments of Indigenous peoples are affecting their main sources of livelihood - traditional herding practices, traditional agricultural practices and revenue from tourism (UN 2009). For example, a study conducted in Nepal shows that the Indigenous Chepang community is facing increased crop losses due to increased in climate induced crop diseases and insect infestations, and increased frequency of erratic rainfall and drought (Khanal et al. 2019). In many countries including those in Central Africa, Kenya and Tanzania, Indigenous communities are facing reductions in pasture land and water resources which provide livelihood and are forcing them to travel to find feed and water for their livestock (IWGIA 2020). Several Indigenous communities that depend on fishing and agriculture, live in coastal parts of the USA, Panama, Fiji, Papua New Guinea, the Solomon Islands and Vanuatu, and are being forced to leave their ancestral lands due to sea level rises caused by climate change (Dannenberg et al. 2019). In, the Brokpa pastoral nomad community in India, climatic change and drought are taking away people's traditional means of livelihood (Singh et al. 2018). Climate change is also affecting Indigenous people's production of traditional food crops

which are part of their culture, economy and way of life (Lynn et al. 2014). As a result, many Indigenous people are having to make changes that are having impacts on their social capital, food security and access to health and education.

Indigenous people are responding to the impact of climate change. A global review of Indigenous peoples' adaptation to climate change shows that they have adopted strategies related to changes to farming practices including planting times and location of crops (Schlingmann et al. 2021). In a study conducted in Nigeria, Ishaya and Abaje (2008) found that changes to varieties is the most common adaptation strategy of Indigenous communities. A study of the coastal Vedda Indigenous community in Sri-Lanka showed that collective action and livelihood diversification are important adaptation strategies (Galappaththi et al. 2020). The Konda Reddis community in India has switched from growing *jeelugu* to *tati* palm, and shifted from slash-and-burn agriculture to searching for alternative food sources in the forest (Kodirekkala 2018). In the Peruvian Amazon, Shawi community are adapting by planting tree on river banks to protect homes and crops from flooding (Torres-Slimming et al. 2020). Similarly, in the hill districts of Nepal, Indigenous Chepang (Piya et al. 2013) and Thami (Thapa 2019) communities are adjusting sowing time of crops to adapt to changing rainfall pattern.

The vital role of Indigenous peoples in tackling climate change and improving environmental sustainability has increased research interest in Indigenous communities in recent years (FAO 2018). Existing studies on Indigenous people and climate change, while fall into three broad groups, broadly they have a differential view on Indigenous people capacities to respond to climate change. First, work on perception of and responses to climate change (Ahmed and Atiqul Haq 2019, Ali et al. 2020, Persoon and Minter 2020). These studies acknowledge the value of indigenous knowledge and practices for understanding and responding to climate change (Son et al. 2019, Mohamed Shaffril et al. 2020, Petzold et al. 2020). Second, is work that focuses on Indigenous peoples' rights and portray Indigenous peoples as vulnerable and victims of climate change. For example, Indigenous people living in low-lying islands are becoming environmental refugees and are facing loss of indigenous territory and enforced migration due to sea level rises and coastal erosion (UN 2009, McMichael et al. 2021). This strand of work argues for the need to protect Indigenous people from the social, cultural and economic stresses of climate change, and the need to protect their rights and avoid injustices while adapting to climate change (Wallbott

2018, McGregor et al. 2020, Whyte 2020). Third, is the stream of work on Indigenous people's connections to the land focus on Indigenous land management and nature conservation practices (IUCN 2010, Lemaitre 2011, Fa et al. 2020). These studies view Indigenous peoples as agents of environmental sustainability; they have been living in harmony with nature in a sustainable way, feeding themselves and protecting the environment for many generations. Taken together, these studies show that the response to climate change impacts varies widely and is often insufficient to protect livelihoods. While these literatures add to our understanding of how Indigenous peoples are adapting, there are gaps in the knowledge about how adaptations can be fairer and more effective for Indigenous farmers.

1.4.2 Indigenous people in Nepal

The National Foundation for Development of Indigenous Nationalities Act 2002 describes Indigenous people as 'Indigenous nationalities' who are tribes or communities with distinct cultural identities, social structures and written or unwritten histories (HMG-N 2002). Similarly, the Nepal Federation of Nationalities (NEFIN), which include 54 Indigenous people's organisations, describes Indigenous communities as communities with distinct traditions, languages and culture, who believe in ancient animism, worship nature, the land, seasons and ancestors. The collective term for the Indigenous people in Nepal is *Adivasi Janajati*; *Adivasi* refers to the first settlers and *Janajati* denotes population groups that are not part of the Hindu caste system.

A national population survey shows that there are 125 caste/ethnic groups in Nepal, including 59 indigenous communities (CBS 2012). About 36% (10.72 million) of the 29.8 million population are Indigenous people (IWGIA 2020). It is believed that the Indigenous people in Nepal migrated from north, south and west over the last two millennia, and different groups with distinct cultures and languages settled in different regions of Nepal. In the hill and mountain region, Tibeto-Burman speaking groups, such as Gurung, Limbu, Sherpa and Yolmo, migrated across the northern Himalayas at different times (Pradhan and Shrestha 2005). The Tharu have been settled for more than 2,000 years in the southern plains or Terai region which also is home to *Maithili* speaking Indigenous groups. Until the 18th century, Nepal had numerous autonomous territories of Indigenous people, which were self-ruled by local chiefs based on customary systems (Toffin 2009). These culturally and linguistically homogeneous Indigenous groups lost their autonomy when King Prithvi Narayan Shah expanded the Shah dynasty by integrating territories of Indigenous groups into a Greater Nepal in 1769 (Bhattachan 2012). Since then, socio-economic

suppression of ethnic minorities from the upper castes has continued, and state rulers have enforced the Hindu religion on non-Hindu Indigenous people (Toffin 2009).

Between 1769-1950, the state suppressed the cultures of Indigenous people, and promoted Hindu culture (Pradhan 2007). In 1854, the first Civil code of Nepal, *Muluki Ain*, placed Indigenous people as second class citizens (DFID 2006). This discriminatory law based on caste was abolished in 1963. In 1957, the Nepalese government nationalised all private forests and passed strict laws on forest conservation (Gautam et al. 2004), which caused Indigenous people to lose their social, cultural and economic dependence rights to the forests. By the 1960s, Indigenous peoples in Nepal had lost ownership and control of their ancestral lands (Bhattachan 2012). Also, the *Kipat* system, a communal land tenure system practised by the *Kirat* Indigenous communities in Eastern Nepal, was abolished.

In 1974, government nationalised pasture lands through the Grazing Lands Act, which undermined traditional pasture management practices by Indigenous communities. In 1970s and 1980s, increased international pressure for bio-diversity conservation resulted in further restrictions on forest and grassland resources and establishment of protected areas in the form of national parks and conservation areas. The forest and grassland dependent Indigenous groups were perceived as destroyers of biodiversity and their traditional slash-and-burn and transhumance herding practices were held responsible for reducing food and habitats of wild animals. The movement of herds was banned. This led to a decline of transhumance herding practices by Indigenous group and also decline in traditional land management practices which allowed diverse plants and animals to flourish. By 1990, most Indigenous groups abandoned their nomadic traditions of hunting and gathering and living in forests, as they lost control of forests due to the government's forest policy, which shifted ownership of the forests to government and non-indigenous people (Bhattachan 2012).

After 1990, Nepal recognised the multicultural nature of nations and the rights of its Indigenous population; however, the cultural, economic, social and political dominance of the upper caste Nepali speaking Hindus persisted (Bhattachan 2012). In 2019, government introduced a new act to abolish *Guthi* - a customary self-government social organisation of *Newar* and a form of institutional landownership – but withdrew it following huge protest from the *Newar* community

(IWGIA 2020). The historical social and economic discrimination by the Hindu upper caste rulers has caused pervasive and persistent ethnic inequalities which continue to today (Toffin 2009, Al 2019). For instance, Indigenous people are underrepresented in administrations, education and politics, while upper Hindu castes, Brahmin and Chhetri, dominate and govern the administrative, social, economic and political domains in Nepal (Bhattachan 2012).

1.4.3 Policy framework for Indigenous people

Nepal's Five Year Plans, starting in 1950, ignored Indigenous people until the abolition of the authoritarian Panchayat system in 1990. Following a period of political turmoil and restoration of democracy in 1990, inclusion of Indigenous people has become central to Nepali politics due to the increased recognition of the Indigenous people's movement. The Ninth Five Year Plan (1997-2002) for the first time included the term *Adivasi Janajati* (Indigenous people) and a separate sub-section on Indigenous people and development programmes. It aimed to empower Indigenous people economically and socially, through their participation in local development. The Tenth Five Year Plan (2002-2007) also addressed Indigenous people's participation in development processes and conservation of indigenous skills and cultural heritage. The subsequent Five Year Plans have included Indigenous people's issues related to social inclusion and development. The current plan, the Fifteenth Five Year Plan (2019/20- 2023/24), aims to increase participation of Indigenous people in politics, administration and education, and makes provision for nurturing Indigenous cultures.

Currently, Nepal is one of the few countries in Asia whose legislation respects cultural diversity, recognises cultural identity and acknowledges the territory of Indigenous people (Errico 2017). Nepal's current constitution 2015 accepts diversities in castes, culture, languages and religion. To try to reduce the disproportionate advantages of upper caste people, Nepal has acknowledged the social inequalities embedded in the current constitution. The constitution prohibits any kind of discrimination based on caste, race and gender. Article 18(3) of the Constitution of Nepal 2015 includes special provision for the protection, empowerment and development of marginalised groups including Indigenous communities. To support the inclusion of Indigenous groups in the civil service, the Civil Service Act 1991 provides quota for recruitment of 45% of government employees on an inclusive basis. Similarly, to increase the participation of Indigenous peoples in political bodies, Nepal has quotas for Indigenous people in elective bodies at the local, provincial and national levels. Agriculture Development Strategy (ADS), a twenty-year (2015-2035) action

plan, overlooks the issues of Indigenous people in overall agricultural development. Similarly, Climate change Policy has made provision to include Indigenous people in the adaptation programs. In many donor funded development and climate change related programs projects, there is often mandatory inclusion of Indigenous people, however their participation mostly remains as a formality. As a result, discrimination and exclusion of Indigenous groups in the development arena still persists.

Previous strategies and programmes for enhancing the livelihoods of Indigenous people have failed due to lack of participation and consultation of Indigenous people (Bhattachan and Webster 2005). Nowadays, lack of a policy framework and laws to support Indigenous people are not the problem in Nepal, but their lack of enforcement is a chronic issue. Inclusion and political representation, socio-economic empowerment and human development continue to be major issues for Indigenous people. As a result, Indigenous people are demanding protected and autonomous areas to allow them to reclaim ownership and control over resources and territories (IWGIA 2020).

1.4.4 Study area

Nepal is a small landlocked country in South Asia, bordering Tibet in the north and India to the east, west and south. The agriculture sector contributes about 35% to national gross domestic product and represents the main livelihood for 64% of households in Nepal (CBS 2013). Among the 3.83 million farming households in Nepal, more than 53% have less than half a hectare of cultivated land (CBS 2012) and these smallholder farmers are engaged, mostly, in subsistence agriculture (CBS 2013). The topography of Nepal ranges from 25 metres above sea level in the south to 8,848 metres above sea level in the north. Based on altitude and climate, Nepal includes three agro-ecological zones: the Terai (lowland region) in the south, a hill region, and a mountain region in the north (Figure 1). These regions have distinct ecological and climatic conditions which have changed in recent decades (Shrestha et al. 1999). They also have distinct languages, customs, traditions, farming systems and living standards. The main crops cultivated in the Terai are rice and wheat, in the hills the main crops are maize, millet and rice, and in the mountain regions potatoes and barley dominate. The study focuses on three districts, one from each agro-ecological zones, and two villages from each district.



Figure 1. Map of Nepal showing the three agro-ecological zones and the case study sites

Agriculture in Nepal is highly sensitive to climate change since nearly half (47%) of its cultivated land area depends on rainfall (CBS, 2013). Due to the high reliance of the Nepalese economy on climate-sensitive agriculture, the country is extremely susceptible to climate change. It is ranked 4th in the list of the most climate vulnerable countries in the world (Croft 2011) and was 9th in the 2016 global climate risk index (Eckstein et al. 2019). The impact of climate change in the form of extreme climatic events, such as erratic rainfall, floods, drought, hailstones and high temperatures, is increasing in Nepal (IASC-N 2008). Analysis of data for 1975 to 2006, shows that annual maximum temperatures have increased by 0.04 °C and rainfall has increased 0.82 mm per year (Baidya and Karmacharya 2007). The intensity and frequency of extreme weather events, including erratic rainfall, hailstones, floods and drought, are increasing (Dahal et al. 2015), which is having a significant influence on agricultural systems. Due to the rise in temperatures, farmers are reporting early flowering of crops and appearance of new agricultural pests and weeds (Chaudhary and Bawa 2011). Farm production is being threatened by extreme weather events (floods, drought, hailstones) and temperature rises and these climate change consequences are

projected to increase over the next few decades (MoE 2010). These extreme climatic events will have major negative effects on the economy of Nepal and will affect the livelihood and food security of vulnerable and poor farming households (Palazzoli et al. 2015, Panthi et al. 2016).

Table 1. Characteristics of study sites and the villages included in the study in each agro-ecological zone

District	Sunsari	Lamjung	Sindhupalchowk
Agro-ecological zone	Terai	Hill	Mountain
Villages chosen for the survey	Amaduwa and Sahebganj	Mohoriyakot and Ilampokhari	Kiul and Helambu
Indigenous group	Tharu	Gurung	Yolmo
Altitude (m above sea level)*	152 m to 914 m	385 m to 8162	747m to 7085 m
Climate	Warm temperature, rainfall	Medium temperature all year round	Cold climate, snowfall in winter
Economy type	Semi- commercial farming: major crops include rice, wheat, sugarcane and maize	Subsistence agriculture due to very limited land, mainly maize-millet relay cropping	Potato based farming system and barter system of agricultural products in the Himalayas
Major crops	Rice, wheat, and sugarcane	Maize, millet and rice	Potato and barley
Location and general characteristics	Bordering India in the south, no public transport facility	No public transport, not all households have electricity supply	Located on the buffer zone of Langtang national park.
Irrigation	No irrigation facility, Few individuals own underground irrigation	Community managed irrigation system, available mainly in rainy season, no irrigation in between November to June	No irrigation facility
Main climatic shock	Drought	Hailstone	Hailstone

(Source: Compiled by author)

Note: * (CBS 2006, CBS 2006, CBS 2007)

The political turmoil in recent decades has rendered Nepal a fragile country. It suffered 10 years of Maoist conflict between 1996 and 2006 and, in 2007, the monarchy was overthrown and replaced by a constitutional assembly. Nepal's new constitution was promulgated in 2015 and envisaged decentralization based on the establishment of federal governments. The new governance structure consists of 7 federal provinces, 77 districts, 293 municipalities and 460 rural municipalities. Currently, Nepal is in the process of transforming its administrative structures, resources allocation and management and making major changes to its policy-making procedures and policy implementation at the national, regional and local levels.

1.4.5 Climate change adaptation policies in Nepal

Despite continuing political instability, the government of Nepal has been participating actively in international climate change negotiations and agreements. In 1992, Nepal signed the United Nations Framework Convention on Climate Change (UNFCCC), ratified in 1994. In line with its commitment to international climate change agreements and its national needs to manage climate change impacts, in 2010, Nepal implemented a National Adaptation Plan of Action (NAPA), an overarching climate policy framework, and in 2011 adopted a Climate Change Policy. NAPA is the first comprehensive document on climate change in Nepal and is aimed at identifying the country's immediate adaptation needs. NAPA envisages implementation through a common multi-stakeholder platform for planning, coordination, management and monitoring of implementation. Similarly, the Climate Change Policy aims to promote climate change adaptation and reduce the impacts of climate change; it endorses a socio-economic development path to achieving poverty alleviation.

Government, international agencies and the non-government sector are all involved in climate change adaptation programs based on the objectives of NAPA and the Climate Change Policy. The Nepalese government established a National Climate Change Support Programme (NCCSP) based on a grant from the UK Department for International Development (DFID) and the United Nations Development Programme (UNDP). Similarly, the World Bank and the Asian Development Bank (ADB) implemented a Pilot Programme for Climate Resilience (PPCR) (2014-2017), based on loan and grant funding. Nepal submitted its first and second National Communications to the UNFCCC in 2004 and 2014 respectively. In relation to the goals outlined in the Paris Agreement, Nepal submitted its first Nationally Determined Contributions (NDCs) to the UNFCCC in 2016.

This document emphasises Nepal's efforts for climate change adaptation to protect the livelihoods of the most vulnerable people. Currently, the Nepal government is formulating National Adaptation Plans (NAPs) to increase adaptation to climate change by mainstreaming climate change policies and initiatives in development programmes.

At present, Nepal government is implementing two major climate adaptation programmes. Building a Resilient Churia Region in Nepal (BRCRN) programme aims to enhance the resilience of ecosystems and vulnerable communities by adopting climate resilient land use practices. Similarly, NCCSP phase 2 programme aims to increase resilience of vulnerable communities to existing climate related shocks and future climate change. Based on principles, the existing and past adaptation programmes in agriculture can be categorised in different groups such as community based adaptation, ecosystem based adaptation, climate smart agriculture, climate risks-resilience-adaptation and disaster risk reduction.

These climate adaptation policies and programmes have had some positive effects on awareness building in some local level areas; however, successful adaptation has not increased in line with the higher number of policies and programmes (Regmi et al. 2016). If this situation persists and adaptation policies fail to contribute to fair adaptation outcomes, the weaknesses of some communities will increase. This vulnerability, potentially, could result in conflicts among communities or between communities and government, which would threaten the country's peace and security (Vivekananda et al. 2014). This would seem ample justification for an analysis of the Nepal case.

1.4.6 Climate change adaptation programmes in the study area

The government's Local Adaptation Plan of Action (LAPA) is its key local level adaptation policy instrument which should achieve the goals of the National Adaptation Plan of Action (NAPA) and its Climate Policy. LAPA was formulated to identify, prioritise and implement local adaptation programmes and ensure active participation of key stakeholders (MoE 2011). Municipalities were identified as the most appropriate level to include climate change adaptation in local development planning processes. However, none of the study villages had invested in LAPA planning and implementation for climate change adaptation in agriculture. These rural municipalities in the study areas cited lack of funding from central government for lack of local level programs in climate

change adaptation in agriculture. Besides, these rural municipalities did not integrate local adaptation needs into local planning to increase the adaptive capacity of resource poor farmers. It is also a fact that only a few villages in Nepal received external funding for LAPA planning and implementation. And there was no protocol of the local government to internalise the LAPA that was prepared by other agencies.

The study areas had no local government climate adaptation programmes in place. Due to the remoteness of the study villages in Lamjung and Sindhupalchowk, regular contact with district agricultural offices was not feasible. Few farmers in the study villages of Sunsari district who had good contact with the district agricultural development office, received some help from their district level agricultural programmes, especially support for deep tube wells for irrigation (see Chapter 3 for details). NGOs were not present in the study areas, except in the study villages in Lamjung district. An NGO had implemented a community led adaptation project, which aimed to increase awareness of climate change and promote improved farming practices related to cultivating tomatoes and ginger. However, the target beneficiaries to the project were very few. Therefore, in the absence of external supporting institutions, adoption of new agricultural technologies in the study villages was very limited.

1.4.7 Selected Indigenous communities

Indigenous communities in Nepal often inhabit in areas with very fragile ecosystems. Much of the hills and mountains ecosystems are little are fragile due their susceptibility to land degradation , rapid loss of habitat and genetic diversity. Indigenous populations residing in fragile areas and depending on climate sensitive rainfed agriculture makes them highly vulnerable to climate change impacts (Lama and Devkota 2009). Three Indigenous groups- Tharu, Gurung, Yolmo - one from each agro-ecological zone were selected for the study.

Tharu

Tharu have been living in the southern plains of Nepal, Terai, for 2,000 years. Currently, the Tharu are one of the largest Indigenous tribes with a population of 1.7 million (CBS 2012). a traditional governance system. Traditionally Tharu community is led by Mahaton. They practice a mix of animism and Hinduism religion, and worship ancestral and clan deities (Cox 1990). They once

lived in the dense tropical forests along the Rapti river valley and practised slash-and-burn agriculture. Until 1950, the Terai was isolated from the hill and mountain people due to threat of malaria and much of the Terai was covered with forests. The Nepal government launched Malaria Eradication Programme in the 1950s, which resulted in upper caste Brahmin/Chhetri people from the hills migrating to the Terai regions to exploit the fertile land and dense forests. Tharu became victims of the influx of people from other areas, as the upper castes registered much of their lands, which was previously unregistered (Cox 1990). The land grabbing of Tharu land by upper Hindu castes was accelerated by the government's policy of clearing Terai forest for a resettlement programme, resulting loss of land ownership, status and autonomy in their territories. Tharu not only lost their traditional agricultural land but also their access to forest resources which were critical to their culture and livelihood. This situation compelled them to leave their traditional practice of fishing and hunting, and slash-and-burn agriculture.

Currently, Tharu households are dependent mainly on agriculture and many are tenant farmers. Previously, migration was not common in Tharu households in the study areas. However, due to the increase in crop loss due to drought or delay in monsoon, farmers sending their male members to cities and abroad is increasing. Tharu, in the Sunsari district are mostly engaged in cereal crop production including rice and wheat, while in some areas perennial crops, such as sugarcane, are grown. Rice is mainly transplanted in the rainy season in June/July, and harvested in October/November, depending on the variety. Similarly, wheat is generally planted in October/November, immediately after rice harvesting, and harvested in February/March. Sugarcane is a perennial crop, which is mainly planted in September/October, while harvesting is generally done in March/April.

Gurungs

Gurung or *Tamu-mae* is an Indigenous group historically residing in the Annapurna Himalayan range in central Nepal, mainly in the Lamjung, Kaski, Gorkha and Syangja districts. According to the 2011 census, they number around 522,641 (CBS 2012). Legend suggests that Gurungs migrated from highland pasture regions of western China and Tibet where they were shepherds; others believe that thousands of years ago, Gurungs migrated from Myanmar (Macfarlane and Gurung 1990). The Gurung practice blend of Hinduism and Buddhism religion combined with a local form of animism. The Gurung community is traditionally led by the *Chima*, who is responsible for settling disputes and informal village administration. Gurung are an excellent example of

collective action, mutual support and cohesion within the community. For example, the social practice of *parma*, of helped farming households by exchanging labour or services in the community for the performance of agricultural activities. The *Ama Samuha* (mothers' group) is an informal social and economic organisation that contributes to the village community welfare, health and income generation. In the past, Gurung were mainly sheep herders and lived in small hamlets in the mid and high hills and practised shifting cultivation. They owned territory ruled by *Ghale Raja*, which was taken by the Shah Dynasty in the 15th century AD. They were excellent warriors and King Prithvi Narayan Shah recruited them to his army to expand the Shah dynasty by integrating the territories of various Indigenous groups into the Greater Nepal.

Currently, Gurung households depend mainly on agriculture. In the study area of Lamjung district, farmers mainly grow maize and millet in *Bari* (upland) and rice cultivation is limited by lack of *Khet* (irrigated lowland). Rice is transplanted in July and harvested in October/November. After harvesting, *Khet* land tends to be left fallow. In the *Bari*, farmers grow maize and millet in relay cropping. Maize is planted in early April and harvested in October; in August, about six weeks old millet seedlings are transplanted into the maize plantation, which is harvested in October. Livestock rearing is important and includes buffalo and goats, generally reared for milk and meat production respectively. Few households also keep oxen to use for ploughing.

Yolmo

Yolmo or Hyolmo refers to a sacred and fertile place (Gawne 2016). It is believed that about two or three hundred years ago, Yolmos migrated from Tibet and settled in the mountainous Helambu, Sindhupalchowk district. Yolmo farmers believe that the Helambu region is a holy place, consisting of sacred forests and providing sanctuary to plants and animals. The Yolmo communities are a minority group comprised of 10,752 people (CBS 2012). They follow the Tibetan Buddhist religion. *Ghyang* (monastery), which is central to the social and religious context of the Yolmo people and owns the vast majority of Yolmo land as trust land (*Guthi*) and includes forest, agricultural and pasture areas. The chief *Lama* of *Ghyang* has both social and religious powers. The income from the land managed by the *Ghyang* is used for religious activities such as maintenance of the *Ghyang*, daily worship and celebration of religious festivals.

Yolmos in Nepal mainly reside in the sacred upper part of the Helambu and Melchi valleys at between 2,200 and to 3,400 metres above sea level, on the southern slopes of the Himalayas (Clarke 1980, Gawne 2013). This high-altitude area has limited agricultural production, due to harsh climatic condition. Initially, the Yolmo were transhumance herders and raised mainly sheep, mountain goats and yak, moving their herds in the alpine grasslands, between 2,200 and 4,300 metres above sea level. During the winter period when climatic conditions worsen with high snowfall in the highlands, they move to the villages in the Helambu region where they establish temporary settlements, and cultivate barley, potatoes, and beans.

Transhumance herding continued to remain a major source of income, and farming supported for food and income security. Since the 1970s, they have settled permanently in the upper part of the Helambu region and their numbers have grown. After the Langtang National Park was established in 1976, restrictions were imposed on use of forest resources and open rangeland herding. Traditional practices such as movement of livestock for herding, forest fires and extraction of forest products were banned. Lack of fodder for livestock arose due to government-imposed restrictions on traditional herding practices in communal forests. Reduced numbers of livestock affected their traditional production and sale of hand-knitted woollen mats and blankets (*radi and pakhi*). Although tourism has grown due to the popularity of trekking in the Langtang National Park, the number of Yolmo households in the hotel and tourist guide business is limited. Many Yolmo people send family members to take jobs in Kathmandu and India (mainly Himanchal region), which has started a trend towards temporary and permanent out-migration.

Yolmo agriculture communities are secluded from the outside world, have limited outsider influence in farming. The Yolmo's religion and cultural practices have an impact on their agricultural practices. For instance, they do not plough or sow during the days preceding and just after a full moon and a new moon. If the household labour is insufficient, Yolmo farmers practice *laari*, a traditional village labour exchange system, to get help from neighbours for activities such as planting, weeding and harvesting of crops. Potatoes and barley are the main agricultural products of Yolmo in the Helambu region. Potato is the main crop and is planted in December/January and harvested in July/August. Barley is planted in August/September and harvested in November. These Himalayan products are in high demand due to their peculiar taste and are bartered with other items such as rice, millet and wheat.

Although three Indigenous communities have different beliefs and practices, they are bound by similar social and cultural practices, which affect their agricultural practices. For example, all three communities have a particular socio-economic system governance structure: *Lama* of Ghyang in Yolmo, *Chima* in Gurung and *Mahaton* in Tharu. *Parma* and *Laari* refer to the collective action of the Gurung and Yolmo respectively which is labour exchange in the peak agricultural season. Similarly, the mothers' group of the Gurung is a collective action dedicated to village community welfare and maintenance of social harmony. While these traditional collective actions are decreasing in the study areas, the systems of cooperation and mutual support have increased the capacity of the communities to recover from climate induced disasters, mainly hailstone and drought. Therefore, understanding the economic, social, cultural and symbolic capital enacted by these communities is important for understanding these farming communities' adaptations to climate change.

1.5 Methodology

This study uses a mixed method of data collection and analysis (Creswell and Clark 2007) which comprise quantitative and qualitative information on climate change adaptation. Qualitative methods are a more appropriate tool for capturing the social and institutional contexts of peoples' lives while quantitative methods are best suited to studying households' socio-economic features (Ellis and Mdoe 2003). Using both quantitative and qualitative approaches in data collection and analysis increase the trustworthiness of information (Marsland et al. 2001). The qualitative data were collected from focus group discussion (FGD), semi-structured interviews and participant observation (PO), which provided detailed information context of the study, adaptation processes and institutions working in the area. The quantitative data were collected via a household survey asking for farmer and farm characteristics, and psychological information on households' adaptation practices in response to climate change.

The poor infrastructure and low level of education of farmers in Nepal meant that interviews had to be conducted face to face rather than by mail or telephone (Karki et al. 2011). Face to face data collection minimizes the likelihood of false responses due to the respondent consulting others (Saunders et al. 2007). The fieldwork was carried out between June to October 2013. The details of each type of method and its relation to the research are presented in Table 2 and discussed in the following sub-sections.

Table 2. Data collection methods used in the study, their purpose, focus, data collection level and the total number

Methods used	Purpose	Focus of data	Data collection level	Total Number	Chapters based on
Household survey	To understand farmers' intention and adaptation behaviour	Farming households	Micro - Household	546	Chapter 2
Semi-structured interviews	To understand social, economic, cultural context in climate change adaptation (CCA)	Government, international agencies, NGOs. Leader farmers, communities	Macro – institutional level	36	Chapter 3,4
Focus group discussion (FGDs)	To understand in-depth views of communities on adaptation practices in response to climate change, and on institutions working for climate change adaptation	Farmers	Meso – Village level	6	Chapter 2,3,4
Participant observation (PO)	i) To build rapport with the community ii) To understand the physical, social, cultural and economic context, and iii) To explore relationships, interaction, norms and activities	Communities	Meso – Village level	8	Chapter 3
Archival records	To understand the institutional context in CCA	Climate policy and strategy documents, publications, annual reports	Macro - Institutional		Chapter 2,3,4

1.5.1 Household/Farm survey

Household survey is a method of data collection which involves presentation of a set of the same questions in a predetermined order to a series of households (Saunders et al. 2007). In this study, the survey was aimed at understanding the relationship among different psychological and situational variables with the adaptation behaviour of farmers (see Chapter 2 for details). The survey questions were developed by reviewing the literature (Ajzen 1991, Deressa et al. 2011, Below et al. 2012, Spence et al. 2012, Arbuckle Jr et al. 2013) which was followed by consultation with experts and the focus group discussions (FGDs). The household questionnaire was organised in three parts and used both open and closed questions. The areas covered in the questionnaire was: i) farm and farmer characteristics; ii) Theory of Planned Behaviour (TPB) variables; iii) farmers' adaptation strategies (see appendix 1).

The survey was conducted in three districts in different agro-ecological zones: Sunsari (terai), Lamjung (hill) and Sindhupalchowk (mountain). In each district, two villages were randomly selected for the study. The selected villages were: i) Amaduwa and Sahebganj in Sunsari; ii) Ilampokhari and Mohoriyakot in Lamjung; and iii) Kiul and Helambu in Sindhupalchowk. Due to differences in



Figure 2. Household survey in Kiul, Sindhupalchowk

the numbers of household in these villages, sampling intensity was used to ensure equal representation of households in each district. A lottery system was used to select the sample households in each village. From a total of 5,520 households in six villages and three districts, 546 households (9.89%) were selected for the survey. The list of households was obtained from the village municipality offices. A pilot survey ($n=15$) was used to refine the questions where necessary. After a revision to the questionnaire, a second pilot ($n=10$) was conducted. This did not result in any changes and the data derived from this pilot test were included in the analysis. The final household questionnaire comprised both open and closed questions.

The household surveys were arranged directly with the farmers, at a time convenient to them. The survey respondent was the household head since they made most of the decisions related to the farming activity (Bhattarai et al. 2015). The survey took around one hour to administer. The surveyed households were informed that their names and the information provided would remain confidential, which encouraged them to be more open about their views of the organizations involved. Quantitative analysis of factors influencing adaptation to climate risks in farming is heavily relied on the household survey data, and hence it is explained in detail in the following chapter (Chapter 2).

1.5.2 Semi-structured interviews

The semi-structured interviews are non-standardized qualitative interviews (Saunders et al. 2007). They are based around a list of themes and some key questions which means the conversation varied across interviews (Easterby-Smith et al. 2012). In this study, the semi-structured interviews were aimed at obtaining an in-depth understanding of the interactions among the of actors in the climate policy process and, the social, cultural and economic processes in farmers everyday lives affecting climate change adaptation at the local level (Hancock et al. 2001, Robson 2002).

Topic guides for the semi-structured interviews were developed based on a review of the literature. The topic guides were further refined following comments from the PO and FGDs. Guidelines were prepared for the semi-structured interviews with experts (Appendix 2) and leader farmers (Appendix 3). The expert topic guide included questions about the interaction among the actors during the formulation, implementation and outcomes of climate adaptation policies and programmes (Appendix 2). The topic guide for farmers included three sections. The first section asked participants about climate change and its impacts on their farming systems in recent years. The second section asked about the farmers' responses to climate change. The third section asked about external assistance to respond to climate change. The first two parts focused on adaptation to climate change (Chapter 3) and the last part focused on the outcomes of the adaptation policy process (Chapter 4).

As already mentioned, semi-structured interviews with leader farmers and experts were conducted for in-depth analysis of adaptation practices and adaptation policy formulation and implementation. The experts, which included members of government and international agencies and NGOs, were selected based on their long experience in a range of environmental and climate policy formulation and implementation. Experts were from various organisations including government organisations (GOs), such as ministries, ministerial district offices, and senior officers from international agencies which allowed the collection of multiple perspectives. Also, in order to understand the policy implementation, national and local NGO staff and leader farmers were included. In this context, leader farmers are farmers with a high level of knowledge and experience, who set an example to the village by being more open to experimental and new technologies or practices. This range of interviewees provided rich information and allowed a comprehensive understanding of climate adaptation policy making, implementation and outcomes

at the local level. The random sampling method was not appropriate for selecting the participants in the semi-structured interviews. Farmers and experts were selected using a combination of purposeful and snowball sampling. A total of 36 in-depth, semi-structured interviews were conducted, which included government officials (9); senior officers, representatives and consultants from international agencies (4); national and local NGO staff (5); and farmers (18) (Table 3).

To ensure that interviewees felt relaxed, the place and time of the interview was arranged to suit them. Farmer interviews were conducted in the farmers' homes and the expert interviews were conducted in their office or home according to what they preferred. The interviews were recorded, and the most important points were noted also on paper. Interviews lasted between one to two hours, depending on the issues being discussed. The researcher's previous relationships and informal interactions with respondents, and knowledge of context was helpful for reassuring participants and obtaining in depth information. For the Indigenous people and women, in particular, the one-to-one interviews provided an opportunity for them to voice their opinions.

Table 3. Lists of participations included in the semi-structured interviews

Organisation	Participants	Total
International agencies	Deputy Director	1
	Researcher/Consultant	2
	Senior Officer	1
Government agencies	Senior Officer (Central level)	3
	Senior Expert (Central level)	1
	Planning Officer (Central level)	2
	Local Development Officer (District level)	1
	District Officer (District level)	3
NGOs	Senior Officer (District level)	1
	Programme Manager (Central level)	2
	Chairman (Central level)	1
	Researcher (District level)	1
Farmer organisations and leader farmers	Formal (Cooperatives) Sunsari – 2; Lamjung -1	3
	Informal (farmer producer) groups	3
	Lead farmers (3 in each district)	9
	User committee (Forest, Micro-hydropower, and Anti-poaching)	3
Total		36

Note: Cooperatives refers only to Sunsari and Lamjung; Helambu does not have a farmer cooperative.

1.5.3 Focus group discussion



Figure 3. Focus group discussion in Mohoriyakot, Lamjung

The focus group discussions (FGDs) followed an appropriate discussion guide (Maynard-Tucker 2000). Six FGDs were held in three communities (Appendix 5). The FGD participants were selected through purposive sampling, following consultation with the rural municipality offices and local NGOs.

Each FGD included between 18 and 24 participants. The discussion was guided by the topic guide (Appendix 4) and included: i) perceptions of climate change and impacts; ii) farmers' responses to climate change; and iii) views about the activities of NGOs and GOs working on climate policy formulation and implementation. Chapters 2 and 3 are based on the first two topics; Chapter 4 is based on the data from the latter part of the FGD. The discussion was facilitated by the researcher and two assistants hired to observe and make notes on the discussions. The purpose of the discussion was explained to the participants along with their expected role and how the data would be used. Participants were informed that their participation was voluntary and that they could exit the discussion at any time. After receiving their verbal consent, the FGDs started. They lasted for a maximum of two hours. Attention was paid to ensuring that all the participants were heard and remained focused.

The FGDs provided a good understanding of the communities' views about climate change and adaptation strategies, and the institutions working on climate change adaptation. The results of the FGDs were qualitative in nature and were used, mainly, to enhance the data from the household survey and the semi-structured interviews. For example, land area was denoted "*kattha*" or "*bigha*" in terai and as "*ropani*" in the hills and mountains. Similarly, weight measurements (of crops) were "*man*" in terai and "*pathi*" and "*muri*" in the hills and mountain regions. Although the literature refers to tree planting, mixed cropping and drip irrigation as farmer adaptation strategies, the FGDs showed they were irrelevant in the study areas, and hence deleted from the questionnaire. The FGDs built a rapport with the farmers, which facilitated

administration of the household survey and the semi-structured interviews in the Indigenous communities.

1.5.4 Participant observation

Participant observation (PO) allows the observer to learn about the daily activities of those being observed, in their natural setting, based on observation of and participation in those activities to better understand the context and the phenomenon under study (Kawulich 2005). The PO in this study was aimed to establish a rapport with the participants to enable data collection, understand the context and develop the interview guide (Musante and DeWalt 2010). To achieve this, the researcher acted as an observer who was not a member of the group but who was interested in observing the group members' activities (Gold 1958, Kawulich 2005). Farmers' interactions during household activities, community forest groups, cooperatives and producer groups, religious gathering and social events were observed, and the researcher also participated informal meetings, events and activities. The researcher participated in eight formal discussions [Sindhupalchowk (3), Lamjung (3), 2 Sunsari (2)] as participant observer (Annex 6). The number of participants observed was smallest (9) in the executive committee meeting of the sugarcane producer group and highest (54) in the saving and credit cooperative.

The study used descriptive observation, which implies that the researcher knows nothing and observes everything. Wherever possible, notes were taken during the observation. This led to the collection of minutiae not completely relevant to the study. For example, although observation in the anti-poaching group (Figure 4) explained the relationships and conflicts with the local nature



Figure 4. Participant observation in Helambu, Sindhupalchowk (Researcher at the back)

conservation authority, these topics were beyond the scope of the present research and were deleted from the notes. Further, the researcher had assumed that participant observation in *ghyang* (a socio-religious Yolmo institution) was not relevant, but it provided important information

on the relationship between *ghyang* and migrant members of the community. The information was included in the topic guide for the semi-structured interviews, to highlight the interdependence between culture and migration due to climate change.

PO provided an opportunity to observe culture, land use patterns, impact of climatic (drought, hailstone) and non-climatic stresses (wild animals, insect, diseases, market, infrastructure) and helped to cross-validate the information given by respondents during interviews. PO was helpful to understand the politics and power in the meetings, observe who had a voice, who participated actively, how participants' influence the discussion and how they use their positions to influence the meetings (Jorgensen 2015). For example, participation observation of a farmers' cooperative in Amaduwa, a Tharu village, provided a more in-depth understanding of the role of formal and informal financial institutions for small farmers and women. This was helpful to understand the role of everyday activities in the communities where resource-poor farmers were even more heavily trapped into a debt cycle.

1.5.5 Secondary data

Secondary data, in the form of statistical reports, annual reports and planning reports, were collected from relevant government and non-government offices. National policy and strategy documents and government reports were obtained from the ministries of agriculture, forests and environment. Documents on climate change programmes were collected from other government organisations (GOs), NGOs and international NGOs working in the study areas. Village profiles were obtained from municipality offices in the study area and the district profiles were obtained from the respective district coordination offices.

2. Factors influencing adaptation to climate risk: A socio-psychological analysis of farmers adaptation behaviour

2.1 Introduction

Climate change, in the form of extreme climatic events, is causing significant negative impacts on crop and livestock production and farmers' livelihoods (Osbaahr et al. 2008, Quan et al. 2019). The occurrence of and losses from extreme climatic events, such as flash floods, drought, intermittent rainfall, storms, hailstones and heat waves, caused by climate change, are increasing and are expected to continue to increase in the future (Hellmuth et al. 2011). The persistence of current climate change will reduce global food production considerably, threatening farmers' livelihoods (Battisti and Naylor 2009, IPCC 2014). In less developed countries in the global south, in particular, small farmers are suffering from the impact of climate change due to poor access to and control over resources, lack of new technologies and weak infrastructure (IPCC 2007, Morton 2007, Heltberg et al. 2009). Adaptation to climate change is needed at the farm and community levels to minimise its negative impacts on small and resource-poor farmers in less developed countries (IPCC 2007, Jerneck and Olsson 2008, Hisali et al. 2011).

Adaptations to reduce climate risks require changes to either farming practices or livelihood activities. Several studies note that farmers' behavioural changes vary depending on socio-economic factors (Below et al. 2012, Chhetri et al. 2012, Wood et al. 2014, Trinh et al. 2018). This body of work assumes that farmers behave rationally and that they will change their behaviour if they find that a new practice is economically beneficial compared to the existing one. Researchers and development agencies assume that wealthier farmers will adapt to climate risks (Jain et al. 2015). However, evidence shows that economically poor farmers located in wealthier areas, are also likely to adapt (Wood et al. 2014). Also, farmers may adapt farming practices even if the economic benefits are unclear (Wauters et al. 2010). To study changes in behaviour requires an examination of both socio-economic factors and subjectively held information, that is, individual beliefs that link behaviour to attitudes, subjective norms and perceived behaviour control (Ajzen et al. 2011). Examining individuals' subjectively held information and how it shapes intentions is important for understanding behaviour (Ajzen et al. 2011). While psychological factors are important to understand behaviour change in response to climate risk in agriculture, research utilising such factors are limited (Dang et al. 2014, Truelove et al. 2015, Dang et al. 2019).

Where studies exist, either they are atheoretical or descriptive, and also do not identify a causal relationship between adaptation behaviour and other factors (Arbuckle Jr et al. 2013, Li et al. 2017). This research seeks to fill this gap by analysing research question - Which factors influence farmers' adaptation behaviour in response to climate change? Building on the Theory of Planned Behaviour (TPB) (Ajzen 1991) and adding situational factors, the research investigates the psychological and situational factors influencing farmers adaptation behaviour.

This chapter is structured as follows. Section 2.2 reviews the literature and discusses the TPB and the proposed conceptual framework. Section 2.3 describes the research methodology. Section 2.4 presents the results, which is followed by discussions of findings in section 2.5. Section 2.6 offers some conclusions and some theoretical and practical implications.

2.2 Literature and Theory

2.2.1 Adaptation in agriculture

Adaptation is the process of adjustment to the environment in response to past, existing or expected climatic changes, aimed at reducing their negative consequences (Smit and Skinner 2002, Adger et al. 2007, Hisali et al. 2011). In the context of climate risk in farming, adaptation involves farmers making efforts to reduce the adverse effect of climate change on livelihoods by adjusting farming practices or diversifying livelihoods. Adjusting in farming practices includes changes in sowing dates and varieties, changing tillage methods and application of fertilisers and shifting to land management practices such as agroforestry, silvicultural practices (FAO 2007). Adaptation can be planned by agencies or enacted autonomously by farming households and communities. Planned adaptation is guided by external agencies such as non-government organisations (NGOs), government organisations (GOs) and the private sector (Forsyth and Evans 2013). These external agencies assume that farmers and, in particular, small and poor farmers, are vulnerable to climate change, which calls for external interventions. For instance, development agencies in drought prone areas may provide drought resistant varieties or help with water management in order to prevent future crop losses due to drought. Autonomous adaptation assumes that farmers adapt by using different crop varieties or diversifying to other activities, using their own knowledge and experience (Forsyth and Evans 2013, Eakin et al. 2014). Climate change adaptation in this study is refers to any changes in the farming practices or livelihoods in response to the risks of extreme weather conditions.

Several studies have added to our understanding of adaptation to climate risks in agriculture. They focus on classification of adaptation options and identification of appropriate or best available adaptive agriculture practices (Smit et al. 2000, Neil Adger et al. 2005, Howden et al. 2007, Hallegatte 2009, Deressa et al. 2011). Adaptation options can be categorised as structural (e.g., dikes to prevent flooding, irrigation canals), technical (e.g., climate information and forecasting), management (e.g., changing sowing time and varieties), economic (e.g., crop insurance) and regulatory (e.g., land use planning) (Næss et al. 2005, Below et al. 2012, Wood et al. 2014, Arunrat et al. 2017). The literature focuses mostly on factors influencing different farmer and farm characteristics influencing adaptive measures in agriculture (Agrawal and Perrin 2009, Deressa et al. 2011, Below et al. 2012, Zampaligré et al. 2014). Until now, little attention has been given to psychological factors influencing adaptation behaviour of farmers in response to climate risks (Truelove et al. 2015, Niles et al. 2016, Dang et al. 2019).

2.2.2 The theory of planned behaviour

The Theory of Planned Behaviour (TPB) (Ajzen 1991) is used frequently in behavioural studies (Anable et al. 2006, López-Mosquera et al. 2014). According to the TPB, when making decisions about actions, intention is the best predictor of actual behaviour (Ajzen 1991). Intention is defined as individual willingness to perform the behaviour in question (Ajzen 1991). Intentions are mediated by attitudes, subjective norms and perceived behavioural control (Ajzen 1991). Attitude to a behaviour refers to the individual's evaluation of the positive or negative feelings towards performing the behaviour and is determined by the individual's set of beliefs at the time (Ajzen 1991). Subjective Norms (SN) refer to the perceived social pressure to engage (or not) in a behaviour and are determined by the set of normative beliefs held by significant peers, such as family, friends, relatives and also other important individuals, on the behaviour (Ajzen 1991). Perceived Behavioural Control (PBC), which is similar to *self-efficacy* (Bandura 1997) refers to the underlying perception of the individual ability to perform the behaviour and is determined by control beliefs which refer to perception of the factors that might facilitate or create a barrier to the performance of the behaviour (Ajzen 1991).

Attitude measures the degree to which an individual evaluates the performance of a behaviour positively (as good) or negatively (as bad) (Ajzen 1991). Subjective norms refer to perceived social pressure to perform a behaviour and are related to how the people considered important in society (e.g., neighbours, friends and family) think about the behaviour. Perceived behavioural

control measures individual's perception of ability to perform the behaviour and the ease with which it could be performed (e.g., constraints and enabling factors). According to the theory, the more favourable attitude and subjective norms, and the stronger the perceived behaviour control and the higher the likelihood that a specific behaviour will be performed. Hence, in the context of farmer's adaptation to climate risk, good attitude towards an adaptation practice, positive perception of the adaptation practice from social groups (i.e. family and friends) and individual belief in the capacity to adopt the practice (easiness), will result in a higher likelihood of adaptation.

The TPB is used to predict a range of behaviours in various fields such as health, environmental conservation and agriculture. In agriculture, the TPB has been employed to study sustainable agricultural practices (Fielding et al. 2008), diversification of agriculture (Senger et al. 2017), conservation agriculture (Wauters et al. 2010), adoption of grassland management (Borges et al. 2014), soil nutrient management (Daxini et al. 2018) and water conservation (Yazdanpanah et al. 2014). However, few studies use a TPB framework to analyse climate change and climate mitigation at the individual or community levels (Tikir and Lehmann 2011, von Borgstede et al. 2013, Masud et al. 2016). In the context of farmer adaptations, Arunrat et al. (2017) draw on the TPB, using adaptation intention to proxy for actual adaptation, to analyse the adaptation intention among farmers who do not adapt. However, at the time of writing, there was no published explicit research on the influence of socio-economic and psychological factors on adaptations to climate change in agriculture.

The TPB assumes that people follow certain paths when deciding about certain behaviours (Ajzen 1991). However, in a real-life context, the relationship between attitude, intention and behaviour varies depending on the situation. For example, farmers may be interested in new technology to enable adaptation to climate change, but may be reluctant to adopt it because of the additional investment, time and difficulty related to its use. Thus, a positive attitude to adaptation is a necessary, but not sufficient condition to change farmers' behaviour. Psychological attributes include attitude, subjective norms and perceived behavioural control in addition to several other factors that influence human behaviour, but which are not considered by the TPB (Barr et al. 2001). The TPB has been criticised for its overreliance on psychological factors (Armitage and Conner 2001, Thapa Karki and Hubacek 2015) and, therefore, its ability to predict the relationships between attitude, intention and behaviour, and there have been calls for an extended TPB

(Armitage and Conner 2001, Barr et al. 2001) which would include additional variables that would increase its predictive capacity (Ajzen 2011)

2.2.3 Conceptual framework to analyse farmers adaptation behaviour

This study proposes a conceptual framework (Figure 5), based on the TPB (Ajzen 1991). The TPB includes attitude to adaptation behaviour, subjective norms, perceived behavioural control and intention to adapt. Attitude toward adaptation, in the context of climate change adaptation in agriculture, refers to the farmer's evaluation of an adaptation behaviour as good or bad. Subjective norms refer to how others view adaptation to climate change. Perceived behavioural control refers to the perceived level of easiness or the farmer's confidence in adaptation to climate change. For example, farmers who perceive that they have the capacity easily to change their farming practices will be more likely to adapt than farmers who perceive change as difficult. Intention to adapt indicates the individual's readiness to perform a behaviour. In this study, intention to adapt is the degree of readiness of the farmer to adapt in response to climate risks.

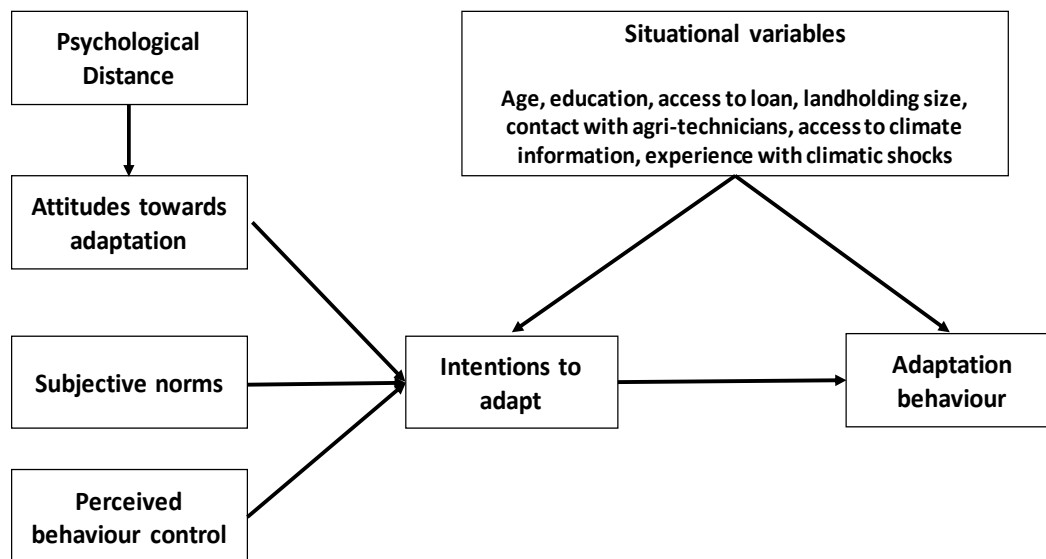


Figure 5. Conceptual framework explaining antecedents of intentions, intention to adapt and adaptation behaviour (Source, adapted from Barr and Gilg, 2007)

This framework integrates psychological distance, a psychological construct, and also situational variables in the TPB (Figure 5). Psychological distance refers to the farmer's mental experience on the temporal, geographical and social distance to the occurrence of climate change. Thus, if

the farmer is psychologically distant from climate change, he or she will believe that it does not exist now or in the near future, and will only affect other geographical locations. On the other hand, if the farmer is psychologically close, he or she will be ready to take steps to adapt to climate change (Spence et al. 2012). The TPB does not include situational variables since it assumes that these variables are mediated via attitudes, subjective norms and perceived behavioural control. The situational variables include in the proposed framework are age of household head (Nhemachena and Hassan 2007), landholding size (Tun Oo et al. 2017), education (Alauddin and Sarker 2014), access to loan (Deressa et al. 2009), access to agricultural technicians, experience of climate shocks (Boansi et al. 2017, Zamasiya et al. 2017) and access to climate information. By including these situational variables, the proposed framework responds to critiques about the TPB's overreliance on psychological factors (Beedell and Rehman 1999, Thapa Karki and Hubacek 2015).

2.3 Methodology

2.3.1 Data collection

A total of 546 households were selected for the survey using a lottery system and based on lists of households obtained from the village municipality offices. Fifteen statements were generated, including attitude to adaptation, subjective norms, perceived behavioural control, psychological distance and intention to adapt, to measure psychological constructs. The household survey was pilot tested (n = 15) following its translation into Nepali. The different parts of the survey referred to: i) farm and farmer characteristics; ii) climate change beliefs, perceptions and TPB variables; and iii) farmers' adaptation strategies. Some of the questions were tailored to the study regions. Administration of the surveys was arranged directly with the farmers at times and places to suit them. The respondents were household heads because of their important input to decision-making in farming households in Nepal. Interviews lasted around one hour.

As expected, farmers in the study areas did not understand the term 'climate change adaptation'. At first, we had informal discussion with key personnel in the villages which revealed main extreme climatic events - hailstones in Sindhupalchowk and Lamjung, and drought in Sunsari. During data collection, we asked about changes to their farming related practices and livelihood strategies to

face the recent extreme weather events. This process ensured that adaptations were climate change related.

Extreme climatic events in Nepal, such as massive rainfall, floods, landslides and forest fires are considered weather related, however they are not included in the study since they did not affect the study areas. For example, agricultural land in the Sunsari district are affected annually by flooding of the Saptakoshi river, but the Amaduwa and Sahebganj villages in the same district have never been affected by flooding since they are fairly remote from the river. However, they have been severely affected by drought and delayed onset of the monsoon. Similarly, as landslides, and forest fires were not significant problems in the study areas in the Lamjung and Sindhupalchowk districts, they were not included for the study. This implies that extreme climatic events are place specific, and it is important to contextualise the extreme climatic events in climate change research.

Focus group discussions (FGDs), including 18-24 farmers for a period of around 2 hours, were held in the six villages to obtain a better understanding of farmers' attitudes to adaptation and their adaptation behaviours. The topics discussed in the focus groups included: i) farmers' perceptions of changes to local climatic conditions in the previous 20 years; ii) their impact on farming systems; and iii) how the farmers had managed those changes. The results of the FGDs which were held before the household survey was conducted, contributed to its design and reformulation (e.g., the adaptation practices identified in the FGDs were included in the household survey) and data from the FGDs were used to complement the survey findings. For example, the responses to the survey highlighted the factors influencing adaptation to climate change, while the FGD provided an understanding why these factors were important. In the succeeding sections, we describe our data collection methods.

2.3.2 Variables and measurement

The statements related to TPB, including attitude to adaptation, subjective norms, perceived behavioural control, intention and adaptation behaviour, are based mainly on Ajzen (2006) and Francis et al. (2004). The questions related to psychological distance to climate change were developed in line with Liberman and Trope (1998) and Spence et al. (2012). The questions related to situational variable were based on Deressa et al. (2009) and Below et al. (2012). The survey

included 22 items, 15 psychological variables (see Table 4) and 7 situational variables. All the psychological variables in the study were measured on a Likert scale from 1 to 5 (1 = strongly disagree, 2 = slightly disagree, 3 = neutral/do not know, 4 = slightly agree and 5 = strongly agree).

The situational variables included in the study were farm and farmer characteristics including age, education, landholding size, access to loans, contact with agricultural technicians, climate information and number of climatic shocks in the previous five years. Information on landownership was categorised as: 1= less than 0.5 ha, 2 = 0.6 to 1 ha, 3 = 1.1 to 1.5 ha, 4 = 1.6 to 2 ha and 5 = more than 2 ha. Information on household head age was categorised into four groups (under 30 years old, 31 to 45 years, 46 to 60 years and over 60 years). Education was categorised as illiterate, just literate, primary, education, secondary education and university education). Climate shocks in the previous five years were categorised as Low=1, medium=2 and high= 3 or more. Access to loans, climate information and contact with agriculture technicians are dichotomous variables.

Among the situational variables, this study does not include household head gender. Direct information on gender of household head does not correctly reflect the household decision maker, due to deeply embedded patriarchal system in the Nepalese society. Focus group discussion and informal communication with participants showed that even in mostly female households the eldest male makes most of the farm related decisions. Instead of asking about gender of household head, it was necessary to ask who made decisions on each of the farming and household activities which is beyond the scope of the study. Similarly, this study does not include traditional knowledge as a variable since it is difficult to quantify the extent of traditional knowledge used by farmers in various adaptation practices.

Adaptation behaviour was measured on a 3 point Likert scale based on number of adaptation practices (1 = less than 2 practices, 2 = 3 to 4 practices, 3 = 5 to 8 practices). These adaptation behaviours included: adjusting the cropping area, changing the crop, migration, changes to crop variety, growing a different crop, adjusting sowing time, increasing livestock holding, raising different types of livestock.

2.3.3 Data analysis

Farmers' responses were analysed by using the Statistical Package for Social Sciences (SPSS 23). First, the data were cleaned by checking for cases with missing values, outliers and irregularities. Structural Equation Modelling (SEM) was applied to examine the conceptual framework to determine the adaptation behaviour of farmers in response to climate risks. Amos 25 software was used to analyse relationship among the model variables and produce a graphical presentation. SEM is a statistical method used to evaluate the plausibility of a hypothesised model. SEM has two components: a measurement model and a structural model. The measurement model describes the relationship between the observed variables and the latent constructs. The observed variables can be measured directly, but the abstract nature of the latent constructs does not allow direct measurement. The structural model describes the interrelationships among the constructs. Each construct includes different manifest variables which are measured through observed statements. For example, attitude is a construct that is measured through three statements as manifest variables.

Structural Equation Modelling (SEM) is a frequently used method to test models that include latent and observed variables (Daxini et al. 2019). SEM is a powerful tool that has the unique capacity to estimate multiple relationships, identify unobserved constructs in these relationships and define a model explaining an entire set of relationship (Kline 2005, Hair et al. 2014). First generation tools, such as regression, ANOVA and MANOVA cannot answer a set of relationships in a single, systemic and comprehensive analysis (Anderson and Gerbing 1988, Tarka 2018). Compared to first generation statistical methods, SEM assesses the measurement model (which relates the measured variable to the latent variable) and, in the same analysis, to evaluate the structural model (which relates the latent variables to one another). Other multivariate techniques are able to examine only one relationship at a time and cannot be used to test an entire theory using a comprehensive technique and all available information (Hair et al., 2014; Xiong et al., 2015). Therefore, SEM allows more rigorous analysis of the research model and is a powerful methodological tool (Hair et al. 2014).

The conceptual framework was tested and analysed using the two-step SEM recommended by Anderson and Gerbing (1988). First, Confirmatory Factor Analysis (CFA) of the measurement model showed the relationships between the observed variables and the constructs. CFA aims to

understand how well the measured variables represent the constructs before testing the overall measurement model (Hair et al., 2014). Then, a structural model showing the relationships between the constructs is tested. The relationship between the constructs was tested using Maximum Likelihood estimation. Different fit indices were used to check how well the theoretical model fit the data (Hooper et al. 2008): they included normed chi square (CMIN/DF), root mean square approximation (RMSEA), Comparative Fit Index (CFI) and Parsimonious Normed Fit Index (PNFI). A model is acceptable only if it satisfies the recommended goodness of fit indices. The general guide to the cut off values for these indices was used to determine adequate model fit: normed Chi-Square and RMSEA should be less than 3 and 0.06 respectively while CFI and PNFI should be greater than 0.95 and 0.5 respectively.

2.4 Results

2.4.1 General characteristics

Household heads were aged between 22 and 90 years, with an average age of 52.38 years (S.D. = 12.07); 86.9% of them were men. About two-third (67%) were aged over 45 and about half (46.3%) were aged between 46 and 60 years. Only 2.4% of farmers were under 30 years old. More than half (61.72%) had received no formal education. One-fifth (20.5%) were illiterate. Very few had a university education (1.8%). About three quarters (74.17%) of farmers had owned less than one hectare of land and only a few (3.5%) farmers had owned more than two hectares of land. Almost a third (31%) of households had contact with agri-technicians. The major climate shocks were hailstones in Lamjung and Sindhupalchowk and drought in Sunsari. More than four-fifths (83.2 %) households had direct experience of at least one climatic shock in the previous five years.

2.4.2 Adaptation behaviour

The results of the household survey showed differences in the responses to climate change. Farmers' adaptation strategies included adjusting crop area, changing crops, changing crop varieties, growing a new crop, adjusting sowing time, migration, increasing livestock holding and keeping a different type of livestock (Figure 6). The most frequent adaptation strategies to respond to climate change were changing livelihood strategy and dependency from migration for off farm activities (72%), changing the crop (56%) and changing the crop variety (46%). Changing dependency from farming to off-farm activity by migration as an adaptation strategy was highest

in Lamjung (96%) followed by Sindhupalchowk (86%) and Sunsari (46%). Migration is normally temporary for waged labour and taking a job in a nearby city or abroad, which acted as a safety net following a climatic shock. Farms that suffered hailstone damage or drought were required one or more adult members of the household to migrate to engage in non-farming activities to manage the immediate crisis.

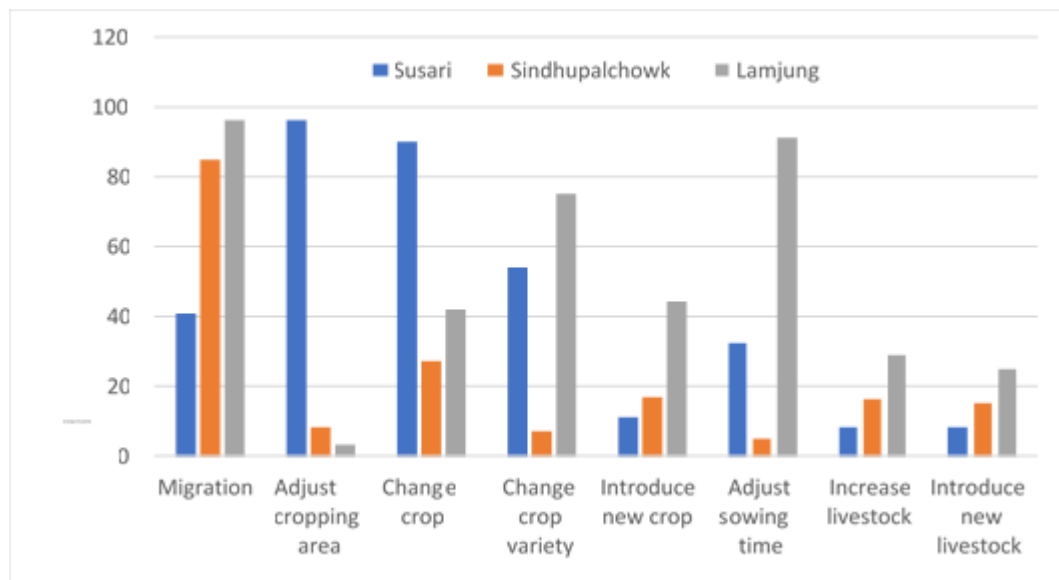


Figure 6. Adaptation practices adopted by farmers in three districts

Changes to or a shift to livestock farming was increasing in Lamjung where hailstone damage was very high compared to the Sunsari and Sindhupalchowk regions. The results of the household survey showed that 17.2% farmers had increased their existing livestock holding and 15.4% were keeping different livestock as an adaptation strategy. During the FGDs, it emerged that one of the main reasons for shifting to raising more animals was that they could be sold immediately following a climate shock. Animals are affected less than crops by hailstone damage or drought, for instance, which is a motivation for increasing livestock holdings and keep different livestock.

2.4.3 Measurement model

This section discusses measurement of the relationship between the observed variables and the underlying latent constructs in the conceptual framework. For example, in Table 4, attitude is a latent construct which cannot be measured directly, but rather is measured using three statements. Factor loadings in the measurement model show how these statements are related to the corresponding latent construct. CFA is used to measure the factor loadings, which show correlation between the original variables and derived constructs. The factor loadings of the observed variables range from 0.657 to 0.951, showing high variance which is explained by the variables for the corresponding factors (see Table 4). CFA was used to test the adequacy of the measurement model. To examine the validity of the conceptual framework measurement model, a five-factor model was tested using CFA, where the factors of interest (attitudes toward adaptation, subjective norms, perceived behavioural control, intention, psychological distance) are modelled as distinct, but interrelated constructs.

The reliability and validity of the latent constructs in the conceptual framework were examined. Reliability measures the internal consistency of the multiple observed variables in the latent constructs (Hair et al. 2014). Composite Reliability (CR) of the latent constructs should be more than 0.7. CR values ranged from 0.83 to 0.92 (see Table 4), which indicates good reliability of the latent constructs in the framework. Validity is associated to the degree to which the observed variables measure the intended construct. Convergent validity is the extent to which different measures of the same construct are related, which is measured by Average Variance Extracted (AVE). The AVE value should exceed 0.5 to show suitable convergent validity (Hair et al. 2014). The calculated AVE ranges between 0.62 and 0.80 (see Table 4), showing good reliability of the model. The AVE value of each construct was greater than the square of the corresponding inter-construct correlations, confirming discriminant validity.

Table 4. Descriptive statistics of statements for measuring different TPB constructs and results of the measurement model

Items	Statements	Mean (S. D.)	Factor loadings	CR	AVE
Attitudes towards adaptation behaviour					
AT1	Adaptation in agriculture is necessary to reduce the impact of climate change.	4.10 (0.88)	0.793	0.84	0.64
AT2	Adaptation in farming is important to reduce the negative consequences of climate change in agriculture and our livelihoods.	3.90(0.90)	0.782		
AT3	Adaptation in farming is good for me and my family.	4.48 (0.80)	0.821		
Subjective norms					
SN1	People think that all the sectors of the society be responsible and act equally in response to changing climate.	3.42 (0.86)	0.832	0.83	0.63
SN2	I have seen other farmers changing the farming practices to adapt to climate change.	3.44 (0.89)	0.794		
SN3	I believe that all farmers should respond to climate change to protect their livelihoods.	3.61(0.93)	0.748		
Perceived behavioural control					
PBC1	Farmers can change farming practices according to the need or climate change.	3.93 (0.97)	0.892	0.88	0.79
PBC2	Changing farming practices in response to climate change is up to me.	3.46 (0.93)	0.889		
Intentions to adapt					
INT1	I intend to adapt my farming.	4.24 (0.75)	0.894	0.86	0.62
INT2	I would consider the practical solutions and recommendations for adaptation in my farming.	4.27 (0.64)	0.667		
INT3	It is likely that I will change my farming practices.	4.08(0.77)	0.657		
INT4	I will apply my knowledge and skills on adaptation practices.	4.26(0.71)	0.889		
Psychological distance					
PSD1	Climate change is not problem in our area.	2.62 (1.24)	0.951	0.92	0.80
PSD2	Climate change will have only negligible impact for farmer like me.	2.53 (1.37)	0.786		
PSD3	Climate change will not affect us until next ten years.	2.57(1.17)	0.935		

2.4.4 Structural model

Figure 7 presents the graphical output of the conceptual model showing the influence of the different variables on intention and adaptation behaviour. Starting from the left-hand side of the model, psychological distance shows a significant and negative relationship on attitude to adaptation. The negative influence of psychological distance is as expected since it was assumed that psychological proximity (low psychological distance) increases the positive attitude to adaptation and has a positive effect on the intention to adapt. The influence of psychological distance was not significant for the intention to adapt. This implies that the influence of psychological distance on intention to adapt is likely to be facilitated by the attitude towards adaptation. In terms of the TPB variables, attitudes, subjective norms and perceived behavioural control have a significant and positive relationship to the intention to adapt.

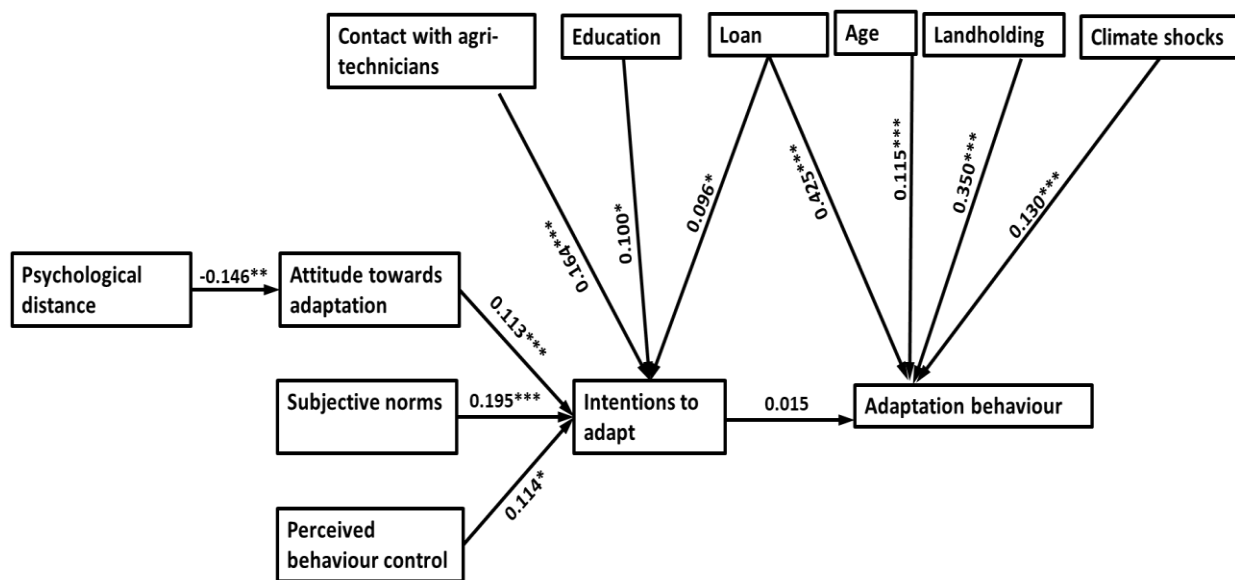


Figure 7. Graphical output of the conceptual model showing influence of different variables on intention to adapt and adaptation behaviour

(Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; only significant paths are presented in the diagram for clarity of presentation; $\chi^2/df = 1.51$, RMSEA = 0.031, CFI = 0.980 and PNFI = 0.683)

The results showed that assigning more importance to role of the interaction with the society in adaptation as a subjective norm had the highest positive relationship on intention (0.195) compared to attitude to adaptation (0.113) or perceived behavioural control (0.114). Contact with agricultural technicians, education and access to loans have a positive and significant relationship

with the intention to adapt. Climate information has no significant relationship with intention to adapt or adaptation behaviour. Similarly, intention to adapt has an insignificant relationship to adaptation behaviour. The situational variables, such as age, landholding size, access to loan and experience of climate shocks, have a significant influence on adaptation behaviour. Access to loans is the only situational variable which shows a positive and significant relationship to both the intention to adapt and adaptation behaviour.

2.5 Discussion

The aim of this chapter is to investigate intentions related to the farmers' decision-making processes in adaptation, to encourage further adaptation in farming. An extended TPB framework including psychological variable (psychological distance) and situational variables (age, education, landholding size, access to loan, contact with agricultural technicians, climate information and experience of climate shocks) was used to analyse farmers adaptation behaviour. The findings confirm the importance of considering both psychological (attitudes, norms, perceived control) and situational (farmer characteristics and farming context) factors to analyse farmer behaviour.

2.5.1 Adaptation behaviour of small farmers

The results showed that the major farm related adaptations of farmers in response to climate change are changing livelihood strategies from farming to off-farm work, changing crops, changing crop varieties and adjusting sowing times. These traditional adaptive measures require few additional resources or external support. However, they are not very effective for reducing future losses to agricultural production. A possible explanation of this result is that farmers with a low level of education, few resources (land, credit), and little external support, adopt adaptation practices that require fewer skills and resources. A key implication of this result is that in the absence of supporting institutions for more technical adaptation practices, farmers will rely on traditional adaptation strategies (e.g., livelihood diversification, migration) and management (e.g., change sowing time). Many technical adaptation practices, which require more knowledge and resources, including rainwater harvesting and drip irrigation (Ferrand 2015, Khatri-Chhetri et al. 2017), soil conservation (Wauters et al. 2010, Altieri and Nicholls 2013) and use of climate information are not popular in the study area. The diffusion of technical adaptive measures to small farmers requires external technical and financial support, at least initially. In general, these

adaptation strategies are planned and mediated by local NGOs and national or regional organisations and, hence, can be mostly seen only on the programme intervened areas. Provision of technological and financial services for adaptation are important for the uptake of technical adaptive measures by farmers.

These adaptation practices of farmers are mainly autonomous response, devised by farmers to mitigate the impact of extreme weather events. It can be sometimes difficult to disentangle traditional and technical adaptation behaviour. For example, in the case of the Amaduwa and Sahebganj villages in Sunsari, there is a nearby sugarcane factory with extension agents who promote sugarcane production. However, sugarcane cultivation is limited due to the risks and additional costs involved. Many farmers switched from rice to sugarcane crop only after a drought or delayed monsoon which cause reduced rice yields or crop failure. For Indigenous farmers, these changes are a spontaneous response to changing climate which the interviewer introduced as climate change adaptation.

The results of the quantitative analysis show that farmers use one or more adaptation practices depending on individual capacity. However, the analysis does not explain the possible implications of these adaptations for society, culture and the environment. Qualitative information from focus group discussions showed that shifting to off-farm activities or migration and reliance on remittances can result in loss of traditional labour exchanges '*laari*' in Yolmo and '*parma*' in Gurung community. This kind of loss of traditional social and economic institutions can have serious implications for secluded Indigenous communities. Similarly, shifting to new hybrid rice seed by the Gurung could lead to loss of traditional varieties, higher use of chemical fertilisers and loss of traditional rice seed exchanges, all of which will threaten the sustainability of the smallholder farming system. Moreover, top-down approach of technical adaptation interventions is more focussed on increasing robustness of livelihoods and avoiding future economic losses rather than on the possible negative consequences. Future research could examine the implications of climate change adaptation for sustainability of Indigenous societies, culture and environments.

2.5.2 The role of social contexts on intentions

The result shows that attitudes to adaptation, subjective norms and perceived behavioural control have a significant and positive relationship to intention. This suggests that a positive (favourable) attitude to an adaptation practice, the belief that an important individual or social group approves the adaptation practice (perceived social pressure), and the belief that a farmer has the capacity to adopt the practice (easiness of performing an action), will result in the likelihood of intentions to adapt. This finding is in line with work on sustainable agricultural practices (Zeweld et al. 2017), conservation agriculture (Lalani et al. 2016), improved natural grassland (Borges and Oude Lansink 2016), nutrient management (Daxini et al. 2019) and agricultural diversification (Senger et al. 2017). Among psychological factors, the influence of subjective norms was highest for the intention to adapt. This suggests that farmers who feel social pressure from others in society who are responding to climate change will be more likely to change their farming behaviour. This contrasts with the findings from studies of pro-environmental behaviour (Masud et al. 2016) and sustainable agricultural practices (Zeweld et al. 2017), which find that attitude is the main predictor of intention. Other studies (Armitage and Conner 2001, Thapa Karki and Hubacek 2015) highlight the role of attitude in predicting behaviour and suggest that norms and perceived behavioural control are less important than attitude to behaviour. However, the findings are consistent with the results of the studies on intention in the context of environmental conservation (Mastrangelo et al. 2014), forest conservation (Greaves et al. 2013) and agricultural insurance purchase (Lo 2013) where subjective norms have a major influence on behavioural intention.

One reason why subjective norms are shown to be a major influence on intention to adapt might be that this study was conducted in remote villages in Nepal, where the behaviour of farming households is heavily influenced by others' behaviours and opinions, especially those of village leaders, neighbours and relatives (FGD 1,2,3,5). An important implication of this result is that development agencies should focus on creating positive social pressure in relation to adaptation to climate change. This could be achieved by fostering collective action, trust building and shared relationships. Development agencies could use farmer groups, cooperatives and other local community organisations to create social pressure for a change in farming practices. This would lead to the diffusion of adaptation practices among the farmer community.

2.5.3 Influence of situational variables on adaptation behaviour

The findings of this research show that intention to adapt does not influence adaptation behaviour directly, implying that a stronger intention to adapt does not guarantee adaptation behaviour. This contrasts with the findings of Deng et al. (2016) and Masud et al. (2016) in a pro-environmental context which suggest that intention leads pro-environmental behaviour. The reason for a non-significant relationship between intentions to adapt and adaptation behaviour could be due to the situational factors that are specific to individuals. As behaviour is structured around an individual's everyday life, various factors can influence intention and behaviour relationship (Barr and Gilg 2007). Following this, the findings of this research show that situational variables (e.g., farmer age, access to loans, landholding size and experience of climate shocks such as hailstorms and drought) that is specific to individuals are responsible for the gap between intention to adapt and adaptation behaviour.

The results show that landholding size is related significantly to adaptation behaviour. This might be because, in rural Nepal, individual wealth is represented by land holding, which also determines social status and political power (Karki et al. 2011) and, in turn, increase access to other resources such as GOs and NGOs, and agricultural technicians. Larger landowners tend to invest more in adaptation than very small landowners (Bryan et al. 2013, 2016, Ndamani and Watanabe 2016) due to the extent of risks involved. This makes them open to adaptation practices to ensure the loss is limited. This study found, also, that older farmers are more likely to adapt indicating the significant and positive relationship of age and adaptation behaviour. Most farmers in Nepal are aged over 45, with the younger generation less interested in farming and more interested in finding a job in an urban area (FGD 1,2,4,6). Hence, with older farmers their experiences of farming and sharing of their knowledge with neighbours and others facilitates learning and trying new practices. The present study supports the finding that older farmers are more likely to adapt in Nhemachena and Hassan (2007) for Southern Africa, Tun Oo et al. (2017) for Myanmar and Yong (2017) for Cameroon.

The study provides evidence of a positive and significant relationship between education and intention to adapt, but not adaptation behaviour. Since 61.67% of farmers received no formal education, it can be inferred that farmers find it difficult to access information on adaptation. In a developing country context where most farmers are poorly educated, the finding should be seen

as encouraging and since it suggests that adaptation to climate change is not constrained by lack of formal education (Karki et al. 2011). However, Deressa et al. (2009) and Alauddin and Sarker (2014) found that education was an important factor in adaptation.

The findings from this study show that access to loans is significantly and positively related to the intention to adapt and to adaptation behaviour, which is in line with the findings in Deressa et al. (2009) and Gebrehiwot and Van Der Veen (2013) for Ethiopia and Rahut and Ali (2017) for Pakistan, who show that access to loans increases adaptation. In both the FGDs and the interviews, farmers referred to the importance of formal and informal credit. However, most small farmers lack access to large financial institutions and are considered high risk clients (Karki et al. 2011) and the majority are forced to rely on local savings and credit cooperatives and informal moneylenders and merchants who charge exorbitant rates of interest. Interest rates charged by local cooperatives range from 18% to 30% per year while informal moneylenders can demand interest up to 60% per year (FGD1,2,3,4,6). Comparing with a normal bank interest rate of around 12% per year (Bhattarai 2015), this result suggests the need for government regulation to ensure appropriate lending mechanisms and special rates for small farmers.

The study shows that experience of climatic shocks, including hailstones and drought, has a positive influence on adaptation behaviour. This is in line with previous evidence of a positive association between climate change adaptation and experience of climatic shocks (Boansi et al. 2017, Zamasiya et al. 2017) and that experience of climate shocks pushes farmers to take precautions against possible future losses. Therefore, in areas with more dramatic climate shocks, farmers tend to adapt more compared to those that experience minor climatic shocks. For example, if a farmer has never suffered extreme drought, his/her perceived probability of yield losses caused by drought will be lower and will result in a lower level of interest in adaptation. This highlights the need to explain climate risks to all farmers to motivate them to plan for and be able to manage agriculture losses due to multiple and recurrent climatic shocks.

2.6 Conclusions

This chapter contributes to the literature on climate change adaptation by developing a comprehensive framework that includes psychological and situational variables, to understand the influence of different factors on adaptation behaviour. The findings support the proposed framework and provides support for the argument that both situational and psychological factors matter for understanding farmers' adaptation behaviours. The findings show that subjective norms are important psychological factors influencing the intention to adapt and suggest that farming households' adaptation intentions depend on social and cultural influences. Since the farmer's social environment has an important influence on the intention to adapt, more efforts should be made to create positive social pressure for adaptation and to augment farmers' capabilities by promoting collective actions and building mutual trust and shared relationships.

This study suggests that the intention to adapt, on its own, does not lead to adaptation behaviour, what is required is to integrate wider situational factors, such as access to loans, landholding size, age of the household head and experience of climatic shocks in the analysis. To be effective, policy measures to promote climate change adaptation practices should include financial and technical support. The study is relevant, as Nepal is currently National Adaptation Plan (NAP) to guide comprehensive medium and long term planning and reviewing Nationally Determined Contributions (NDC) to achieve the targets of the Paris agreement. A business-as-usual, top down approach to the planning of climate adaptation policies and programmes which introduces new adaptation practices are not effective for farming communities and, especially, Indigenous communities with different and social and cultural practices. Programmes should focus on improvements to existing adaptation practices based on the incorporation of local knowledge and skills. While adaptation is important to increase robustness to future climate change induced economic losses, it can have negative effects on society, culture and the environment.

This study has some limitations which suggest directions for future research. It suggests that some farmers have a negative attitude to certain climate change adaptation practices but does not explain why. Further research could explore the reasons for farmers' negative attitudes to certain adaptation strategies and how these could be changed. This study found that society played a role in determining adaptation to climate risks but is not explicit about how underlying interactions with society affect adaptation. Future research could conduct in-depth study of how farmers

interact with their social and cultural environment and how this interaction influences adaptation to climate change risks (see Chapter 3). The findings from this research are based on self-reported farmer behaviours; self reporting risks 'socially desired' responses (Fisher 1993). Future research could adopt a longitudinal and experimental approach. Nevertheless, the research results provide new insights into the factors determining farmers' decision-making behaviour and how farmers could be encouraged to adapt to climate change.

3. Entrapped in climate change adaptation – Understanding the role of economic and non-economic capitals in farmers adaptation

3.1 Introduction

Climate change is posing significant challenges, including reduced yields, for agricultural development in low income countries and this is affecting the livelihoods of small farmers (Morton 2007, IPCC 2014). Climate change impact projections show that plant pests and diseases will increase and water resources will decrease, which will threaten food production and small farmers' incomes (Mendelsohn and Dinar 2009, Field et al. 2014). These effects will be exacerbated by the increased frequency and severity of different climatic extremes including flood, drought, heat waves, periods of excessive cold and hailstones (Christoplos et al. 2009). Depending on their capacity to adapt, farmers respond to these negative impacts of climate change by either changing their farming practices or changing their livelihood strategies.

Capacity to adapt requires access and control of different forms of capital. Many studies emphasize 'economic capital', such as cash and property, as an indicator of adaptive capacity and argue that adaptation requires high levels of economic capital (Below et al. 2012, Wood et al. 2014). However, this stream of work does not explain social relations and cultural values including power relations affecting adaptation (Pelling and High 2005, McNeeley and Lazrus 2014, Casanova-Pérez et al. 2016). Despite being in possession of the required economic capital, some individuals in certain communities may fail to adapt, perhaps because the farmer's actions may depend on the community (Xue et al. 2014). Failure to adapt may be the result of local social, cultural and political impediments which marginalise already resource-poor farmers even further (Adger et al. 2013, Biesbroek et al. 2013). Therefore, regardless of knowledge about and interest in adaptation, adaptive capacity is shaped by social relations and cultural values including power relations (Pelling and High 2005, McNeeley and Lazrus 2014, Casanova-Pérez et al. 2016). All of this points to the value of non-economic capitals in the context of adaptation to climate change, including economic, social (networks) and cultural (skills, knowledge, education) (Byg and Herslund 2014, Chen et al. 2014, Alam et al. 2016).

Among forms of non-economic capital, there has been increased academic interest in understanding the value of symbolic capital (prestige, reputation) in the context of farming (Eichholz et al. 2013, Conway et al. 2016, Bartkowski and Bartke 2018). For example, (Eichholz et al. 2013) discuss how farmers in Uzbekistan use symbolic capital to access land and water resources. However, very few studies look at the role of symbolic capital in farming. An understanding of symbolic capital is important since it endows social agents with the symbolic power to dominate in society, and helps to legitimize supremacy in society (Bourdieu 1986). However, among types of non-economic capital, the role played by symbolic capital in climate change adaptation, in a resource constrained developing context, has received little attention.

So far, work on adaptation has emphasised the influence of individual forms of capital. However, previous work does not discuss how farmers switch between economic and non-economic capital to adapt to climate change (WRI 2009). Although there is a strand of work that discusses the role of different forms of capitals in adaptation to climate change in farming (Valdivia et al. 2010, Ifejika Speranza et al. 2014, Tinch et al. 2015), it does not explicitly examine the conversion of capital from the perspective of climate change adaptation. Despite the conceptualisation that capitals are convertible (Coleman 1988, Sutherland and Burton 2011), there is a lack of empirical research on this issue. The present study tries to fill this gap by exploring research question - how Indigenous farmers use and convert different forms of capital in their adaptations to climate change?

The study is motivated empirically by the small body of work on the dynamic nature of capital at the household and community levels from other disciplines including education (Bathmaker et al. 2013), health (Veenstra and Abel 2019) and aging (Gilleard 2020) which is explored in the context of Indigenous communities -Tharu, Gurung, Yolmo - in Nepal. Historically, Indigenous communities in Nepal and elsewhere the world have been marginalised in the process of development and overlooked by academic, policy and public discourse (Salick and Byg 2007). These communities are the most exposed to climate change because they are located in geographical regions with fragile ecosystems (Oviedo and Fincke 2009). However, research on adaptation by Indigenous communities is scant (Ford et al. 2016), The context of the present research is unique not only in studying Indigenous farmers in a low-resources developing country (Nepal) but also because, so far, few other developing countries formally protect their Indigenous communities from socially embedded inequalities. Nevertheless, Indigenous communities tend to be perceived by policy and practice as a homogenous group and their different inequalities have

received neither policy nor research attention. Nuanced studies are needed to understand climate change adaptation in relation to Indigenous communities.

The findings show that unequal possession of different types of capital and differential ability to convert available capitals, increases inequality such that already disadvantaged farmers are pushed into a maladaptation¹ trap, while privileged farmers reap the benefits. This study argues that ignoring the heterogeneity within Indigenous groups, masks disparities in the mobilization of capital, which increases the vulnerability of small farmers. By implication, the results provide support for Bourdieu's (1986) claims, that individuals use and convert different forms of capital in order to gain and maintain their position in society. From a theoretical perspective, the results of this study suggest that, in a developing country context, symbolic capital is a strong driver of adaptation to climate change in farming because it facilitates acquisition of the resources required for adaptation from powerful institutions. This paper contributes to work on climate change adaptation and policy debates on Indigenous communities, by helping to explain how the adaptation efforts of certain privileged groups affect the adaptation efforts of disadvantaged groups in society. The results should be useful for policymakers and development practitioners, planning and implementing economically and socially equitable interventions in Indigenous communities in response to climate change.

This chapter is structured as follows. Section 3.2 explains the theoretical background to the study and introduces Bourdieu's theory of practice to conceptualise capitals and conversion of capitals. Section 3.3 describes the methodology and Section 3.4 presents the results which are discussed in Section 3.5. Section 3.6 offers some conclusions and theoretical and practical implications of this research.

3.2 Theoretical background

Bourdieu and Nice (1977) describe the *theory of practice* based on the interrelated concepts of *habitus*, *field* and *capital*. *Habitus* refers to internalisation of the social world by social agents in the form of skills, habits and dispositions, which ensures regularity of behaviours associated to social structures such as class, ethnicity and gender. *Habitus* guides agents' values and

¹ In a general sense, maladaptation refers to actions, or inaction that may lead to increased risk of adverse climate-related outcomes, increased vulnerability to climate change, or diminished welfare, now or in the future (IPCC, 2014)

perceptions of the world, ensures a common approach to the rules of the game (*modus operandi*) and determines reactions to certain situations (Bourdieu and Nice 1977, Anderson et al. 2010). *Field* refers to the social spaces where individuals and groups with specific interests, capacity and power relations, negotiate and compete for resources (Sapiro 2010). Bourdieu (2011) suggests that social agents struggle for economic, cultural, social and symbolic forms of *capital* in order to assure their position in the social order and, thus, to accumulate capital. Power relations between the dominant and subordinate positions in the social spaces are reinforced, maintained and legitimised through social interactions and exchanges of capital (Baynes et al. 2016). Social agents with high amount of available forms of capital play a dominant role in shaping the rules of the game, which gives them power and ability to control the social spaces (Bourdieu 1986).

Bourdieu argues that human actions are facilitated by exploitation of capital and that it is difficult to explain the social world without understanding the different forms of capital and their conversion from one form to another (Bourdieu 1986). In Bourdieu's sense, farmers use social interaction and capital exchange mechanisms to accumulate more capital (Anderson et al. 2010). One type of capital can be obtained directly or indirectly through the use of other forms of capital (Bourdieu 1986). The amount and structure of forms of capital play an important role in the capital conversion process (Baynes et al. 2016). Non-economic forms (cultural, social and symbolic) are intangible and are rooted in economic capital, but can never be reduced completely to an economic form (Bourdieu 1986). Bourdieu (1986) explains that by converting an available form of capital into other forms of capital, individuals contribute to the increase in capital and maintain their position in society.

Economic capital includes financial assets such as buildings, land and natural resources. Bourdieu (1986) argues that economic capital is the most important form of capital; economic capital is more easily converted easily into other forms of capital than vice versa. Also, in climate change, economic capital is seen as a major influencing factor in the adoption of adaptation technologies, since high income farmers can afford more risky decisions (Wood et al. 2014, Jianjun et al. 2015).

Bourdieu (1986) defines social capital as total actual and potential resources that can be accessed through a network or via social connections. The amount of an individual's social capital depends on the size of the network and the resources available within the network (Bourdieu 1986).

Farmers benefit from belonging to a social network; for example, following an extreme climatic event the network enables collective sharing of labour and equipment (Lee-Ann and Glendinning 2008). Social capital is important for understanding individuals' adaptive capacity (Pelling and High 2005) and increases cultural capital through the transfer of knowledge and skills within the network. For example, in a study of cocoa agroforestry practices in Ghana, Isaac et al. (2007) found that transfers of knowledge from both Indigenous and external sources was facilitated by the informal networks within the farming community.

Cultural capital includes three forms: embodied, objectified and institutionalised capital. Embodied cultural capital refers to the farmer's long established personal dispositions including social and family norms and knowledge and skills (Bourdieu 1986). For example, a child in a farming household sees and learns different farming practices from his or her parents, through the transfer of cultural capital which ensures specific behaviour in specific situations (Sutherland 2013). Also, cultural experiences, such as visiting demonstrations sites, increase cultural capital. The knowledge, beliefs and perceptions related to cultivating different crops, and the ability to use different farming equipment, are examples of embodied cultural capital. Farm tools and equipment are objectified cultural capital, exemplified by the possession of high-status cultural goods such as modern farm machinery (Burton et al. 2008). Institutionalised cultural capital refers to recognition of an individual's cultural capital in the form of education degree and similar credentials. Cultural capital is considered important for farmers to access social capital (Lee-Ann and Glendinning 2008).

Symbolic capital refers to the value of all the forms of capital possessed by the social agent (farmer) in symbolic forms such as honour, recognition, respect and prestige (Bourdieu 1986). The position of an agent within a social space depends on accumulated symbolic capital, which is the individual's total combined economic, social and cultural capital (Lee-Ann and Glendinning 2008). The value of symbolic capital depends on the perceptions of other actors within the social space and, therefore, differs across social groups and contexts (Stotten 2016). Symbolic capital can be achieved through good agricultural practice, rewards or honours (Sutherland 2013), or through the possession of specific cultural capital in the form of skills (Sutherland and Burton 2011). In a developing context, farmers with large land ownership have higher symbolic capital in the form of prestige in society, which give rise to economic power and a higher social and political position (Karki and Dhakal 2009).

This study uses Bourdieu's concept of capitals and their conversion from one form to another, to understand how Indigenous farmers mobilise various forms of capital for adaptation to climate change. Here, adaptation in farming take place in a social space where different farmers struggle for recognition, which is fundamental to social life. Hence, adaptation in farming occurs following interactions in the society in which different capitals plays an important role. Through these interactions, farmers accumulate both economic and non-economic (cultural, social, symbolic) capital. In Bourdieu's sense, farmers with greater ability to use and convert *capital* become dominant in the social space and shape practices, which gives rise to more power and recognition in the social space.

3.3 Methodology

The research adopts a qualitative approach to data collection and analysis in order to understand how farmers convert available capitals in their adaptations to climate change. It is aimed at understanding how Indigenous farmers make sense of their life experiences amidst climate change and translate them into adaptation practices. Understanding life experiences requires a focus on broad rather than specific questions. Hence, by allowing participants to share their experiences, this study uses the voices of Indigenous farmers to describe and interpret their lived experience in the context of climate change adaptation. Following Tuffour (2017), this study captures farmers' lived experience by asking about farmers' adaptation experience.

3.3.1 Data collection procedure

Multiple tools were used to collect participant data including Participant Observation (PO), Focus Group Discussion (FGD) and semi-structured interviews. Farmers' involvement in different household activities, community forest groups, cooperatives, rituals and social events were observed via participation in eight formal and informal meetings, events and activities (for details see Section 1.5.4). FGDs were held in six villages to obtain a better understanding of climate change adaptation by Indigenous farmers. Focus group participants were selected via purposive sampling, following consultation with the rural municipality offices of the villages and local NGOs.

The semi-structured interviews were aimed at reaching a wider group including leader farmers, who are more experienced farmers, and marginalised demographics, including women; interviewees were identified with the help of local organisations and other farmers. Purposive sampling combined with snowball sampling were used to select the study sample. Among the 18 farmer participants, 6 were identified with the assistance of ward staff and local NGOs and 12 were identified by other interviewees. The interviews were designed to understand the agricultural and climate change context at both farm and village level and were conducted in participants' homes at times of their choice. Interviews lasted between one to two hours (see 1.5.2 for details).

Participants were asked some broad questions such as: 'Can you tell me what you have done in your farming practice in response to climate change (referring to an extreme climatic event e.g. hailstones, drought)?' Subsequent questions were based on the stories that participants told. The farmers described their personal experiences and their thinking about adaptations to climate change in the village. The semi structured interviews allowed us to explore communities' everyday activities and understand what they did, how they did it and why, which allowed a deeper appreciation of the issues involved in climate change adaptations. The concept of capitals and their conversion was not considered in the initial data collection, but emerged from analysis of interview data on adaptations to climate change by Indigenous farmers (Gummesson 2000).

3.3.2 Data analysis

Data were analysed using a hybrid inductive-deductive analysis (Fereday and Muir-Cochrane 2006). This method combines theory based deduction with data driven inductive methods. Deductive methods use theory to generate a set of a priori codes while inductive methods provide additional codes based on careful examination of the data. The analysis involved four steps. First an initial coding template was developed to define each construct in the conceptual framework. Second, code reliability was tested by applying the coding template to the interview data. Third, initial themes were identified by applying the coding template to the data sets and the additional codes. Fourth, codes were clustered with themes based on identification of patterns in the data sets.

The researcher immersed himself in the data to achieve familiarisation with the study context. This involved multiple reviews of the raw data from the FGDs and the interviews to generate an

understanding of the key issues related to adaptation practices adopted by households in the communities. The data were examined based on the two constructs: capitals and adaptation practices. Next, template analysis identified cases related to the coding template to code the interviews. The third stage involved the coding process. The coding template was used as guide, but as new codes emerged, they were included under the appropriate construct (e.g., religious institutions, permanent mobility of households). After several iterations to compare codes, 23 first-order codes were created (Figure 8). Codes were grouped and patterns were identified, to ensure that the themes represented the coding template and the codes assigned. For example, prestige, social position, awards and recognition, and reputation were clustered under symbolic capital. This process led to the identification of six second-order codes: changes in farming practices, migration, social capital, cultural capital, symbolic capital and economic capital. Finally, the second-order codes led to the aggregation of themes. The data structure (Figure 8), illustrates the systematic process of analysis and development of themes.

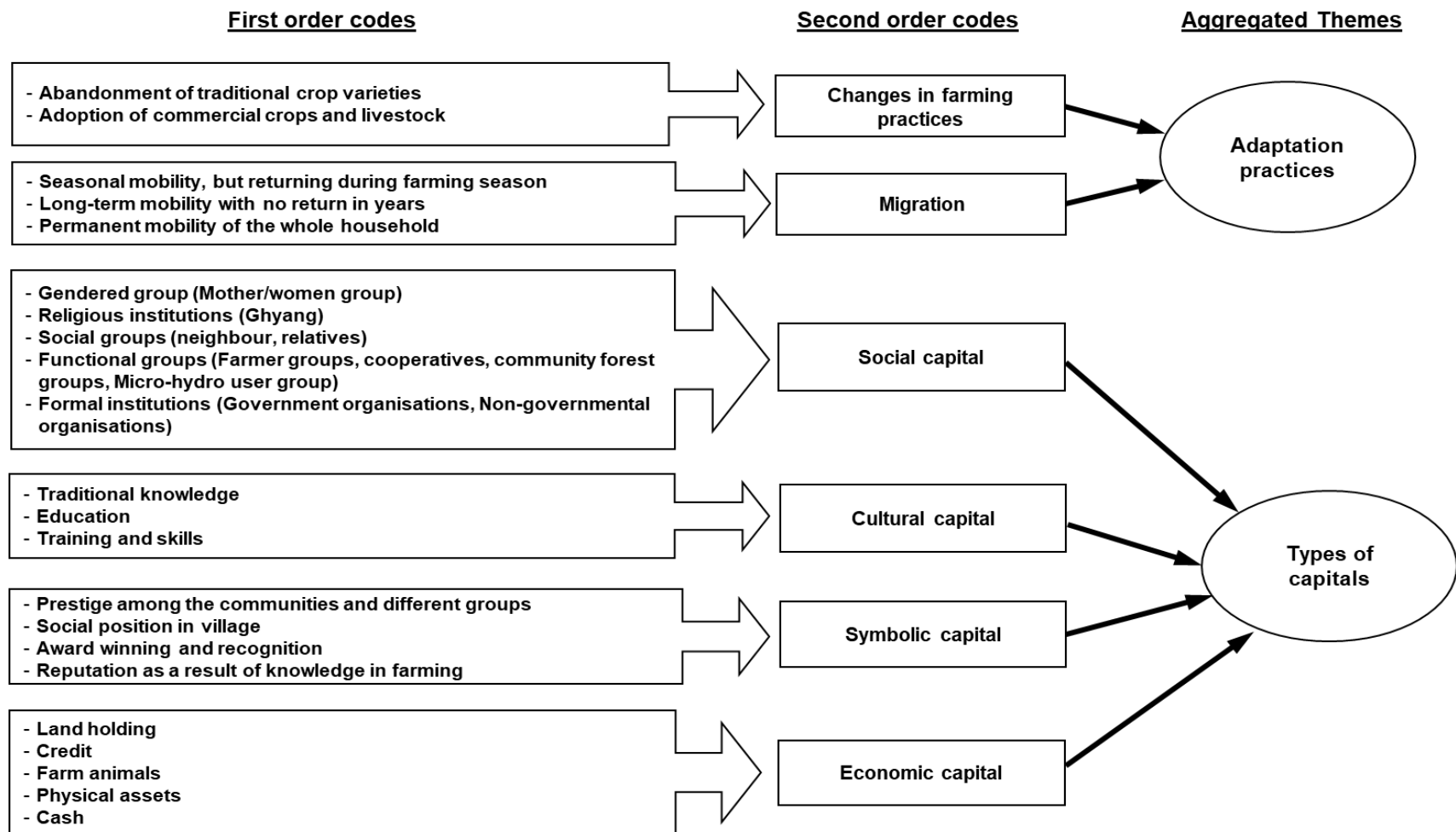


Figure 8. Data structure showing generation of themes

3.4 Findings

This section explains how the aggregated themes - capitals and adaptation practices - reflect interactions in the everyday lives of Indigenous communities which shape the adaptive capacity of different groups. Following Pratt's (Pratt 2008, Pratt 2009) recommendations for qualitative research findings and, the results are presented with quotes to highlight the salient features of the data and support the arguments. These quotes allow the voices and perceptions of Indigenous people to be represented in their own words, and not an interpretation of what they said. Supplementary document (Annex 11 and 12) provide representative quotes.

3.4.1 Adaptation practices

Two adaptation strategies were adopted by farmers – changing farming practices and moving to off-farm practices. Changes to farming practices include adoption of cash crops and livestock production and abandonment of traditional varieties and crops. Whereas, off-farm practices mainly included migration, both temporary and permanent.

Changing farming practices: Adoption of commercial crops and livestock production

The Tharu villages, Amaduwa and Sahebganj in the Sunsari district, once had access to year-round irrigation from the Chanda Mohan canal in the village. However, the canal was damaged in 2010 and farmers were forced to rely on rainfall to irrigate their rice crop. In recent years, rainfall has become more erratic and the onset of the monsoon rains could be delayed by more than two months. As a result, some small farmers were feeding their rice seedlings to their livestock while others were forced to wait for the rain in order to transplant their seedlings. Uncertainty related to rice yields, compelled many Tharu farmers to reduce their rice and wheat production in favour of sugarcane. Sugarcane requires less water and has a bigger profit margin than rice. However, it requires irrigation at particular stages, making installation of tube wells and pumps for groundwater irrigation imperative. The Nepalese government provides a certain number of grants and subsidies to install tube wells and pumps, to promote sugarcane cultivation as an adaptation technology. However, demand for this financial help was three times greater than the available finance (Participant 11) and it was mainly farmers with influence with GOs and politicians, who received these subsidies (FGD 1,2). Other – mainly resource poor farmers - had to rely on paying for irrigation water from farmers with groundwater irrigation facilities.

Farmers indicated the falling in debt trap as a consequence of adaptation to the marginalised groups of the communities. Switching to a perennial crop, such as sugarcane, entraps small and tenant farmers in poverty for three to five years, because of delayed payment by the sugarcane factory. Farmers have to wait for more than 15 months for payment (Participant 23). Only farmers with political influence received timely payments and that small farmers often had to take out loans from various sources, including local moneylenders, in order to survive (FGDs 1,2). Access to banks (economic capital) was unavailable in remote areas and lengthy administrative procedures constrained small farmers from bank borrowing. Due to the ability to use and convert social capital to economic capital, powerful farmers with high levels of symbolic capital benefited the most. A Gurung farmer told:

‘I am affiliated to a saving cooperative, but it would not lend to me as I already had a loan from the sahu (local moneylender) which was very expensive. I wanted the loan to repay the sahu. We poor farmers are always in debt’. (Participant 25)

Also, farmers reported that reliable social capital, including small farmer groups and local farmer cooperatives, could not solve their problems since they would not lend to farmers with outstanding debt. This left small farmers reliant on informal village money lenders who charged exorbitant rates of interest. In Nepal, bank interest rates can be as much as 11.21% (Bhattarai 2015), while local and informal financial networks charge up to 60% interest per year (FDG 1, 2, 3,5,6). Therefore, for small and tenant farmers, the borrowing and repayment cycle is vicious and difficult to escape. This means that existing social capital does not help disadvantaged farmers.

Gurungs in the villages of Mohoriyakot and Ilampokhari in Lamjung district, had begun increased production of livestock, mainly buffalo, as the result of the increased incidences of hailstone damage to their traditional rice and maize crops. However, as livestock production requires a high initial investment, only the better off farmers can follow this route. Similarly, training in the cultivation of ginger and off-season tomatoes was based on the capacity to invest, which either excluded resource poor farmers or forced them to borrow. Hence, this off-season vegetable production technology as an adaptation strategy that was confined to large landholders.

The cases of Tharu and Gurung farmers show that social capital in the form of links to powerful and formal and informal institutions is not enough and it is the ability to obtain scarce resources for adaptation that is important. The ‘capacity to influence’ is based on symbolic capital and

social capital derived from interactions with local politicians, NGOs and GOs and informal social organisations. High symbolic capital helps to perpetuate the dominant position and high status in society, through increased income from adaptation. This indicates the importance of converting social capital to symbolic capital which increases chances of acquiring resources for adaptation.

Changing farming practices: Abandoning traditional crops and varieties

Traditional crops and varieties and their related cultivation practices represent inherited cultural capital and are linked to the community's social and cultural settings. Farmers convert this cultural capital to economic capital to sustain their livelihoods. However, this conversion ability is being threatened by the damage to crops in the study area, caused by extreme climatic events such as drought and hailstones. In the study sites in Gurungs and Tharus, abandoning cultivation of traditional crops and varieties is a common adaptation strategy to respond to climate change.

Gurung farmers reported having stopped cultivation of traditional rice varieties, such as *Darmali* and *Pakhne*, and Tharu farmers had stopped growing jute, (FGDs 1,2,3,4). Traditional rice varieties take longer to mature, which increased their vulnerability to hailstone damage during ripening in October. Large landowners who could afford the risk would cultivate traditional rice varieties, which had become a status symbol in the village. Thus, large landowners continued to convert cultural capital to economic capital, which small farmers were unable to do due to loss of traditional varieties. For Tharu farmers, jute was a source of energy (burning the stems) and generated income from sale of the fibre. When farmers had access to the irrigation canal, most households in the study area used to cultivate jute. They would make *guitha*, a cooking fuel, by encasing jute stems in animal manure and drying them in the sun. However, in recent years, increasing prolonged dry periods and a delayed monsoon season had led to declining yields, with the result that jute crop areas had decreased or ceased to exist. Only a few large farmers had access to groundwater irrigation required to grow jute (FGDs 1,2).

The abandonment of crops has affected the livelihoods of disadvantaged groups and women. For example, in the Tharu communities, discontinuing jute cultivation results in resource-poor farmers being not able to use jute stem to prepare *Guitha*. Jute fibre from the stem is removed by retting, a process which is carried out by men. Thus, reduced cultivation of jute had reduced

the workloads of men. However, it increased the women's workload as they had to look for alternatives cooking fuels such as plant parts, crop debris from the fields (Participant 36).

In contrast, Yolmo communities were not convinced that the new crops could withstand the harsh climate and were against discontinuing cultivation of traditional crop varieties. One farmer stated that:

'We do not look for new crop and varieties as the new varieties do not grow well in our area. We do not use chemical fertilisers and pesticides, but the modern varieties need them. However, if we use chemical fertilisers, potatoes become susceptible to disease and do not yield well. We prefer to maintain our traditional crop varieties'. (Participant 34).

In the Yolmo community, this cultural capital related to traditional crops and varieties, has contributed positively to preserving traditional varieties. Although Yolmo farmers are aware of climate change and its impacts, their traditional practices were not conducive to adaptations. For example, the Yolmo's religious beliefs related to respect for all animals, prevents the farmers from using chemical pesticides to reduce white grub damage (Participant 32). While this helps to conserve soil quality, the damage inflicted continues to be a major problem and, in the Yolmo case, cultural beliefs are restricting farmers' capacity to adapt to climate change.

The household's decision to abandon traditional crops and varieties is related to its social and cultural capital within the Indigenous community. Indigenous communities like Yolmo that are culturally and socially and religiously secluded, are more resigned to the problems related to farming traditional crops. In contrast, the practice of traditional varieties in Gurung and Tharu communities was challenged by climate change, which led to the loss of traditional varieties and food security in those communities.

Shifting to off-farm practice - Migration

Migration is an important adaptation strategy for resource poor households in all three communities and results in new forms of capital through societal interactions. The findings show that people used to migrate due to the lack of opportunities for off-farm work in the remote areas, when it was difficult to feed the family due to small land ownership. Farmers acknowledged the increase in extreme climatic events such as drought, hailstones and delayed monsoon rains, the number of families sending family members to cities was

increasing (FGDs 1,2,3,4,6). Seasonal and temporary migration are more common than permanent migration due to the social, economic and cultural capital related to a sense of identity and belongingness to the home area. For example, rather than migrating completely to an area with more fertile land and access to irrigation, the Indigenous communities prefer to live in their sacred area, Helambu.

The decision to migrate and the different destination choices are based on availability and capacity to use different capitals. For example, migration is inspired by relatives, neighbours and friends (social capital) and perceptions about safety nets to minimise the risks of living away from home (FGDs 1,3,4,5,6). Migration also requires economic capital, in the form of loans based on social capital, from friends, relatives and moneylenders (Participant 36). Resource poor farmers do not have the capital required for migration and are forced to rely on informal borrowing from the community's wealthier households. Therefore, migration provides an opportunity for high economic capital households to lend to poorer households and the income derived from this activity increases or maintains the privileged position in society.

While both seasonal and long-term migration are common adaptation strategies for Yolmo and Gurungs farmers, migration is not popular in Tharu communities. Tharu prefer to work on their own farms based on their cultural identity as *Bhumi putra* or sons of the land and are proud to claim that 'they are born to toil in the field' (Participant 22). Those with less land rent land from others (*Thekka*) or engage in share cropping (*Adhiya*) (FGD 1,2). Their cultural and economic capital makes Tharu farmers less mobile than Yolmo and Gurungs (FGD 1,2). However, delays in the monsoon rains have increased and are affecting productivity and increasing insecurity in rice cultivation. This is forcing farmers with small landholdings, to send family members to work in Biratnagar, Kathmandu or abroad (Participant 36).

The remittances derived from migration help to increase the adaptive capacity of migrant sending households and contribute to the increase and maintenance of social and cultural capital. Some Yolmo communities invested in the construction of a new monastery or *Ghyang* in Kiul, Sindhupalchowk, and, every year, the villagers voluntarily donate farm produce and money to the monastery to run its social and religious ceremonies (FGD 5). In the case of the Gurung community, household members who belong to mothers' groups (*Ama samuha*), organise cultural programmes which include local dances and songs. Migrant member donate voluntarily to mothers' groups. The amount donated is redistributed to the community via

communal activities such as installation of water tanks, maintenance of local roads, relief following climate disasters and the religious activities of the *ghyang* (FGDs 3,4,5,6).

Temporary migration can become long-term or permanent migration, which has a negative impact on the farm production of migrant-sending families. One old Yolmo farmer told that:

My son had planned to stay in the village and work on the farm. But, due to the hailstone damage last year, his plan for the apple orchard was shattered, and he went to Kathmandu. I have asked him to come back, but he wants to stay and earn money in Kathmandu. I am old and cannot travel far for farming. I am barely able to manage my bari (upland), which is close to my house (Participant 30).

The migration of the working age population from villages and communities is causing several problems. Out-migration has increased production costs due to unavailability of farm labour, resulting in land being abandoned and increased dependence on remittances (FGDs 3,4,5,6). Farmers reported that due to the out migration of working age family members, participation in traditional communal activities, including labour sharing (*parma*) and mothers' groups was decreasing (FGDs 3,4). Thus, migration is affecting social capital and maintenance of traditions that might act as a safety net following an extreme climatic event.

In the context of climate change, migration is the chosen strategy of farmers with low economic capital (land) in order to increase their adaptation capacity. In remote villages, where other opportunities are not available, and access to support for other adaptation options in agriculture are limited, migration is the only way to secure the livelihoods of low income households. Migration as an adaptation practice shape social, cultural and economic capital, which demonstrates the linkages among different adaptation practices.

3.4.2 Conversion of forms of capital in adaptation efforts

The study revealed two groups of farmers - privileged and disadvantaged - with different access to and control over capitals. Due to their positions and reputation, and their links to powerful institutions outside the community, such as GOs and NGOs, and their influence in community-based organisations, privileged farmers, who also own more land and physical assets, enjoy better access to resources for adaptation. Disadvantaged farmers have less or no access to resources for adaptation and are more dependent on the community due to their lack of reputation and smaller landholdings. Most of these individuals are small and tenant

farmers who engage in subsistence farming, have little knowledge or capabilities related to improved technology and, instead, rely on traditional farming practices. Privileged farmers can reap the most benefits from adaptation while disadvantaged farmers although involved in the adaptation process, obtain fewer benefits from it. Table 5 presents the capitals characterising these farmer groups.

Table 5. Capitals characterising different groups of farmers

Capital	Privileged farmers	Disadvantaged farmers
Economic capital	Own high capital, mostly large land ownership and more physical assets	Own low capital, limited land and mostly tenant farmers
Cultural capital	Semi-commercial or full commercial farming or diversified livelihoods, relatively high knowledge and skills related to new technologies	Subsistence based farming, fewer tools and equipment, low knowledge about and skills related to improved technology, high reliance on traditional skills
Social capital	Primarily through relationships with organisations outside the community, and greater ability to exploit own community.	High reliance on relationships or networks within the community
Symbolic capital	High levels of prestige and recognition, either 'ascribed' or 'achieved'	Low recognition or reputation, usually alienated

Bourdieu (1986) explains that, by converting available forms of capital into other forms, individuals contribute to their increase of resources and maintain their dominant positions in society. Therefore, the conversion process is regarded as a strategy for reproducing capital and maintaining position in social space. Consistent with Bourdieu's conceptualisation of forms of capital, the following section explores how economic, cultural, social and symbolic capitals are converted from one form to another by Indigenous communities while adapting to climate change. Examples on conversion of capitals, characteristics of the disadvantaged groups and implications on the disadvantaged and privileged groups are presented in Table 6.

Table 6. Conversion of capitals, group characteristics and their implications

Conversion from one form to another	Conversion process	Characteristics of the groups in relation to the conversion process		Implications for the groups	
		Disadvantaged farmers	Privileged farmers	Disadvantaged farmers	Privileged farmers
From economic capital to cultural capital	Use of economic capital to acquire training, education and new skills	Investment in new farming skills, education and training not perceived as beneficial Expect incentives rather than own investment	Interest in paying for training in new technologies	Greater dependence on traditional knowledge	Informed about new technology and knowledge to facilitate adaptation
From economic capital to social capital	Use of economic capital to gain membership in formal and informal organisations such as farmer groups, forest user groups, micro-hydro user groups, mothers' groups and farmer cooperatives	Lower capacity to pay for memberships (e.g. farmer cooperatives and groups); would like free memberships	Greater interest in and capacity for paying membership costs	Confined mainly to social capital within the community	Increased social capital outside of the community, mainly with powerful institutions
From economic capital to symbolic capital	Using land ownership and wealth to increase reputation, investing time and money in competitions to increase prestige and recognition	Ownership of less land, usually subsistence farming Less money to spend, and less time to invest in competitions	Large landownership, and command of machinery allowing surplus production which can be traded Higher rate of participation in local competitions	Alienation from powerful institutions	Increased recognition from powerful institutions
From cultural capital to economic capital	Using knowledge, education, traditional skills and practical experience to obtaining economic benefits	Increased problems related to continuation and transfer of traditional farming practices	Capacity to transfer unique customs and farming practices which allow surplus production that can be traded	Loss of traditional skills and Indigenous varieties	Increased benefit from new adaptation practice
From cultural capital to social capital	Sharing knowledge and skills	Lower participation in formal and informal meetings due to lack of time and social norms which inhibit active participation in meetings	Capacity to participate actively in meetings	Confined to social capital within community network and organisations, and little knowledge and information about adaptation	Acquisition of new contacts and more information due to increased information sharing
From cultural capital to	Using education, training and knowledge about new technologies to increase reputation	Less interest in and ability to use knowledge and skills to acquire symbolic capital	Demonstration of good knowledge and skills related to new technologies which	Exclusion from participation in the programmes related to	Added benefits derived from becoming a focal point for village

symbolic capital			attracts the attention of powerful institutions	increased resources for adaptation, e.g. subsidies/grants	organisations, based on increased symbolic capital
From social capital to economic capital	Using the network structure and diversity to increase incomes and reduce farming expense	Tendency to rely on informal loans from local moneylenders	Use of social capital to lend money at exorbitant rates of interest	Exploitation by privileged members in relation mainly to informal loans for adaptation activities	Increased income which allows continued dominance in society
From social capital to cultural capital	Using farmers, family ties and other contacts for social learning to acquire adaptation knowledge and skills	Less active sharing of knowledge about new varieties, farming methods and farm related products in informal meetings in the village Lack of access to formal events such as training, farmer tours and farmer field days	Greater participation in knowledge sharing in informal meetings Better access to formal events	Less new knowledge and information	Increased knowledge about new technologies for adaptation
From social capital to symbolic capital	Building reputation through embeddedness in networks with powerful institutions including politicians, GOs and NGOs	Less likely to exploit powerful institutions including political contacts (GOs, NGOs)	Greater use of political contacts and powerful institutions (GOs, NGOs)	No benefit from social capital	Increased benefit in the form of greater attention from powerful institutions
From symbolic capital to economic capital	Using reputation to influence politicians, GOs and NGOs to acquire the resources for adaptation Maintaining collective symbolic capital	Less likely to receive grants or subsidies for adaptation Less ability to using collective symbolic capital to increase prices and engagement mainly in subsistence farming	Higher likelihood of grants or subsidies for adaptation Ability to utilise symbolic capital by raising prices if hailstone or other damage reduces supply	Not beneficial since production mostly goes on feeding their families Caught in a maladaptation trap	Greater benefit due to increased production and higher product prices
From symbolic capital to cultural capital	Acquiring high symbolic capital to increase access to learning	Lower access to new knowledge and opportunities to learn new practices	Learning from exposure to experts, tours and training	Less knowledge and awareness of new adaptation measures	Increased knowledge and skills for adaptation
Symbolic capital to social capital	Using reputation to increase networks	Membership of several organisations which offer loans	Leadership positions in several organisations	Trapped in a vicious cycle of loans and debt	Increased ability to obtain subsidies and grants from GOs and NGOs

Conversion of economic capital

The results show that disadvantaged farmers were reluctant to convert their limited economic capital to other forms of capital (Table 6). Most of the farmers, mainly disadvantaged farmers, were not interested in paying or were unable to pay for formal education and training. For them, spending time and their limited money on the higher education or training in climate change adaptation is not worth due to low returns from farming (Participants 32,19, 34). Research results shows that farmers are not enthusiastic about building skills through trainings if they have to bear the costs of the training (Participants 27,29, 20). The majority of the farmers in the FGDs in all three regions expected to receive incentives, mainly from government or NGOs, to attend training related to adaptation (FGDs 1,2,4,5,6). In contrasts to disadvantaged farmers, the privileged farmers were relatively more interested in paying for training in new technologies related to climate change adaptation (FGDs 1,2,3,6). The climate adaptation programmes in the villages favoured farmers with high economic capital because they required a financial contribution to cover the materials used for the training. A small farmer said: 'I already have an outstanding loan from our group ... They [NGO] selected participants who could afford the cost required for the training materials' (Participant 24). Therefore, farmers with high economic capital had an opportunity to attend the training, while farmers with low economic capital were excluded.

Farmers were interested in increasing their social capital through membership in different formal and informal organisations, such as farmer groups, forest user groups, micro-hydro user groups, mothers' groups and farmer cooperatives, which provide a platform for adaptation to climate change. The more privileged farmers were more interested in network and organizations outside of the community social capital and were willing to pay fees for membership of informal and formal networks. However, disadvantaged farmers were not interested in using economic capital for gaining social capital; they were involved mainly in networks and organizations within community which did not require a fee to become a member of a network (Participant 29). However, the practice among resource poor farmers of not using economic capital to increase their social capital, hinders access to networks and organisations outside of the community and increased dependence on social relationship and organisation within the community. Moreover, attempts by disadvantaged farmers to join powerful institutions, such as farmer cooperatives, was constrained, also, by informal rules made by privileged members of the groups. For example, the farmers' cooperative in Amaduwa had increased the membership cost for new members, to a level that was difficult for resource poor farmers. These new rules imposed by local groups and

cooperatives, made local community based platforms beneficial only for economically well off farmers.

This study identified multiple ways in which symbolic capital was derived from economic capital. Economic capital, in the form of large land ownership, provides symbolic capital since land ownership in rural Nepal determines social position and the individual's economic, social and political power (Karki and Dhakal 2009). Some farmers converted economic capital, in the form of labour, time and money, to symbolic capital. For example, spending time and money for winning district and village level agricultural competitions, increased social recognition and prestige (Participant 22). Although farmers were aware that high symbolic capital gave privileged access to NGOs and GOs adaptation support, few large farmers were interested in gaining symbolic capital by winning competitions (FGDs 1,2,3,5).

Conversion of cultural capital

Knowledge, education, traditional skills and practical experience contribute to cultural capital which is important for adaptation to climate change. Farmers reported different ways of converting cultural capital to other forms of capital. They mentioned the importance of traditional skills, cultural capital inherited from their ancestors, for transferring unique customs and farming practices which contributed to the conversion of cultural capital to high economic capital (Table 6). For example, cultivation of Indigenous varieties and crops in Helambu village, mainly radishes, barley, potatoes and beans, attracted a premium price. Therefore, they believed that these inherited skills were a blessing from their ancestors (FGD 5). However, for the disadvantaged group of farmers, they made little difference since they were subsistence farmers who produced little or no surplus that could be sold or traded. The privileged farmers benefited from selling or bartering surplus production (FGDs 5, 6).

The results show that farmers convert cultural capital into social capital by sharing knowledge and skills on adaptations to climate change in farming. For community members, sharing knowledge and skills occurs in social interactions based on a sense of identity and community belongingness. One farmer said: 'It's our community norm that we share our knowledge or technique and skills. We expect the same from others' (Participant 26). This statement shows that farmers use cultural capital to fill gaps in their knowledge and skills related to climate change adaptation. This tradition

of sharing cultural capital in their networks and relationships, helped not only to develop and maintain social ties but also to respond to climate change. For example, due to the remoteness of the area and the low level of education, farmers had low access to information infrastructures including newspapers, television and the internet; information on climate change reported on the radio was shared and discussed in village meetings involving all farmers (FGDs 1,3,4,5,6). The practice of sharing knowledge and information helps the communities to adopt new adaptation practices without the support of external institutions; examples include sugarcane cultivation in Tharu and use of a new rice variety (hybrid rice) in Gurung community (FGDs 2, 4). However, since resource poor farmers participate less in informal meetings due to lack of free time, and since social norms prohibit them from active participation in meetings, the information was available to and used mostly by the more privileged farmers (Participant 22,29,33).

This study found that farmers convert cultural capital to symbolic capital by building reputation, using innovative farming methods. For example, a farmer explained that he had gained reputation after the successful use of a drought tolerant rice variety (Sukkha 2), and had been able to buy *1.5 bigha* (1 ha) of land using income from cultivating sugarcane (Participant 23). Another farmer had obtained recognition and appreciation from the district agriculture office through the introduction of water saving technology for rice production (Participant 28). Due to their popularity and reputation in the village, these innovative farmers had become a focal point for every organisation in the village, mainly GOs and NGOs, implementing new programmes or providing training (Participant 23,24). However, privileged farmers with high levels of cultural capital obtained additional benefits from capital conversion due to their greater ability to invest and bear risks (Participant 28).

Conversion of social capital

Social capital refers to the network structure and diversity. Farmers described how they converted social capital to economic capital (Table 6). Apart from family, friends and neighbours, the farmer cooperative is the main way to convert social capital to economic capital. Farmers saved on the costs of production through collective ownership by the cooperative of farm machinery. Since the charges for hiring machinery and equipment (tractors, irrigation pump) from landlords and local merchants were high, the farmer cooperative in Amaduwa, Sunsari, decided to purchase a tractor and harvester which would be available to cooperative members at an affordable rate (Participant 20). Ownership of farm machinery by the cooperative had reduced production costs by about 40%

(FGDs 1,2). In Lamjung, a community forest user committee member was cultivating cardamom in the community forest to earn extra income (FGD 4). Farmers with more economic capital were able to use the social capital within their community to lend money informally at high rates, since other sources of finance were relatively unavailable to marginalised farmers (FGDs 1,2,4,6).

Farmers converted social capital into cultural capital through the acquisition of knowledge and skills from other farmers and from family and friends (Table 6). This kind of social learning was prevalent since farmers tend to believe what they see (FGD 2,3). Strong family and friendship ties, contact with GOs and NGOs and belongingness to the community are forms of social capital that farmers can draw on and convert into cultural, symbolic and economic capital. Farmers used to discuss various problems, including climate change impacts and new technological options for farmers, in both formal and informal meetings in the village (Participant 29). For example, farmers in Sindhupalchowk had learned about preventive measures against white grubs in potato crops from local informal meetings (Participant 36). Also, participating in formal events, such as farmer tours and farmer field days, organised by GOs and NGOs, allowed interaction with other farmers and discussion and evaluation of new technologies for adaptation (Participant 25). However, access to such events was confined mainly to privileged farmers (FGD 1,2,4).

Farmers converted social capital into symbolic capital by building reputation through embeddedness in their networks with powerful institutions including politicians, GOs and NGOs. Such symbolic capital gives power and influence for obtaining resources for adaptation from powerful institutions (Participant-36). Thus, by converting their available social capital, farmers can increase the symbolic capital required to obtain resources for adaptation activities (see following sub-section for details). This study found differences in the ability to use social capital (community-based platforms) to gain other forms of capital, among privileged and disadvantaged community members. The increases in social capital achieved through belonging to local community groups and cooperatives, did not ensure that the benefits accrued to all members equally. For example, disadvantaged farmers were borrowing from multiple local saving and credit organisations in order to repay earlier loans. It was almost impossible for the poorest farmers to escape this loan trap (FGDs 1,2,3,4). Similarly, a lack of formal financial institutions in Helambu village meant that Yolmo farmers were paying high interest rates to the local money lenders (Participant 36). The cost of these loans increases over time to the point that many small farmers were forced to sell their small pieces of land to repay the money lender (Participant 23). Therefore,

in these communities, where farmers rely on the networks within their communities, the chances of exploitation by the most privileged groups in the community were much higher.

Conversion of symbolic capital

The findings show that the conversion of symbolic to economic capital differs among farmers (Table 6). At the individual level, symbolic capital, that is, reputation in the community, attracts the attention of powerful institutions, including GOs, NGOs and informal social organisations, that provide the resources for adaptation to climate change. In the Sunsari case, only a few farmers and only those with high symbolic capital, had received grants to construct tube wells (groundwater irrigation). This was based on their influence with politicians and government offices and highlights the importance of symbolic capital in economic resources constrained contexts.

At the community level, Helambu village had high 'collective symbolic capital' in farming due to the demand for organically grown and superior tasting mountain produce including potatoes, broad beans and radishes. This study defines collective symbolic capital in farming as the combination of economic and non-economic capitals, manifested in the form of prestige and recognition based on the unique characteristics of the agricultural production (crops or livestock), which attracts high consumer demand, privileged market access and premium prices. This symbolic capital contributes to adaptations to climate change.

In this case, demand always exceeded supply. One farmer told us that: 'The crops we grow are not sufficient to satisfy demand. We have limited land and income to invest in their cultivation'. Farmers were able to use their collective symbolic capital to increase their economic capital, by raising the price of potatoes 75% when hailstone damaged reduced the supply available (Participant 36). Although production decreased due to climate (hailstone) damage, the farmers' income did not reduce significantly (Participant 34). Large landowners benefited more than smallholder farmers due to their ability to produce a surplus which could be traded (FGDs 5,6). Also, large landowners could earn more by being able to hold back their produce and sell it when the price was at a peak. Small farmers used most or all of their production to feed their families.

Farmers converted symbolic capital to cultural capital in different ways (Table 6). Acquisition of high symbolic capital increases access to learning. For example, farmers gained symbolic capital

from recognition as innovative leaders. Awards and recognition at the local level opened opportunities to engage in learning through exposure to experts, tours and training (Participant 19). Many GO and NGO opportunities were not available to farmers with low symbolic capital. For example, in the case of training in vegetable production using polytunnels, as a climate change adaptation strategy, participants were selected based on their social position in the village. Many farming households have no opportunity to attend training because the NGOs assume that they will be unable to pay the costs of participation, in terms of the time and money required (Participant 25). The selection of participants based on social position and influence was prevalent in all the study areas, as was the exclusion of disadvantaged farmers with low symbolic capital (FGDs 1,2,3,4,6).

Farmers use their symbolic capital to increase their social capital by expanding their networks. Farmers described good reputation as important for influencing others. A leader farmer said: 'Last year, people from different places also came to meet me and observe my demonstration of new water saving technology in rice. It was a good opportunity for networking and getting new information as I learned about collaboration for seed production' (Participant-28). Privileged farmers find it easier to expand their networks. For example, most organisational leadership positions are occupied by large landowners with high symbolic capital, which further increases their economic, social and political influence in the community (FGDs 1,2 4,6). In some cases, the same person might be the leader of several local organisations, leaving small farmers disadvantaged due to under representation (FGDs 1,3). Due to their wider social networks and greater influence compared to subsistence farmers, these leaders are more likely to be awarded subsidies and grants from GOs and NGOs (Participant 21). For resource poor farmers, membership of several similar organisations is necessary for them to acquire loans to replay outstanding debts (FGDs 1,2).

Symbolic capital is important for acquiring and sustaining high levels of social capital, which allows the individual to take advantage of public services or goods for adaptation from powerful institutions. There was a common view among disadvantaged farmers that only influential people in the village have access to support (FGDs 1,2,4,5). This is evidence of the importance of symbolic capital for adaptation activities. In turn, the income derived from adaptation is used to dominate the weaker groups in society. For example, privileged farmers, whose symbolic capital allowed them to build own tubewell irrigation, gained even more from lending tubewell pumps to

poor farmers with no access to an irrigation facility (FGDs 1,2). Also, when sugar cane factories had difficulties paying farmers, only influential farmers were paid based on their personal relationships with political leaders and government (FGDs 1,2). These privileged farmers then lent money at high interest rates to disadvantaged farmers who had been nearly bankrupted by these delayed or non-payments (FGD 1).

3.5 Discussion

The aim of this study was to investigate the role of economic and non-economic capital by exploring how farmers in a developing context convert available economic, cultural, social and symbolic capital while adapting to climate change. This study argued that, in the context of adaptation to climate change by Indigenous communities, social interactions, including social norms and relations, and local politics might reduce the capacity of the most marginalised segments. Central to the data analysis is how Indigenous farmers adapt to climate change despite different capital constraints. Figure 9 depicts the relationship between capitals and adaptation to respond to climate change, and the consequences of adaptation for privileged and disadvantaged groups in Indigenous communities.

3.5.1 Capitals and adaptation practices

Indigenous people living in fragile environments historically have coped with the risks related to cultivating traditional crop varieties. The findings show that the adaptation actions of Indigenous farmers are in line with studies in adaptation in agriculture which show changes in farming and migration as major adaptation practices (Deressa et al. 2011, Amdu et al. 2013, Burnham and Ma 2016). Farmers are more resistant to change in areas with high cultural capital such as geographically and socially secluded communities like Yolmo. Traditional farming methods are more important in Yolmo communities compared to Tharu and Gurungs communities. The high demand and premium prices paid for locally produced agricultural products facilitate the conversion of cultural capital to economic capital. High cultural capital, mainly traditional skills and experiences ensures resistance to change. However, in order to sustain such traditions, the ability of conversion of cultural capital to economic capital, should be maintained.

The results show that symbolic capital plays an important role in adaptation to climate change in farming by facilitating network building and providing access to tools for adaptation. This is an important result since symbolic capital has received little attention in the climate adaptation literature. Farmers with high levels of symbolic capital are able to influence powerful institutions to obtain support for adaptation. The research found that high levels of symbolic capital increase cultural and social capital by allowing access to higher learning context by increasing access to trainings and information. This supports Bourdieu's notion that symbolic capital is easily converted to other forms of capital (Bourdieu 1986). The case of Yolmo farmers shows the importance of 'collective symbolic capital' in the adaptation to climate change, showing its ability in fetching premium prices for their agricultural products. This finding is important as collective symbolic capital has not been applied in climate change adaptation yet. The concept of symbolic capital Bourdieu (1986) as a collection of economic and non-economic capital, applies to individuals or social groups whereas Harvey (2012) extended the concept to include place or territories. Similarly, Macías Vázquez and González (2015) applied the symbolic capital to fishing communities in Spain. However, so far, this concept has not been applied to the context of climate change. Future research could investigate the management of collective symbolic capital in adaptation to climate change in farming.

It is interesting that farmers were more reluctant to use economic capital while converting to other forms of capitals, in adaptation to climate change. This is because, in less commercialised or subsistence farming, non-economic capital (cultural, social, symbolic capital) is important (Eichholz et al. 2013) and, therefore, giving primacy to economic capital masks the importance of non-economic capitals in climate change adaptation. Bourdieu (1984) cautions about giving too much emphasis to economic capital and suggests that individuals unconsciously follow societal norms which are culturally transmitted social constructions. This finding is relevant since many adaptation projects in developing countries emphasize economic contribution for participation. Therefore, policies and practices focused more on economic capital will fail (Burton et al. 2008) except in the case of the most privileged groups in Indigenous communities.

The results show that Indigenous people depend heavily on the social capital confined to networks or organisations within the community. This is mainly due to common social and cultural dispositions in socially and culturally secluded Indigenous communities, where the sense of community belongingness and mutual support is strong. An example of the importance of social

capital is collective action for benefit of community members. However, social capital which is limited within a community does not always benefit disadvantaged groups in Indigenous communities and the chances of being exploited within the community are high. This is an important result since many development agencies emphasize local networks, without considering the negative consequences for resource poor groups. This study urge promotion of connection with external networks and organisations, to reduce the chances of the weaker groups in Indigenous communities being marginalised.

3.5.2 Different consequences of adaptation

Differential adaptation outcomes in privileged and disadvantaged groups within Indigenous communities are depicted on the right hand side of Figure 9. Privileged farmers are those farmers with more resources that can invest in multiple adaptation practices or have access to external resources for adaptation. Disadvantaged farmers have minimal resources and are less likely to obtain resources for adaptation from external agencies. Thus, they have lesser ability to convert capital. As a result, the more powerful groups increase their adaptive capacity and maintain their dominant position, while the weaker groups become even more marginalised.

In the Gurung and Tharu communities, the loss of biodiversity as a consequence of adaptation is related to climate change challenging conversion of cultural capital (associated with traditional varieties and skills) to economic capital. For example, *Darmali* and *Pakhne* are traditional rice varieties for the Gurung and were very productive based on use of traditional knowledge and local resources. However, the longer time needed for the cultivation has resulted in hailstone damage which occurs usually in October. Hybrid varieties that can be harvested earlier avoid hailstone damage. This means conversion of cultural capital to economic capital is threatened if farmers continue to use traditional varieties, leading to a shift to hybrid rice. Such depletion of traditional varieties due to climate change is relevant since previous research portrays Indigenous populations as 'conservationists' (IPCC 2007, Sobrevila 2008). Similarly, article 7(5) of the Paris Agreement emphasises the preservation of the traditional resources of Indigenous peoples. However, this study shows traditional knowledge and skills cannot fully accommodate the new severe risks posed by climate change. Adaptations to cultural capital are needed as traditional knowledge and skills in farming become less economically beneficial and Indigenous varieties disappear from the fields of the most resources poor groups.

Promotion of cultural capital in disadvantaged populations could be the basis for developing effective strategies for adaptation to climate change. A bottom-up approach, based on a combination of scientific knowledge and indigenous knowhow, is important to understand and co-produce adaptive co-management systems to conserve traditional crop varieties and improve livelihoods. The government of Nepal could establish participatory on-farm research programmes to preserve indigenous varieties and indigenous cultivation practices. Awareness among consumers and stakeholders about the health, ecological and environmental benefits of indigenous varieties is also important. As discussed above, promotion of 'collective symbolic capital' in farming is important due to its ability to achieve premium prices for agricultural products. More research could be helpful to increase market access and value chains in traditional crop varieties with premium flavour and aroma and improve the livelihoods of resource poor farmers.

Adaptation to climate change is presenting new opportunities for the privileged groups while constituting a maladaptation trap for the disadvantaged groups in Indigenous communities. For example, the 'privileged' in the Tharu community received quadruple benefits including: new adaptation instruments such as water pump tractors; profits from lending money at exorbitant rates to resource-poor farmers; income from adaptation measures, for example, sugarcane cultivation; and income from lending water pumps to poor farmers. This means rich farmers are deploying and converting capitals in order to carry out more effective technical adaptation, while the poor farmers are confined to traditional adaptation. Disadvantaged groups are further locked into the maladaptation trap due to their increased levels of debt, due to less capacity to mobilise capitals. This economic maladaptation (Magnan 2014) or entrenchment (Sovacool et al. 2015), which leads to climate injustice², can be found in other developing countries where the weaker segments are economically impacted further (Sovacool et al. 2015). The findings that if we do not consider heterogeneities within Indigenous communities, adaptation to climate change increases inequalities in Indigenous communities is relevant as development and adaptation projects in developing countries emphasise adaptation, but do not consider the different consequences for

² According to the Robinson and Shine (2018) 'Climate justice is related to the rights of the most vulnerable and sharing the burden and benefits of climate change and its resolution equitably and fairly'. Similarly, the Bali Principles of Climate Justice 2002 call for the inclusion of Indigenous communities according to the rights to representation (Article 3) and participation (Article 21), and access to natural resources (Article 18) and land (Article 20).

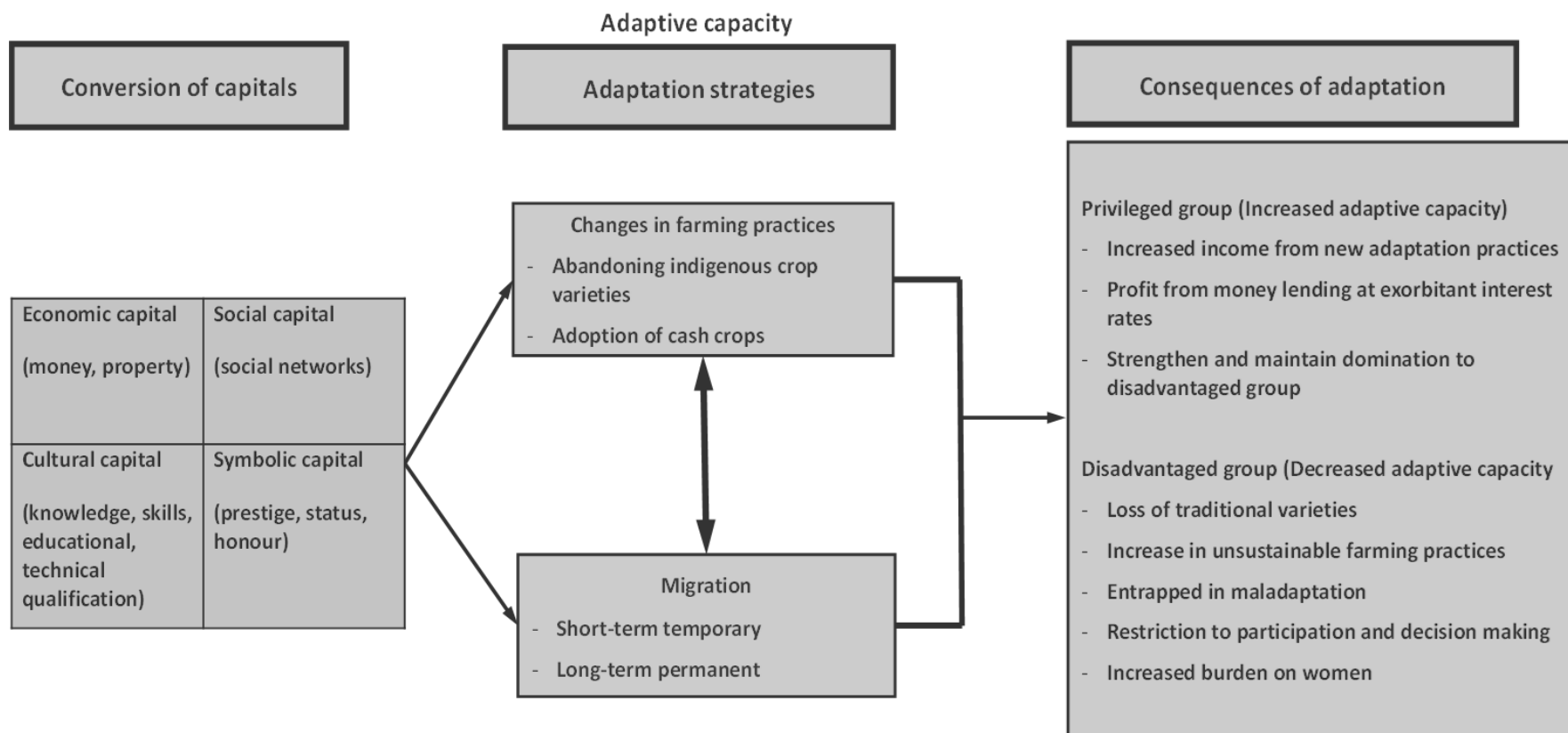


Figure 9. Capitals and adaptation practices in response to climate change and consequences of adaptation to different groups in the Indigenous communities

different groups. This research would recommend more investigation on the distributive fairness in adaptation for equitable outcomes while planning external interventions. In its absence, resource-poor farmers are likely to be pushed into even greater poverty and more reduced adaptation capacity, while the privileged farmers in communities' benefit.

In this exploration of differential adaptation outcomes in privileged and disadvantaged segments in the Indigenous communities, we argue that treating Indigenous groups as homogenous community ignores capital distribution and utilisation differences which further increases inequalities in adaptation. The government of Nepal perceives Indigenous communities as a homogenous group and no account is taken in its policies of the heterogeneity within these communities. For example, article 18(3) of the 2015 Nepal constitution provides for special arrangements to protect, empower and develop marginalised groups including Indigenous communities. However, the voices of the most disadvantaged are blocked by those of the privileged groups. This dominance of farmers with more influence is reinforced and legitimised by the mutual support among existing informal and formal institutions. The government and development agencies should take account of the different beliefs and practices and different levels of economic and non-economic (social, cultural and symbolic) capital and their conversions, both across and within Indigenous communities. This would increase acceptance by and effectiveness of adaptation options among the most marginalised in the Indigenous communities and contribute to more inclusive and socially just adaptation to climate change in these communities.

3.6 Conclusions

This study examined how farmers convert different forms of capitals while adapting to climate change. It employed Bourdieu's (1986) forms of capital and focused on different adaptation practices engaged in by different Indigenous farming communities. The study has implications for a better contextualisation of the adaptation-capitals interface and highlights how adaptation and adaptation capacity are structured through the capital conversion processes embedded in the everyday practices of Indigenous farmers and their interactions with the socio-political, cultural, economic and ecological environment. The interrelation among conversion of capitals and adaptation practices provides insights into some interesting individual and community level

dynamics. The study context of Indigenous farmers in a developing country, provides some interesting nuances related to farmers' adaptation practices and different forms of capital.

This research adds to the small stream of work on the role of different forms of capitals in other fields of study such as education (Bathmaker et al. 2013), health (Veenstra and Abel 2019) and aging (Gilleard 2020). Capital conversion is a complex process and farmers mobilise different forms of capital in their adaptations to climate change. This study highlights the value of Bourdieu's (1986, 1977) conceptual framework to analyse how farmers use their resources and demonstrates the different ways farmers convert their capitals to adapt to climate change. We throw light on previously unidentified forms of capital conversion such as conversion of social capital into cultural and economic capital via cooperatives and use of symbolic capital to generate social, cultural and economic capital. Symbolic capital has received little attention in agriculture research. This study shows that symbolic capital is a strong driver of adaptation to climate change in farming and provides increased access to networks, tools and powerful institutions. It highlights the role of 'collective symbolic capital' in reaping premium prices, providing privileged market access and increasing consumer demand, all of which influence adaptation to climate change. The effectiveness of symbolic capitals may differ in the different developed and developing countries. Further comparative research is needed, on different countries and regions, to study the role of symbolic capital in farmers' adaptation practices.

The limitation related to the generalisation of the findings from this study could be eased by more research in different developing country contexts. It would be interesting to investigate different combinations of capitals which might increase farmers' capacities to adapt. A better understanding is needed of the rationale behind individual adaptive capacity and the strategies that might reduce the constraints to climate change adaptation. A longitudinal study would provide a better understanding of the temporal changes to capitals and their conversion.

Ability to convert different forms of capital has different outcomes for Indigenous communities. Adaptation to climate change is providing new opportunities for the most privileged groups, but is increasing the indebtedness of disadvantaged groups. The privileged groups are able to exploit the benefits derived from adaptation to maintain or increase their dominance in the community. The inequitable outcomes of adaptation is reducing further capacity of disadvantaged groups. In most

cases, Indigenous people are considered by both academia and policy, to be a homogenous group (ILO 2017). This study argues that different Indigenous groups have different adaptation capacity. The assumption of homogeneity will exacerbate the vulnerability of the most disadvantaged groups and strengthen the adaptation capacity of privileged groups. To increase fairness in adaptation for adaptation to climate change within Indigenous communities will require development programmes that recognise the differences across and within Indigenous communities.

4. Alone and stranded: The political economy of climate change adaptation in Nepal

4.1 Introduction

Following the agreement reached at the 2010 United Nations Framework Convention on Climate Change (UNFCCC) held in Cancun, which called for an equal emphasis on climate adaptation and mitigation efforts, funding for different international agency adaptation policies and programmes has increased annually. In 2017, international funding for climate change reached \$71.2 billion (OECD 2019) and is expected to \$100 billion by 2020 (UNFCCC, 2009). International efforts have led to the engagement of different stakeholders in the preparation and endorsement of climate change policies and programmes in developing countries. So far, 51 least developed countries have submitted National Adaptation Plans of Action (NAPAs) to the UNFCCC and until October 2019, 120 developing countries were engaged in formulating National Adaptation Plans (NAPs) (UNFCCC 2019).

Climate change policies and programmes are expected to be efficient and inclusive and address local needs and priorities in developing countries (Stigka et al. 2014, Tanner et al. 2014). Climate policies are implemented through different financial instruments with the support of the UNFCCC and other bilateral or multilateral international agency funding mechanisms. To employ international frameworks at the national and subnational levels, a country-led policy formulation, implementation and evaluation process is required to support the most vulnerable communities (Fisher and Rai 2016). This is particularly important in the case of smallholder farmers who are disproportionately affected by the impacts of climate change due to their low levels of resources and technology (Morton 2007, IPCC 2014). However, unequal power relations in the policy process can increase the influence of certain actors and overlooks the voices of weaker groups, resulting in inefficient policies.

The growing number of studies on climate change adaptation policies in developing countries is adding to our understanding of how adaptation policy is formulated, translated and practised. Ampaire et al. (2017) studied the policy process in Uganda and found hegemony of central government in policy formulation and exclusion of non-state actors. Similarly, Pardoe et al. (2018) investigated the cases of Malawi, Tanzania and Zambia and show that external influences on adaptation policy planning and implementation are less relevant than human and financial resources. A study of climate policy in South Africa shows that a profit oriented private sector influences climate policy (Rennkamp 2019). Ryan and Bustos (2019) investigate the policy making process in six South American countries - Argentina, Brazil, Chile, Costa Rica, Paraguay and Uruguay - and found lack of required knowledge among policymakers on climate adaptation effectiveness, socio-environmental vulnerability. Di Gregorio et al. (2019) examine climate adaptation and mitigation policy processes in land use sectors in Brazil and Indonesia and found cross-level communication and collaboration between the national and sub national level was a major barrier to policy making process.

Analysis of the policy process on climate change adaptation should include interactions among actors at different levels to allow an understanding of who benefits most from the policy process and why some are excluded (Wolmer et al. 2006, Naess et al. 2015). Most previous work focuses on either the national or sub-national level. Despite the importance of international actors in shaping climate policies in developing countries, we lack comprehensive research on the interactions between international and national actors in the formulation of national climate adaptation policies (Naess et al. 2015, Funder et al. 2018). What is needed is an analysis that includes the full set of policy actors (Cuevas 2018) to understand the different interests and different opportunities of the actors involved in shaping the policy process at the national and local levels (Brock et al., 2001) and to identify why some voices are heard and others are ignored (Dewulf et al. 2009). Besides, comprehensive studies, which include direct experience of international actors, is generally lacking. To try to fill this gap in climate policy literature, this study explores the national climate policy process and the local level outcomes of policy implementation in Nepal. It addresses the third research question of: How do international actors, national governments and local actors with different interests interact in the climate adaptation policy process and what is the impact of their interactions on policy outcomes.

4.2 Approaches to analysing the policy process and the framing for this study

The policy process includes policy formulation and implementation, and evaluation of policy outcomes (Keeley and Scoones 1999). Traditionally, the policy process has been considered a linear process involving: i) agenda setting; ii) exploring possible outcomes based on weighing their costs and benefits; iii) decision making based on selection of the best options; and iv) implementation and evaluation (Lasswell 1951, Meier 1991). The policy process starts with various interest groups, such as research organisations and NGOs advocating for government consideration of the issue. Policymakers evaluate and select among possible options, design the policy and submit it to the administration for implementation. The traditional view conceives the policy process as technocratic and involving the scientific study of problems, and problem solving based on scientific evidence and rational decision making. However, such approaches have been criticised for their linearity and for being apolitical and technical, and ignoring the complex and messy procedure related to the inclusion of the different interests of multiple actors (Wolmer et al., 2006). The policy process should be viewed as a 'chaos of purposes and accidents' (Clay and Schaffer 1984, Sutton 1999).

Studies to analyse the climate policy process fall into four categories: i) *actors and institutions* and their role in and influence over the policy process (Smucker et al. 2015, Di Gregorio et al. 2019, Kronsell et al. 2019); ii) *narratives and views* on climate change adaptation (Gillard 2016, Bushell et al. 2017, Howarth 2017); iii) *politics and interests* which includes power dynamics; and iv) *policy implementation* (Ampaire et al. 2017). The complex, multifaceted and non-linear nature of the policy process and the involvement of multiple actors means that none of these constructs, on their own, captures the intricacies of the policy process in different settings (Keeley and Scoones 1999, Weible et al. 2012). Therefore, integrating these four approaches in the study of policy process, this framework fulfils the gap of lack of comprehensive framework and an integrated approach to understand the climate adaptation policy process.

This study draws on work on the climate change policy process, which includes four constructs that comprise the framework applied in this paper. The proposed framework is grounded in political economy analysis. Political economy is understood in this study as referring to the: 'way that ideas, power, resources are conceptualized, negotiated and implemented by different groups' (Tanner

and Allouche (2011:1). Based on this definition, this study highlights contrasting narratives and struggles over power and resources, and investigates who makes the decisions and who are the winners and losers, amongst the government agency, international agency, NGO and farming community. The analysis highlights how the climate policy process could be improved and strengthened to promote good governance (Newell et al. 2014, Naess et al. 2015). A political economy lens used to analyse *actors and institutions* shows how some actors are prioritized and others are neglected in the policy process. *Actors and institutions* refer to those involved and their positions (Turnpenny et al. 2005) and perform specific roles in the policy process. Actors decide what should be included in the policy and are able to influence policy implementation, such that outcomes sometimes differ from policy intention (Naess et al. 2015). A better understanding of these actors would allow identification of their weaknesses and influence in relation to the policy process and would help to improve it (Jackson 2010).

The inclusion of *narratives and views* from a political economy perspective explains why some ideas are adopted and others are overlooked. Climate change narratives are stories about the problems related to climate change and its impacts, and are aimed at increasing the participation of stakeholders and improved climate policy outcomes (Daniels and Endfield 2009, Howarth 2017). In this study, actors' narratives relate climate change experience and its impacts and ways to tackle them. Views refer to the individual actor's perspectives or a part of a narrative. Different actors perceive their stories in different ways. Narratives and views may not lead to immediate action, but they allow the actors to describe their social, economic and cultural circumstances (Bushell et al. 2017, Howarth 2017) and provide a framing for policy formulation and implementation. For example, the narratives identify the importance of climate change to different actors and how and why behaviours need to change to address it (Bushell et al., 2017; Daniels and Endfield, 2009). Views refers to actors' opinion on the narratives. Analysis of narratives and views provides an understanding of how ideas and ideologies shape policy problems and determine policy outcomes. Narratives and views may be based on ideologies, which, in combination with politics and other interests, drive policy making. Ideologies act as guides to what should be done. For example, the formulation and implementation of policy may be guided by certain ideology. The actors might try to frame climate change policies based on their beliefs although they may be incompatible with national interests and the needs of resource poor farmers in developing countries, resulting in frictions between different actor groups in the policy process.

Politics and interests is central to political economy and refers to the underlying power dynamics and influence of the actors involved in the policy process. The competition and conflicts arising from the politics and interests of different actors are important for understanding their engagement in the policy process (Naess et al., 2015) and its effect on policy implementation and outcomes. The different capacities of different actors results in a policy process dominated by certain interests while others are excluded (Fuchs and Glaab, 2011). It has been argued that climate adaptation policy is a bureaucratic, technical and political process, which requires investigation of actors' politics and interests related to adaptation (Funder et al., 2018; Lockwood, 2013; Naess et al., 2015; Tschakert et al., 2016). For example, Alex (2014) studied a Mozambique government plan to resettle people living in flood-prone areas, which government described as a climate adaptation programme although its real interest was the construction of a dam to produce electricity. Policy outcomes can be explained only by obtaining a thorough understanding of the politics and interests of the actors involved, which allows insights into the motivations behind policy choices and the policy frameworks applied to different sectors and locations. This improved understanding should allow more effective climate change adaptation measures (Alex 2014).

The fourth construct, *policy implementation*, is an important component of political economy and allows identification of the benefits and disadvantages of the distribution of resources and power in the current policy process (Ampaire et al., 2017). In this study, policy implementation refers to the actions of government, NGOs, international actors and individuals (or groups), related to climate change policy and outcomes. Investigating policy outcomes of policy helps to identify issues related to policy implementation and unintended outcomes (Lieu et al. 2018) and the need for policy amendments. It explains why certain groups benefit more than others. Therefore, the inclusion of policy implementation in the analytical framework allows identification of inefficient outcomes from the climate adaptation policy process.

4.3 Methodology of the study

4.3.1 Data and Methods

This study employs a qualitative approach to collecting data which come from Focus Group Discussions (FGD) and semi-structured interviews. This method triangulation (Thurmond 2001, Carter et al. 2014), which involves use of more than one methods of data collection about the

same phenomenon, allowed different perspectives and data validation and provided rich and complete information (Lambert and Loisel 2008). Six FGDs were held in the villages and 36 semi-structured interviews were conducted with experts and key farmers.

The interviewees were a mix of domestic and international policy actors from government agencies (9), international agencies (4), national and local NGOs (5) and farmers (18) involved in climate change adaptation policy formulation and implementation. This diverse range of actors allowed the collection of rich information and a comprehensive understanding of the policy process through a focus on policy formulation at the national level and policy outcomes at the local level. The first five interviewees were selected from a group of high-level policy actors who belonged to the researcher's network and local contacts. They were included on the basis of their long experience in government or international agencies, in environmental and climate policy formulation and implementation. Six farmers were identified at the local level, through consultation with the rural municipality offices and NGOs operating in the areas. The remaining interviewees were identified using the snowball sampling process.

Different topic guides were developed for the farmer and expert interviews (Appendix 2 and 3), based on a review of the literature and informal discussion with academics and NGO personnel. The interview guide for the high level policy actors (experts) focused mainly on: i) eliciting policy actors' perceptions of policy formulation and implementation; and ii) understanding asymmetries in the influence of different policy actors in the policy process and how these were managed. The farmer interview guide focused on climate adaptation policy implementation at the local level and asked farmers, specifically, about any external support received and how useful it had been. All interviews began with an open ended question: 'Tell me about yourself and your background'. Participant narratives told stories of climate change adaptation and involvement in the formulation, implementation and outcomes of climate change policies and programmes. Follow-up questions allowed the interviewees to elaborate to provide a more in-depth understanding of the issues. The high-level policy actors were reluctant to admit to conflicts with other actors in the policy process. After being reassured about anonymity, in discussing their involvement in the policy process, they referred to their dissatisfaction with other actors.

4.3.2 Data analysis

The study employs a hybrid deductive and inductive qualitative thematic analytical approach (Fereday and Muir-Cochrane 2006). According to Fereday and Muir-Cochrane (2006), thematic analysis refers to the 'search for themes that emerge [as] important to [describe] the phenomenon'. Thematic analysis starts with a careful reading of the data to identify patterns, followed by organisation into themes related to phenomenon being studied, and identification of emerging themes or analytical categories (Fereday and Muir-Cochrane 2006). This hybrid method involves a theory driven deductive process and a data driven inductive process. Deduction results in a set of a priori codes, based on existing theory; induction identifies additional codes based on data observation. The theory is both the precursor to and the outcome of the data analysis.

Data analysis proceeded in several stages. The first stage focused on using the conceptual framework as a coding template. The conceptual framework guided the a priori coding of the data as part of the deductive approach. The four theoretical constructs refer to the four themes guiding the coding process - actors and institutions (historical and institutional context and roles in the policy process); narratives and views (stories related to climate change policy); politics and interests (underlying power dynamics and influence); and policy implementation (consequences for farmers). In the second stage, alongside the coding template, an inductive approach was employed to generate additional codes. Emerging inductive codes were added to the appropriate constructs to extend the coding template. For example, historical and institutional context, which emerged in the analysis, was added to the construct actors and institutions. This complemented data analysis by integrating the conceptual framework constructs with the themes emerging from the deductive analysis and the inductive coding. The third stage involved the clustering of codes and identification of patterns in the interview data. This involved use of the coding template and assignment of codes and required several iterations of comparing and contrasting codes to achieve the clustering. For example, barriers to NAPA formulation and lack of cooperation from the relevant ministry were categorised as competition over access to and control over resources. Table 7 presents data analysis structure showing theoretical constructs, the sub-categories and the first order codes based on observation of the data.

Table 7. Theoretical constructs, subcategories and first order codes

Theoretical constructs	Sub-categories	First order codes
Actors and institutions	Government agencies, International agencies, NGOs and farming communities/farmers	- Historical and institutional context - Distinct role and position in the policy process
Narrative and views	Multiple narratives of climate change and adaptation	- Reducing farmer vulnerability as a strategy to tackle climate change in agriculture - Mainstreaming adaptation to climate change as part of broader development - Climate change as an agricultural development opportunity - Agriculture as a major development agenda
	Views of agenda framing	- National needs and priorities - Alignment with international climate agenda - Balance between international agendas and local priorities - Local needs and priorities
	Views on inclusion of stakeholders in the policy process	- Inclusion, but government in the lead role - Inclusive approach - Exclusion - Always excluded
	Views about the allocation of resources and who should allocate them	- Direct budget support - At least 80% funding for the local areas - Project aid support to NGOs and the private sector
Politics and interests	Competition over access to a control over resources	- Barrier to NAPA formulation - Lack of cooperation from line ministries
	Conflicts over funding modalities	- Preference for grants - Preference for a range of lending mechanisms - No climate loan
	Disagreement over funding channels	- Prefer government funding - Prefer NGO and private sector funding - Prefer non-government sector - No preference
	Dissatisfaction over the group targeted by adaptation policies	- Priority given to the most vulnerable farming households and communities - Support for a range of beneficiaries (including private sector promotion)
	Dissatisfaction over use of international consultants	- Use of local expertise - International experience and knowledge - Local capacity of universities and research organisations
Policy implementation	Lack of sustained adaptation at the local level	- Multiple standalone projects - Lack of accountability, short term projects - Inability to streamline climate funding
	Misalignment between adaptation projects and local needs	- Top down approach - Lack of proper consultation at the local level - Lack of identification of the overarching problem
	Exclusion from participation	- Participation cost - Passive participation - Benefits accruing most to privileged farmers - Exclusion of the most vulnerable groups

4.4 Findings

This section shows mechanisms of actors influence and reaction of others to overcome such situation in the climate policy process and resulting outcomes of policy implementation. The overarching four constructs explain power dynamics between the actors, and interests of powerful actors in shaping policy formulation and outcomes of policy implementation. As a result, needs and priorities of the most vulnerable are excluded and marginalised in policy implementation.

4.4.1 Actors: Multiple actors at multiple levels with distinctive roles and positions

The actors involved in climate change policy in Nepal can be categorised as government agencies, international agencies, NGOs and farming communities. These actors, have distinctive roles in the policy process, interact with one another at specific times for specific purposes, influence other actors, and are involved in implementing activities in the policy process (see Table 8).

The Climate Change Council (CCC) is chaired by the prime minister and is the highest authority responsible for overseeing climate policies and programmes. However, the CCC has done little in the area of addressing climate change issues (Participant 2). In practice, the Ministry of Forests and Environment (MoFE) is responsible for climate change policies and programmes and participates in the activities of the UNFCCC. Other ministries, such as the Ministry of Agriculture and Livestock Development (MoALD), Ministry of Federal Affairs and Local Development (MoFALD), Ministry of Finance (MoF) and the National Planning Commission (NPC) also play important roles in climate policy formulation and implementation. These organisations are high level and powerful stakeholders, which shape Nepal's climate policy formulation and implementation. For example, the MoF and the NPC control allocation of funds for climate adaptation related programmes.

International agencies, at the national level, play an important role in formulating and implementing climate policies. They include: International Non-Government Organisations (INGOs) such as the World Wide Fund for Nature (WWF), the International Union for Conservation of Nature (IUCN), Plan International and CARE International; bilateral organisations such as the US Agency for

Table 8. Lists of actors and their roles in the climate policy process

Actors	Level of position	Role in the policy process	Major interaction with other actors	Activities in the policy process
Ministry of Forests and Environment (MoFE)	Macro	Formulating and implementing policy and focal point for UNFCCC	International actors	Leading formulating policy, implementing climate change programmes. Have outreach at the local level through regional, and district offices.
International agencies (eg. Bilateral (USAid, DANIDA, EU, GIZ)or multilateral agencies (UN agencies, and ADB, World Bank and INGOs (WWF, IUCN, Plan international, Oxfam)	Macro	Formulating and implementing policy	Ministries for policy formulation, Government departments and NGOs for policy implementation	Advocate and initiate climate policies, work in partnership with the government. Has a dominant role in formulating and implementing policies.
Government ministries and bodies (Ministry of Finance and National Planning Commission)	Macro	Formulating and implementing policy	Ministries, international actors, local governmental bodies, and NGOs	Dominant role in the budget allocation for the climate change programmes.
District and local governments (Municipalities and rural municipalities)	Meso	Implementing policy	Ministries, local NGOs	Lead the implementation of climate change policies at the local level.
National NGOs	Macro, Meso and Micro	Formulating and Implementing policy	Government and international actors	Role is minimum in policy formulation but highly active in policy implementation.
Local NGOs	Micro	Implementing policy	Local government and national NGOs	Limited to policy implementation
Farmer groups, farmer organisations (cooperatives), small/private agribusiness	Micro	Implementing policy	NGOs, Local government	Normally excluded from both the policy formulation and implementation.
Informal climate change expert network	Macro and micro	Formulating and implementing policy	Ministries, NGOs and local government	Included but often voices are not heard during policy formulation
Universities/research institutions	Macro and micro	Formulating and implementing policy	Ministries, local government, NGOs, INGOs	Not direct participation, experts from those institutions are hired indirectly by international agencies

International Development (USAID), Japan International Cooperation Agency (JICA) the European Commission (EC), the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the Danish International Development Agency (DANIDA); multilateral organisations such as UN agencies, the Asian Development Bank (ADB) and the World Bank; and intergovernmental organisation such as the International Centre for Integrated Mountain Development (ICIMOD).

Nepal is highly dependent on international donors for its climate policy process. Some international agencies act as intermediaries between donors and government, to facilitate the climate policy process. For example, under the UNFCCC mechanism, the Least Developed Country Fund (LDCF) and the Global Environment Facility (GEF) use UN agencies (UNEP, FAO, UNDP) as implementing agencies. Similarly, the Climate Investment Fund (CIF) provides funding to Nepal via multilateral development banks (World Bank, ADB). Some bilateral donor agencies like Department for International Development (DFID), European Union (EU) investing directly through government budget aid for implementing adaptation programs. Thus, in general, climate related policies in Nepal are initiated by international agencies, mainly UN bodies, multilateral development banks and few INGOs, which have historical links to the government of Nepal. Although, in many cases, they are no more than funding intermediaries, they are perceived as donors and enjoy high status among the policy actors (Participant 14). These intermediaries have the power to control the financial and technical experts involved in the policy process, who try to push their own agendas and influence others the policy process (Participant 6).

At the meso level, District Coordination Committees (DCCs) and municipalities work collaboratively on programme planning and delivery. At this level there are also national NGOs. The NGO sector includes the Environment and Public Health Organisation (ENPHO), Local Initiative for Biodiversity, Research and Development (LI-BIRD), Clean Energy Nepal (CEN), National Trust for Nature Conservation (NTNC), which have been explicit about the need for climate policies in Nepal since 2003. The first to advocate for a national climate change policy in Nepal was the WWF and its partner international agencies. The coalition of NGOs and INGOs is effective and is important for putting pressure on the government to address climate change issues (Participant 3). A Network of NGOs in Climate Change (NGOCC) was established to campaign for the formulation and implementation of climate policies and programmes (Participant 16). Other NGOs at the national, regional and local levels are involved mainly in implementing policy. The

Nepalese environmental NGOs are given lower status than INGOs as they depend heavily on international agencies for their activities and are considered as intermediaries of 'foreign-born objectives' in climate change (Participants 2, 5, 15). There is always some participation at the national level of NGOs in consultative meetings, but the selection process does not always seem fair or transparent (Participants 15, 13).

The local level actors include local NGOs, small agricultural businesses, farmers and community-based organisations including farmer groups and cooperatives. These actors believe that they are deliberately excluded from policy formulation and that their voices go unheard in climate policies and programmes. The farmers expressed strong dissatisfaction on NAPA and the climate change policy formulation, and implementation processes (FGDs 1,2,3, 5, 6). Similarly, most of the farmers and farmer organisations (producer groups and cooperatives) interviewed, expressed dissatisfaction over their powerlessness and invisibility to the government and international agencies in the climate policy process. Analysis of policy documents, including NAPA, climate change policy, Climate Change Adaptation and Disaster Risk Management in Agriculture: Priority Framework for Action (2011-2020) and Agriculture Development Strategy (2015-2035) documents, show also that Nepal lacks explicit provision to ensure rights and responsibilities and has no clear mechanism for ensuring effective participation of indigenous local communities in policy decision-making.

Despite being regarded as an important local stakeholder in the climate policy process, universities, research institutions, farmer organisations and informal climate change expert groups have only a small role. As mentioned in the section 1.4.6, Nepal is currently developing its National Adaptation Plans (NAPs), in which there is no direct and influential role of these actors. For example, four international agencies are revising the NDC, but as in past climate policy processes, these local actors have only minimal participation in the climate policy process; some academic experts are hired as consultants by the international actors in the policy process (Participant 7).

The national level politicians and Members of Parliament (MPs) have had little interest in the climate policy process (Participants 5,6) although the Nepalese government has portrayed political commitment several times by drawing the attention of international communities. Examples include, a cabinet meeting in Mount Everest base camp, in 2009, and an international climate

change dialogue, '*Sagarmatha Sambad*³' (Everest Dialogue), in 2020. These international events are, however, one-time-shows for drawing attention of international communities, with no efforts on translating policy initiatives into actions (Participant 3). For example, a parliamentary environmental protection committee oversees climate change issues, but their activities are confined to participation in few meetings or discussions arranged by NGOs and international agencies (Participants 2,13). Thus, formal and informal discussions on the climate change agenda in parliament are rare (Participant 5). The absence of high-level politicians in the climate policy process leaves senior government officers and international agencies in a dominant position in the climate policy process.

The results showed three important reasons for national politicians' indifference to climate adaptation. First, national politicians have an opinion on climate mitigation: 'since Nepal's contribution to climate change is negligible, the polluters [developed nations] should pay for climate change adaptation programmes as reparation' (Participant 6, 7, 13, 15). Therefore, they plea for international aid, instead of allocating a separate national budget for extensive climate change adaptation programmes (Participant 5). Second, the national level politicians do not consider climate change impacts as new or emergent problems. They perceive climate change related disasters, such as floods, landslides, hailstones and drought, as perennial problems of the country (Participant 7). They consider climate related disasters as an outcome of the country's fragile topographic features. Third, politicians think that development challenges are more important than climate change issues, in the face of already scarce funding for regular development programmes. Therefore, politicians are more interested in more pressing agendas related to poverty and providing basic needs (Participant 2). For them, if the development challenges related to poverty, lack of access to finance, infrastructures and market are resolved, farmers will have the necessary capacity to adapt. As Nepal is currently preparing the National Adaptation Plan (NAP) for mainstreaming adaptation in development plans, it is probable that after the endorsement of NAP, politicians will gradually realise the importance of mainstreaming adaptation in development.

³ This event was cancelled due to the coronavirus pandemic.

4.4.2 Narratives and views on the climate change and policy process

This section explores the narratives and views of different actors to understand how they act to frame climate change and agriculture policy. Narratives are explained from the perspective of the actor (e.g., government agency), views on the narratives involve a range of actors. The results show overlaps and conflicts in actors' narratives about climate change and agricultural policy (Table 8). Analysis of the interviews identified four main narratives: i) reducing farmers' vulnerability as the main strategy employed for tackling impact of climate change in agriculture; ii) mainstreaming adaptation to climate change in development programmes; iii) climate change as an agricultural development opportunity; and iv) agriculture as a major development agenda.

Government agencies: Reducing farmers' vulnerability as a strategy for tackling impact of climate change in agriculture

The majority of the government agency interviewees supported the narrative of 'reducing farmers' vulnerability as a major strategy for tackling climate change impact in agriculture'. Glacial lake outburst floods and climate disasters such as erratic rainfall, hailstones, drought, floods and landslides are threatening farmers' livelihoods (MoHA, 2017). This narrative portrays farmers as helpless and as severely affected by climate change due to their limited access to technology and finance to adapt. According to this narrative, reducing farmer vulnerability was the best way to tackle climate change and its impact (Participants 5, 7, 8). Therefore the 'vulnerability approach' is emphasised by government agency interviewees in relation to the planning and implementation of climate policies and programmes.

This narrative makes a strong case for international support for Nepal's adaptation efforts in the highly vulnerable agricultural sector, which contributes about 40% of national GDP and employs about two-thirds of the population (MoAD 2014). Its proponents argue that Nepal is one of the countries most vulnerable to climate change despite its negligible contribution to the causes of climate change. For instance, Nepal contributes 0.09% to global greenhouse gas emissions, but is ranked 9th in the world climate index (Eckstein et al. 2019). Its status as a high climate risk country requires huge amounts of resources to combat these negative effects. Nepal's limited internal resources meant that government agencies try to exploit all funding opportunities related to adaptation to climate change (Participant 5, 6).

International agencies: Mainstreaming adaptation to climate change in broad based development

The majority of international actors in the study subscribed to the narrative of: 'mainstreaming adaptation to broad based agricultural development'. They emphasised that adaptation should be part of agricultural development policy and should be an important part of short and long-term national development plans (Participants 2,4). However, government agencies viewed it as involving a change from referring to development funding to referring to adaptation funding (Participant 6). They believed it as a strategy of international agencies for continuing business as usual approaches in relation to funding allocation and mobilisation, and involving private sector promotion.

This narrative portrays climate change as a serious threat to development in the agriculture and many other sectors. This emphasis of international agencies on climate change as a serious threat to development was perceived by the government agencies as a disguised agenda to promote climate mitigation (Participant 5). While international agencies argued that equal emphasis was given to adaptation and mitigation (Participants 1, 2, 4), the government agency interviewees were sceptical (Participants 5, 6) and believed the priority should be reducing farmer vulnerability by tackling farmers' poverty and basic needs and not planting trees or promoting agroforestry. Due to their stronger emphasis on adaptations to reduce farmers' vulnerability, Nepal's Nationally Determined Contributions (NDC) submitted to the UNFCCC do not include climate mitigation efforts in the agriculture sector (Participant 2).

The subscribers to this narrative saw lack of government capacity as the major obstacle in fulfilling the objectives of mainstreaming adaptation in agricultural development. It was assumed that the problem of climate change required complex modelling, impact projections and technological solutions. Therefore, technical support and capacity building are highlighted in adaptation policies and programmes. For example, the NCCSP grant agreement (transition extension from October 2018 to October 2019) shows that only £1.2 million from a budget of £2.08 million was disbursed to the municipalities, with the remainder split between technical assistance and capacity building. The government agency interviewees considered framing climate change as a technological issue was an attempt to divert resources from vulnerable communities to technocrats in international agencies (Participant 6). The interviewees in government agency believed that the international

agencies designed their programmes strategically so as to obtain a large proportion of any funding to finance research and technical assistance (Participant 5).

NGOs: Climate change as an agricultural development opportunity

The NGOs' win-win narrative refers to 'climate change as an opportunity for agricultural development'. It was considered that Nepal could exploit new international funding for climate change adaptation. These narrative stresses the need for a 'no regrets' approach involving climate change adaptation decisions that were appropriate to development goals regardless of future specific or general climate threats. It was seen as including policies with outcomes related to improved economic, social and environmental conditions. This optimistic narrative was supported by rapid increase in NGO funding from international agencies, for climate change adaptation. Thus, NGOs were redefining their development and poverty alleviation objectives within climate adaptation efforts (Participants 13, 15, 6). The motive of this narrative of NGOs is to strengthen the capacity and extend acquisition of resources to maintain business-as-usual in agricultural development (Participant 7).

Based on this narrative, the NGO interviewees explained that, as Nepal's very small contribution to global warming, the developed countries should increase their funding for climate adaptation in Nepal. They consider Nepal a victim of climate change and see the industrialised nations as the culprits. The NGOs were in agreement that the 'victims should not pay, and the polluters should pay' (Participants 14, 16, 18). This narrative has a significant impact on their views regarding the type of climate funding that should be directed to Nepal; they were not in favour of loans since Nepal was not responsible for the climate change. They believed that the developed countries should provide support and funding to developing countries as reparation for their activities and point out that UNFCCC article 4 urges 'all parties to consider their common but differentiated responsibilities' (Participants 14, 16).

Farmers: Agriculture as a major development agenda

Most farmers saw 'agriculture as a major development agenda' and agricultural development as driving economic growth in Nepal. Through this narrative, they wanted immediate action to protect and improve farmers' livelihoods. This narrative is more comprehensive, as it explains the

importance of addressing both climatic and non-climatic stressors in farming. The farmers felt that, despite their huge vulnerability to climate change, they were neglected by government and other agencies (Participant 30).

Farmers mentioned that a narrow focus on climate change adaptation was not conducive to agricultural growth and that they were affected by multiple issues including lack of markets, damaged by wild animals, lack of infrastructure, insect damage, plant diseases and government policy. For example, farmers in Sunsari district described that a shift from rice to sugarcane became an ineffective adaptation strategy since government made no efforts to improve the market or establish a repayment system for sugarcane stalks (FGDs 1, 2). Farmers in Helambu maintained that in the absence of an alternative solutions to reducing damage caused by wild boar, it would be impossible to increase agricultural production since their crop areas would be confined to close to their homes (FGDs 5, 6). They were unable to protect farmland that bordered the forest. In this case, adaptation to climate change through use of improved varieties or technology was not the answer; new government policy was required to control damage to crops caused by wild animals. The results showed that each group of actors had different dominant narratives on climate change adaptation. These narratives are dependent not only on actors' knowledge and experience but also on their vested interest. Although each group of actors mentioned adaptation to climate change is their priority, each narrative represented different motives of the actors while explaining ways of tackling climate change through adaptation. The more powerful actors including government agencies and international agencies wanted to further strengthen their power and position in resource acquisition and mobilisation, while small NGOs and farmers wanted to be fairly included in the policy process and to strengthen their capacity. As different groups of actors had different interests, competition and conflict arise between the actors, which are described below

4.4.3 Politics and interests: Competition and conflict at the multiple levels

Multiple actors with different interests, positions and capacity in the climate policy process, interacted at different levels, which created tensions and led to poor coordination of activities. Each actor group tried to promote their own interests and to avoid potential conflicts by managing the tensions. This study found that the actors use different strategies to manage tension, and if they fail, they focus on their own interests in the policy process.

Competition among and within government ministries

Competition for power and authority in relation to environmental policies and programmes, between the Ministry of Environment (MoE) and the Ministry of Forests (MoF) was evident during the formulation of the NAPA. Most MoE officers believed that other ministries perceived the MoE as unable to manage climate related policies and programmes because the MoE was a new ministry and operated only in Kathmandu. It had no regional or district level offices. The dominant role of the MoE in climate policy formulation and implementation was unpopular with the MoF (Participant 5). Besides, the competition between the ministries in policy process was also related to interpersonal competition between the bureaucratic leaders of the ministries. As the introduction of new policies shows the technical and administrative capacity of a ministry secretary, other ministries sometimes wanted to delay the policy process to block the competitors in gaining personal benefits (Participant 5,6). Due to the competition between these ministries, the MoE was marginalised and organisationally unstable; it had been reorganised several times since its establishment in 1995. The competition between these two was evident until 2018, when government merged them to form the MoFE. The merger was one of the initiatives taken to avoid conflict and never-ending competition.

The competition among government ministries resulted in an ad hoc policy process, and in the process of endorsement of the NAPA, the competition between the MoE and other line ministries, including the MoF, had intensified. MoE officers felt that the other line ministries worked to delay endorsement by raising objections and refusing to review the draft NAPA. As part of the policy process, a cabinet sub-committee comprised of representatives from various ministries, reviews the draft policy documents and recommends amendments. According to one interviewee, a senior government official had assured the then prime minister that the policy document required no further review (Participant 5). In a bid to fast track the approval process, an MoE official said that any further delay to the NAPA would have a negative effect on Nepal's on climate policy making and acquisition of international funding. NAPA 2010 was one of the very few Nepalese policy documents that was approved by cabinet without review by the relevant subcommittee. This shows that the ministry of environment exploited 'impact on international reputation of Nepal' to influence the climate policy process, which further strengthened its role in climate policy decision making in Nepal.

The rift between government ministries hampered the overall climate policy process in Nepal. This resulted in a period of some 22 months rather than the average 12 months, to complete the NAPA formulation (Participant 7). Instead of having an integrated approach, due to the lack of proper coordination, the cross-cutting issues in adaptation were isolated and fragmented in the different plans. For example, although about 40% of the adaptations included in the NCCSP were agriculture-related, the Ministry of Agriculture (MoA) had no opportunity to participate directly. The MoA includes 75 districts, 5 regional directorates and 375 agriculture service centres and is one of the largest ministries in Nepal, but the Ministry of Federal and Local Affairs (MoFALD) implemented the programme. Bypassing the MoA increased the dissatisfaction with the MoE. As a result, the MoA and other line ministries are not collaborating to internalize the climate change programme (Participant 5). This situation was further aggravated by lack of a government mechanism to enable joint responsibility from different line ministries.

Government officers pointed that power struggle by the ministry officers causes frequent transfer of experienced officers to other ministries, which is one of the causes of the government's weak stance in climate policy. Newly transferred senior officers delay the policy process saying that they are new and need more time to gain insight in the progress in the policy process (Participant 3). While extending time by the new officers is quite logical, the international agencies pointed that they often do not want to take the responsibility of previous officers and deny the previously agreed terms in the policy (Participant 2). Therefore, they ask international agencies to restart the process (Participant 1).

Personal conflicts and competition in the government agencies also affect the policy process (Participant 2, 5). For example, the cause of hurdle between the NAPA endorsement was not only due to the competition between the ministries, but also to the personal competition for a senior position in the government bureaucracy. Citing personal competition between bureaucrats, a senior ministry official said: 'Some people (senior personnel of line ministries) did not want me to release the NAPA document as it publicises my greater leadership skills and capacity in policy decision'(Participant 5). International agencies mentioned they have faced delay in policy formulation due to the personal conflict between the bureaucrats within the same ministry (Participant 2,4).

Conflict between international actors and government ministries

The main source of conflicts between the international actors and government ministries was, international agencies pushing own interests based on their technical capacity via international consultants and allocation of resources. The issues leading to conflicts between the international actors and government ministries, and the actions taken to minimise it, are presented in Table 9.

One of the major sources of conflict between the MoE and international agencies was over hiring international consultants when similar expertise was available in Nepal (Participant 5). The international actors were aware of the Nepal government's intention to reduce the use of international consultants, but they provided justifications for using them. They said that, based on their internal policy, international experts were hired to support the low technical capacity of the government agencies (Participants 2,3). Most of the government agencies felt that the international consultants hired by international agencies were international consultants that were not familiar with the local context and were interested in their donors' strategies rather than what suited the local conditions. Such differences in strategy had a major impact on policy formulation and caused disputes and delays. When speaking about the dissatisfaction with international agencies, a government officer said, 'our focus was on the vulnerable population where collective actions through cooperatives of farmers. But the international consultants gave emphasis to promote private sector' (Participant 5). This dissatisfaction related to international consultants was solved through the negotiation, by reducing some level of involvement of external consultants. However, the reduced influence of international actors and involvement of external consultants in the policy process could not continue for a long time due to the frequent transfer of a senior officials. The new senior officers agreed with the terms and conditions of the international agencies (Participant 5). This shows that the influence of policy champions in government ministries and in the interactions with international agencies is important for managing external influence in the policy process. A senior government officer referred to the lead for strong leadership in the ministry: 'Only very few officers oppose the international agencies or donors, while many agree on what they have planned. We cannot blame only donors (international agencies) for their dominance. Were there strong leadership in the ministry for national interests, much work will be done very efficiently. I can see some ministry officials cannot or have no motivation to utilise the already acquired funding for the policy planning and implementation. This justifies the inefficiency of the ministry to the international communities and therefore they want more involvement in the policy process' (Participant 5).

The MoE disagreed with resource allocation by international agencies; this undermined the role of government in the NAPA implementation. For example, during the planning stage of the PPCR to support the NAPA, ministry officers opposed the idea of supporting larger businesses to promote the private sector and instead wanted the focus directly on the most vulnerable farmers (Participant 7). The World Bank bypassed the MoA and used the International Finance Corporation (IFC) to implement the private sector component of the PPCR programme, which gave support to three large private agribusinesses - Golcha Group, Sharda Group and Probiotech-Nimbus group (Participants 5,6). It is more likely that international actors receive objections to loans, for instance, PPCR (Pilot Project for Climate Resilience) (Participant 2).

Agreeing with the resource allocation in the climate change programs has become an informal norm among ministry officials, in particular for grant from donors (Participant 3). Although the government officers were unhappy with the planning of climate change related programmes by the international agencies, they did not raise any objection when the donor came with a grant programs. A senior government officer told:

'We were happy to learn in the Bonn conference about funding for Ecosystem Based Adaptation (EBA); but when the programme was designed, it was not what we expected. The international agencies strategically designed the programme to use most of the fund for themselves in research rather than the actual programme for the vulnerable communities residing in the rural areas. This was in contrary to our expectations; but we accepted it as it was a grant, not a loan' (Participant 5).

Table 9. Competition and conflict issues in the policy process and use of tactics to resolve the issues

Parties involved in the conflict	Policy/Programme	Stage	Issues leading to conflict between parties	Actions taken to address the conflict	Routes of influence
Government ministries - Ministry of Environment (MoE) and Ministry of Forests (MoF)	NAPA	Policy formulation	- Hurdle in approving NAPA due to competition for establishing authority	- The Ministry of Environment (MoE) requested the Prime Minister for approval of the NAPA document without a review by the subcommittee of the cabinet.	Impact on international reputation on climate policy making, which can reduce international funding
Government and International agencies	NAPA Climate Change Policy PPCR	Policy formulation Policy implementation Agenda/ Priority setting	- Reducing international consultants, and using locally available expertise - Fund allocation and management funding - Misalign of interests and needs e.g. promotion of private sector vs vulnerable farming households	- Negotiation and reduced external consultants. - The government proposed that at least 80% should go to the target area. - The government proposed basket climate fund. - Negotiation, but no solution found. The international agencies bypassed the ministries and implemented themselves through own mechanism.	- Advantage of technical expertise and finance - Greater coordination and collaboration on policy formulation - Financial resources from international agencies shape the work of NGOs
Government (ministry of environment) and NGOs	PPCR NAPA, PPCR	Agenda/priority setting Policy formulation	- NGOs- No climate loan, polluters should pay - MoE- climate loan is a concessional resource for fulfilling objectives of NAPA and climate policy implementation. - NGO – exclusion of NGOs in policy making process	- NGOs threatened to file a complaint in the International Court of Justice (ICJ) against four senior officers at the ministry of environment if the government accepts climate loan. - Government included more NGOs, but NGOs did not felt satisfied, arguing the unfair inclusion process.	- Impact on international reputation due to failure to mobilise the already committed fund - Potential transfer of fund to other developing countries

In contrast, the international actors held the view that these programmes were expected to increase government capacity by producing useful recommendations for future policy and generating new international knowledge (Participants 1,2). This shows that the international agencies used funding to exacerbate the inequalities among those in power and to maintain their influence over the policy process. The ministry was reluctant to complain due to the fear of losing grants, resulting in the international agencies dominating the programme. Interactions between the MoE and other ministries, and with international agencies suggests that what happens is not always according to guidelines but depends on individual motivation and the influence of senior government ministry officers. This occurs frequently in the case of donor dependent, less-developed countries such as Nepal, which have experienced political instability and unrest (Participants 5,6,8). Therefore, it is necessary to understand the power dynamics of the individuals involved in policymaking.

Conflict between government ministries and NGOs

The conflict between government ministries and NGOs in Nepal emerged as the result of contrasting views about climate fund types and dissatisfaction about how the ministry formulated and implemented climate policy. NGOs working in the climate change sector were unhappy about their exclusion from the NAPA, Climate Change Policy and the PPCR formulation; only a very few were consulted (Participants 14,15). An NGO officer mentioned that: 'The government (ministries) does not listen to us (Nepalese NGOs) as compared with the INGOs. Some senior government officers of MoE do not have a positive attitude towards Nepalese climate NGOs. There is a formality of inclusion of NGOs in the process by selecting only likeminded NGOs, but they seldom listen to us' (Participant 14). In this sense, policy processes fulfil the requirement of consultation with all stakeholders, but selection processes are not transparent.

The conflict between NGOs and government became more intense during the formulation of the PPCR, which aimed to meet the objectives of the NAPA. In the PPCR, multilateral banks (ADB, World Bank) and the International Finance Corporation (IFC) proposed a mix of loans and grants to increase its resilience. However, the NGOs were against climate loans. An NGO officer said: 'Nepal is a very low emitter of greenhouse gases. The developed countries emit most of the global greenhouse gases that lead to climate change. Therefore, the government should say no to any climate loans. But the government never listen to us. Adding international loan to the country in the name of climate change adaptation is an injustice to Nepalese people' (Participant 15). The

MoE ignored the voice raised by NGOs' alliance against climate loan, and the latter threatened to file a complaint with the International Court of Justice (ICJ) against four senior officers at the MoE if the government accepted a climate loan (Participant 5). The government officers were afraid of losing all funding. There was a rumour that the MDBs would divert the resources to other developing countries if Nepal refused to accept a loan. The MoE officials agreed, subsequently, to accept the climate loan to meet the NAPA objectives and enable climate policy implementation (Participant 5). This is another example of how international sources of funds played role in unequal power dynamics with national actors.

To sum up, the competition and conflicts among the actor groups in the climate change adaptation policy process were related mainly to competition over resources and power dynamic within the government and between the government and international agencies. This competition and conflicts had a tremendous impact on formulation costs and time. For example, the cost of preparing Nepal's NAPA was much higher than similar negotiations in other countries. For example, the NAPAs in Bangladesh and Bhutan cost \$250,000 and \$220,000 respectively, while Nepal spent \$1,330,000 (UNDP, 2019). The inception of the plan to approval, took about two years, 12 months more than expected. The inefficiencies involved in adaptation policy formulation remains evident, since none of the parties involved have changed their strategies. For example, the ongoing formulation of the National Adaptation Plan (NAP) was delayed for over 18 months since late 2016, due to ongoing conflict and lack of coordination among the different national and international actors (Participant 2). The actors used different routes of influence to minimise frictions or to avoid addressing the issues between the different actors due to the contrasting interests. The interests of the powerful actors mainly, international agencies, were included while the priorities of weaker national and local actors were overlooked in the climate policy formulation and implementation. This has significant impact on the outcomes of the policy implementation, which is discussed below.

4.4.4 Policy implementation: outcomes

This section discusses the outcomes of the implementation of overarching climate policies including the NAPA and the Climate Change Policy. Government and NGOs implemented different programmes on climate change adaptation targeting farmers. Due to a lack of consolidated data, it is impossible to estimate the number of programmes and the total budget. These climate adaptation programmes have increased awareness at the grassroots level and informed farmers

of the need for adaptation to climate change; however, their objectives have not been fulfilled. The results show a lack of sustained adaptation at the local level, misalignment of adaptation policies and participatory exclusion when implementing the adaptation programmes.

Standalone projects lack sustained adaptation at the local level

Standalone projects were the results of continued disagreement between international agencies and government agencies on resource allocation strategies: direct budget aid vs project aid. CCP in Nepal had provision of a 'national basket fund' to channel climate finance through government agencies and NGOs according to the national priorities. The objective of the national basket fund was to provide better coordination among stakeholders and keep track of adaptation programmes. Through this provision, government hoped to provide finance and ensure that it reached rural areas, based on the provision of mandatory investment of 80% of the climate change budget. Government wanted direct budget support, to ensure budget in the rural areas by the provision of mandatory investment of 80% of the climate change budget. Although it was not mandatory for non-government organisations, the international agencies were not happy as the provision conflicted with their resource allocation mechanisms which prefer to award project aid to like-minded NGOs (Participants 5,7). Therefore, the international agencies created a pressure, and the provision of 80% at the local level was removed, while updating the Climate Change Policy in 2019 (Participant 2). Therefore, most programmes implemented by NGOs and INGOs avoided the government's institutional mechanisms in climate change adaptation, resulting in multifarious standalone projects that lack sustainability of the impact in the long term.

A local NGO in the study sites in Lamjung had implemented a community led adaptation project. The project raised awareness of climate change among farmers and trained on improved vegetables and ginger production. However, the project was of a short duration project and provided no long-term support for sustainability of its impacts. A farmer said, 'This programme was supposed to assist us in increasing production and marketing of ginger, but the programme, which was completed in two years did not help us to develop proper marketing channels for our farm products' (Participant 22). Most of the interviewed farmers believed that the project left them stranded since there was no development of a marketing channel for their ginger.

High-level policy actors, including government ministries and international agencies, blamed each other for the lack of sustained adaptation at the local level as a result of standalone programmes. Ministry officers and district level officers pointed to the INGOs and NGOs' isolated mode of working which contributed to a lack of sustained adaptation and development actions (Participants 5, 8, 9). The majority of government officers at the district, regional, and central levels admitted that the local NGOs did not collaborate with the local government unless this was mandatory. A government officer maintained: 'While some NGOs coordinate informally, due to the lack of formal coordination with the government's district agricultural offices, the government does not have a record of the such isolated NGO programmes (Participant 6). The NGOs and INGOs had different views about the reasons for non-cooperation and lack of sustained adaptation programmes at the local level. An NGO officer told: 'We do our best using our resources and try to achieve the most from the available resources within the certain timeframe. The formal coordination with the government offices is very difficult and such attempts can trap us in the tedious and time-consuming government bureaucratic system' (Participant 15). Disagreement between national and international actors and lack of cooperation is ongoing and none of the parties had a strategy designed to reduce these problems at the multiple levels.

Misalignment of adaptation projects to local needs

Misalignment of adaptation projects to the needs of the local agricultural communities was due to the contrasting interests of the actors and their different financial and technological capacities compared to the main national actor, government. For example, the international actors favoured like-minded NGOs for resource mobilisation, and smaller, short-term projects, which they saw as having a bigger impact, while the government preferred bigger and longer terms project which they believed would have sustained impacts (Participant 3).

Climate adaptation projects, implemented by NGOs, were mainly top-down and based on little prior knowledge of local needs, which caused a misalignment with priorities (Participants 1, 5, 7, 18, 26). The local adaptation plans and actions were based on guides designed and provided by donors and fulfil international donors' interests and strategies, but lacked an overarching adaptation vision which would require more funding. For example, in the drought-affected villages of Sunsari, drought-resistant varieties and deep tube wells have been implemented, but the farmers' priority was an irrigation canal. One farmer told that: 'We are living in the district which

has one of the largest rivers of Nepal, Saptakoshi, but we are relying on rainfall for irrigation for farming. We asked an NGO and district agriculture office about the drought problem and asked for the renovation of Chanda Mohan Nahar (irrigation canal). But we were advised by the officers to adopt new 'Sukkha' varieties of rice' (Participant 22). The NGO did not know about the need for canal the reconstruction and maintenance, as they had prepared according to donors' limited funding when planning the programme and so the budget was insufficient (Participant 17). The solution proposed by an international actor (an INGO) was to introduce a drought resistant (*Sukkha 2*) rice variety, but few farmers were interested in this new variety. Many farmers continued to grow *Radha 12*, *Masuli*, *Hardinath* and *Kanchi Masuli* rice varieties (Participant 24). Due to this situation farmers in the Sunsari district study area were very dissatisfied with the activities of development agencies and were disappointed by the top-down working modality in climate change adaptation programmes (Focus group 1,2). This example shows that NGOs' cookie cutter approach of adaptation policy making does not fairly address the local problems; their approaches are aligned to the interests of international funding agencies.

The misalignment of adaptation programmes to farmers' needs was putting more pressure on resource-poor farmers and trapping them in a cycle of debt from which there was no escape. For example, in Lamjung district NGOs did not consider the adaptation options best suited to the targeted communities. Farmers were suffering losses in rice, maize and vegetable crop due to hailstone damage and needed financial and technical support to change to livestock farming as an adaptation strategy. However, the NGO was emphasising commercial production of tomatoes and ginger (FGD 3, 4). The new technology was based on the concept of off-season tomato production and use of poly-tunnels. The tomato crop and the poly-tunnels suffered severe hailstone damage. A farmer from Ilampokhari village said that: 'In the expectation to earning more, each of the participating households lost thousands of rupees, which was borrowed from Sahu (local informal moneylender). Now we are entrapped in the debt' (Participant 27). This problem could have been avoided if the project had adopted a bottom up approach and consulted at the local level. Although the technology might be good, if misaligned to local conditions it will have a negative impact on the adapting farmers.

Participatory exclusion

Climate adaptation programmes to support NAPA and the climate change policy targeted mainly low-income households, but active participation of the lowest income groups of farmers was poor. A tenant farmer in Sunsari district was unable to participate in a government tube well irrigation programme for drought-affected farmers because he lacked a land ownership certificate or consent from his landlord. Tenant farmers in Lamjung and Sunsari could not participate in NGO training because they could not afford to lose their wages from labouring (FGD 1,2,3). For them, it was a choice between managing to survive and participating in the training. Even those marginalised communities that were included, were not very active and were dominated by more privileged groups.

The main reason for the low level of participation of lower income farming households was that adaptation programmes took no account of their ability to participate. Resource-poor farmers found it difficult to meet the rules for participation in adaptation programmes as time and costs did not allow their participation. FGDs (1,2,4) and interviews with NGO officers (Participants 15,17,18) found that the financial implication of participation was impossible for rural poor households in Nepal. The rules and conditions favoured richer farmers who were more able to fulfil the requirements of the programmes but fails to consider different needs of the poor. Despite their exclusion of the most vulnerable households, climate change adaptation programmes continued to demand financial participation of farmers (Participants 14,16,17). Seeking financial participation from resource poor farmers is based on the strategy of international agencies which perceives farmers as entrepreneurs in a free market economy, and belief that providing full grant to farmers will reduce the sustainability of the impact (Participant 2). Therefore, although climate adaptation programmes aim for social inclusion, their benefits do not reach the most vulnerable and weaker groups.

4.5 Discussion

This study examined how multiple actors with different interests interact in the policy process and the impacts of their interactions on the outcomes of policy implementation. The present study adds to climate adaptation policy literature by focusing on the different narratives and views of the range of actors involved in climate policy process, the power politics among the actors and the outcomes of policy implementation. This study shows that unequal power relations and frictions among policy

actors arise from their different interests in policy formulation and implementation and exclude the most vulnerable communities. The following sub-sections describe the influence of international actors and exclusion of marginalised communities.

4.5.1 Influence of international actors and politicians as disinterested in the climate change agenda

The climate change agenda involves the translation of international climate policy frameworks to the national level. It is important for international, national and local actors to create a space for dialogue, cooperation and knowledge transfer, and acknowledge the power imbalances at the national and international levels. Despite underlying differences in interests and capacities, the actors have managed to collaborate in the climate change policy process. Nevertheless, these actors compete and promote their own agendas, and powerful international actors can influence the policy process and exclude the interests of developing countries. This means that weaker actors do not have a voice in the policy process. High levels of knowledge and financial resources of international actors are considered necessary to dominate the policy process in developing countries (Naess et al., 2015; Tanner et al., 2014). In the absence of International actors, powerful national level actors dominate the policy making process. For example, powerful national actors interested in soybean cultivation and mining, lobbied in the National Congress of Brazil for policy to remove the territorial rights of Indigenous people to practice Indigenous fire management practices (Bilbao et al. 2019). Among the different actors, international actors are better informed and have better access to knowledge and financial resources.

This study found that policy champions in government ministries are important for promoting national interests. This underlines the need for increased technical capacity and motivation among senior government policy decision makers. It argues that, in the climate change policy process, influencing the policy process using knowledge and resources is not enough. At the national level, what is required is policy champions in government ministries to push national interests and balance the interests of international and national actors. However, frequent leadership changes, scarce resources, poor technical capacity and inter-ministry competition weakens the positions of national policy actors, which allows international agencies to continue to influence and shape climate policies and outcomes. Moreover, senior politicians are not necessarily interested in the climate change agenda, which allows international agencies to have greater influence over the

climate policy process. This finding contrasts with previous works which point to high levels of interest in adaptation policies and programmes among the politicians in power in developing countries (Alex et al., 2014; Funder et al., 2018). These studies portray national governments as 'climate opportunists' who use climate change for their own strategic interests. However, the politicians in Nepal are focused more on infrastructural development and poverty reduction than climate change adaptation. One of the reasons for this is that the narratives that Nepal contributes very little to climate change and, therefore, expects adaptation to be funded by the developed countries who are responsible for climate change effects. A low level of resources devoted to adaptation programmes and trade-offs with competing development agendas, means that climate adaptation tends to be overlooked by the national politicians. This study argues that due to the existing rent seeking behaviour of the Nepalese politicians (Dix 2011), they will become involved if there is greater funding for climate adaptation programmes and infrastructure developments and resettlement programmes related to climate change adaptation in rural areas. This study suggests that climate change adaptation should be high on political agendas to accelerate progress in adaptation to climate change in agriculture. Otherwise, a lack of interests of high-level politicians results in piling of climate change policies, but without enthusiasm of the government in fulfilling the policy objectives.

4.5.2 Alone and stranded: adaptation projects that exclude resource-poor farmers

Government ministry urged international agencies for the direct budget support through national climate basket fund, but international agencies preferred project aid favouring NGOs while implementing adaptation programmes. Therefore, international agencies bypassed the government resulting in fragmented climate adaptation aid and a rapid increase in standalone climate change adaptation projects. This has been a problem in developing countries for a long time (Knack and Smets, 2013; Molenaers et al., 2014; Morss, 1984; Moss et al., 2006). While some standalone projects encourage piloting of new approach and allow competition among donors, too many individual projects lead to negative impacts on the recipient countries (Greene, 2004; Knack and Rahman, 2007; Pickering et al., 2017) and distort recipient countries' priorities by creating a para-state run by the NGO-government sector which undermines government's role in these activities. Standalone projects increase the possibility of duplication of adaptation interventions in the same area due to lack of coordination and poor communication among the different agencies. Therefore, they often do not yield sustainable impact and lack accountability. Also, projects that rely on international consultants do not enable the accumulation of knowledge

and human capacity in the recipient countries (IIED, 2011). Therefore, adaptation programs run by international actors should include a level of flexibility to ensure that the interests of the recipient countries are being respected.

This study shows how power politics between national government and international actors on target groups contributes to the exclusion of marginalised communities at the local level. The study revealed that the exclusion of poor households in policy implementation was related to the strategy of international actors, which is influenced by pre-determined perspectives. Despite objections from the government, international actors continue to pursue a strategy that overlooks the limited capacity of the most vulnerable groups since the focus is on promotion of private sector and removal of subsidies. The data show that even when the most vulnerable groups are included in programmes, they are often unable to participate due to the costs involved, which they are unable to afford. Besides, the social norms do not allow the weaker groups to voice their objections and compels them to agree with all the decisions made by the powerful privileged groups. Therefore, the less powerful, but most vulnerable, can engage only in 'passive participation' in decision making by being identified as beneficiaries of the programme, but not benefiting because of the lack of cost and time required to participate.

The continued non-participation or passive participation of the most vulnerable populations increases the power of the most privileged groups, allowing them to be even more 'active and influential' in decision-making. Since more knowledge implies greater negotiating power and greater ability to grasp opportunities (Weisser et al., 2014), the more privileged groups involved in adaptation programmes obtain more benefits and increase their capacity to adapt. This finding is relevant since previous research suggests that poor implementation is responsible for the exclusion of resource-poor communities and overlooks how the role of actors in the policy formulation process can hinder the participation in adaptation programmes of the poorest households. The 'tick box approach' adopted by development agencies in relation to the inclusion of marginalised communities does not favour resource poor and highly vulnerable farmers at the base of the poverty pyramid. This study suggests that, during formulation and implementation of the climate adaptation policies and programmes, identifying the most vulnerable households is not enough; it is necessary, also, to acknowledge the barriers to their full participation and to include mechanisms to ensure their active participation. Given their high vulnerability and low resources, the most vulnerable farmers should not be seen as rational entrepreneurs in the

Nepalese context. A top-down 'plan and implement' approach will further undermine already vulnerable farming households and increase the capacity of the more privileged farming households.

4.6 Conclusions

This study investigated the experience of policy actors in a developing context in shaping climate adaptation policy and its outcomes. The context of Nepal involves intense competition and conflict among government agencies and between national government and international actors, which provide interesting nuances to the actor-policy process interface. The study contributes to the adaptation policy literature and demonstrates the importance of understanding the role of actors and institutions, their narratives, and their interests in relation to poor outcomes for farmers.

International agencies' adaptation policy framings are found to be problematic in the Nepalese context; they emphasise private sector promotion and removal of farmer subsidies, but do not consider the limited capacities of the most vulnerable farmers. Therefore, evaluation of the unfair distribution of adaptation benefits should consider how the power politics and interests of influential international and national actors are shaping policy outcomes. This would throw light on the causes, their extent and the approaches to secure the engagement of different actors and identify the obstacles to satisfying national and local priorities and why the most vulnerable groups are excluded.

In a resource-constrained developing country, such as Nepal, the policy process tends to be dominated by international actors, based on their ability to mobilise financial resources. Strong interests of politicians in power and supporting policy champions in government agencies are required to align the national priorities in climate change policies and programmes. Government ministries are unable to fully accommodate national priorities in the absence of adaptation as a strong political agenda, and without input from other important actors, such as universities and farmers. Therefore, the vulnerability approach of the government, which urged direct budget support in a basket climate fund to streamline the climate aid for the national priorities, was not successful. In contrast, international agencies fund individual projects which fulfil their interests but take no account of local priorities. Increasing the capacity of government would allow the

relevant ministries together with non-state actors, to formulate and implement more effective climate change adaptation policies that are in line with state capacity and national interests.

The interactions among policy actors depend heavily on the economic, political and institutional context (Funder et al., 2018; McGregor et al., 2015). Therefore, generalising of the results of this research to other developing countries should be done with some caution. However, the relationships and influence of international actors and national governments in the policy process apply to all resource-limited developing countries that rely on foreign aid for their policy formulation and implementation. Future research could employ comparative methods to study the rationales and motivations of government ministries in the policy decision making process and investigate the range of mechanisms used by international actors to plan adaptation policy.

A political economy lens provides additional insights into the injustices and exclusions involved in climate policy formulation and implementation. Important local actors including universities, local research institutions and farmers' organisations are either excluded or assigned a minor role in the policy process. The study shows that the most vulnerable farmers are excluded from the climate policy formulation and implementation process which leads to procedural injustices. The climate change community and, in particular, international actors, government agencies and NGOs, need to engage in more nuanced planning and actions to ensure positive outcomes for the most vulnerable farmer groups. International actors should employ an inclusive and flexible approach in relation to both adaptation financing and donors. This will require changes to how international actors' value and support local actors and local priorities and include them in the policy process through locally designed, locally owned and locally controlled climate change policies and programmes that enhance capabilities at multiple levels. Otherwise, rather than reducing vulnerabilities, climate change adaptation policies and programmes will exacerbate the vulnerability of resource poor farmers and will continue to benefit only privileged farmers.

5. Discussion and conclusions

This chapter discusses the findings from this research in relation to climate adaptation theory, policy and practice, by summarizing the key findings and the contributions of the thesis. Chapter 5 starts with the main findings (Section 5.1) and introduces a multilevel framework to understand climate change adaptation (Section 5.2), and discusses the empirical, theoretical and policy relevance of the findings and the contributions to knowledge (Section 5.3). Section 5.4 outlines some limitations of this research and recommends directions for future studies. Section 5.4. presents some concluding remarks.

5.1 Main findings

This section discusses how Chapters 2, 3 and 4 address the overall research aims and research questions. The objective was to obtain a more comprehensive understanding of adaptation to climate change by Indigenous farming communities - Yolmo, Gurung, Tharu - in three different agro-ecological zones of Nepal. To guide the main research aim we formulated the following questions:

1. Which factors influence farmers' adaptation behaviour in response to climate risk?
2. What roles do the different economic and non-economic forms of capitals play in adaptation to climate change ?
3. How do international actors, national governments and local actors with different interests interact in the climate adaptation policy process and what is the impact of their interactions on policy outcomes?

Drawing on the Theory of Planned Behaviour (TPB) (Ajzen, 1991) in psychology, Chapter 2 explains farmers' adaptation behaviour in response to climate risks. The study argues that both psychological and situational factors are important for understanding adaptation to climate risks in agriculture. This study employs a modified TPB which includes situational factors. The findings show that although psychological factors are important for the intention to adapt, they are not sufficient to affect actual behaviour. The individual's subjective beliefs about certain adaptation practice are not sufficient to change individual behaviour which is both situationally and socially context specific. An individual's belief that certain adaptation practices are good, and the individual

has the ability to adapt are sufficient to create the intention to adapt but not actual adaptation behaviour. The study shows that the gap between intention to adapt and adaptation behaviour among farming households depends on access to loan, landholding size, household head age and experience of climatic shocks. This study found also that subjective norms or perceived social pressure to engage (or not) in adaptation, are the most important psychological factors influencing the intention to adapt. Therefore, efforts should be made to support farmers' groups, to promote cohesiveness, and build mutual trust and a shared understanding based on sharing and transfer of knowledge. This implies that, although the adaptation decision is an individual decision, it is based on the social and cultural context. Therefore, it is important to understand how interaction within the community affects adaptation – see Chapter 3.

Chapter 3 draws on Bourdieu's (1986) notion of forms of capital, and analyses conversion of economic and non-economic (social, cultural and symbolic) capitals from one form to another, to explain adaptation to climate change by Indigenous farmer communities. Highlighting the important role of non-economic capitals, the study revealed that symbolic capital is a strong driver of adaptation to climate change in farming and contributes to networking and access to the resources provided by powerful institutions. The key finding from Chapter 3 is that unequal possession of different types of capital and differential ability to convert available capitals, increase inequalities as a result of differential adaptation outcomes for different groups. The analysis shows that adaptation to climate change is a 'new opportunity' for privileged groups but can be a 'maladaptation and trap' for disadvantaged groups in Indigenous communities.

The study argues that ignoring the heterogeneity within Indigenous groups hides disparities in the ability to mobilise capitals and can create further inequalities in adaptation outcomes for different groups. The privileged group of the Indigenous community uses the strengthened capacity to adapt on developing, reinforcing and maintaining the dominant relationship with disadvantaged groups. As a result, adaptation outcomes increase inequality and push resource-poor farmers into greater poverty, further eroding their capacity to adapt. Therefore, the findings suggest that adaptation efforts should consider the differential abilities of different groups in Indigenous communities to convert capital through the planning and implementation of economically and socially equitable interventions for adaptation to climate change. The use of the concept of different forms of capital helps to explain how the adaptation efforts of certain privileged groups affect the adaptation of disadvantaged groups in the Indigenous communities. However, the

community level analysis does not explain why and how some groups are positioned differently from others. Therefore, we should examine the policy process to understand how the interests of disadvantaged Indigenous farming communities are excluded from policy formulation and implementation – see Chapter 4.

Chapter 4 uses a policy process framework (Keeley and Scoones 1999, Wolmer et al. 2006) drawn from the environmental policy literature and extends it by including policy implementation. The present study adds to the climate adaptation policy literature, using a political economy lens and focusing on the different narratives and views of the range of actors involved in the climate policy process, the power politics among the actors and the outcomes of policy implementation. This study showed that unequal power relations and frictions among policy actors arise from their different interests in policy formulation and implementation, which can lead to isolated and fragmented policy programmes that exclude most vulnerable farmers.

This study (Chapter 4) argues that exclusion starts with the policy making process, where differential actor narratives and interests push their agenda and understanding. A more inclusive and flexible approach would result in more equitable adaptation outcomes. This would require abandoning existing international adaptation policy framings that do not adequately address exclusion and inequalities. Analysis of a range of actors, including donors, governments, NGOs and farming communities, reveals the injustices and exclusions involved in climate policy formulation and implementation. This information could be used to ensure effective participation and greater influence of less powerful actors in all stages of the policy formulation and implementation process. It would better align local and national priorities and interests to international agencies' (funders) objectives. Without this alignment, the climate process could lead to conflicts and competition among the actors, resulting in fragmented adaptation efforts and marginalisation of national interests and priorities and exclusion of marginalised Indigenous communities.

To sum up, the multilevel study used in the three main chapters which constitute this thesis, highlights the main research aim of achieving a more comprehensive understanding of climate change adaptation by Indigenous farmers. Chapter 2 highlights the influence of different psychological and situational factors and shows that the individual's subjective beliefs about

certain adaptation practices are is not sufficient to change individual behaviour. Individual behaviour is situationally and socially context specific. Chapter 3 explains inequalities in adaptation outcomes between privileged and disadvantage groups as a result of overlooking heterogeneity within and between Indigenous communities. Chapter 4 suggests that powerful actors with different narratives and interests push own agenda in the policy making process, overlooking the interests of less powerful actors, and differential capacity of different groups in the policy implementation. Integrating the findings from these three main chapters shows that, without a clear understanding of the multiple factors that enable or constrain adaptation, development agency and government initiatives may not achieve alignment between adaptation needs and prescribed adaptation options and will exacerbate the vulnerability of disadvantaged groups in Indigenous communities.

5.2 Multilevel framework for understanding climate change adaptation in agriculture

Drawing on the findings from the study, this study proposed a novel multi-level framework (including the household, the community and policy) that can be used to investigate climate change adaptation in agriculture (see Figure 10). The framework employs a mixed method approach, both qualitative and quantitative. Quantitative method helps to understand households' socio-economic and psychological factors influencing adaptation to climate change. However, it does not explain why these factors are important. Qualitative methods are used to understand how they do certain things and why. This framework is useful to investigate Indigenous communities' everyday activities and interactions with multiple actors to enable a better appreciation of the complexity of the social, cultural and institutional issues involved in climate change adaptation. The framework employs concepts and theories from multiple disciplines, including psychology (Chapter 2), sociology (Chapter 3) and environmental policy (Chapter 4) and draws on the literature on climate change adaptation in the context of a developing country and Indigenous groups.

At the individual level, the framework analyses farmers' adaptation behaviour from a socio-economic and psychological perspective, and the influence of these factors on attitudes, intention and behaviour (Ajzen's theory of planned behaviour). Since behaviour (adaptation practices) is an outcome of the individual's subjective beliefs including attitudes, subjective norms and behavioural beliefs (Ajzen 1991) associated with adaptation, understanding these beliefs is relevant for

understanding why farmers adopt certain practices and avoid others. While the individual's beliefs are important for forming individual intentions, there are various contextual factors which affect the performance of actions/behaviours (Barr, 2007; Thapa Karki, 2015). The study findings show that the social context has an influence on the adoption of adaptation behaviour and highlight the importance of considering the social and cultural contexts influencing beliefs and behaviour.

At the community level, the framework analyses how farmers convert their economic and non-economic (social, cultural and symbolic) capitals to shape their adaptation practices. Analysis of conversion of capitals provides a better understanding of the inequalities in adaptation outcomes among different groups of the communities. The results show that unequal possession of different types of capital and differential ability to convert available capitals, increases inequality such that marginalised farmers are pushed further into economic maladaptations that continuously traps them in the same practices.

At the policy level, this framework examines actors and institutions, narratives and views, the power politics among these actors and policy implementation. It has been argued that analyses of the exclusion of vulnerable groups should consider how the interests of influential international and national actors shape policy outcomes at the local level. This helps to explain the causes, extent of and approaches to the engagement of different actors and to understand the obstacles to achieving national and local priorities and identifying the reasons why the most vulnerable groups are excluded. This study found that the interests of international agencies and the power dynamics among actors, contribute significantly to the exclusion of marginalised farmers and policy outcomes that are incompatible with the country's needs and interests.

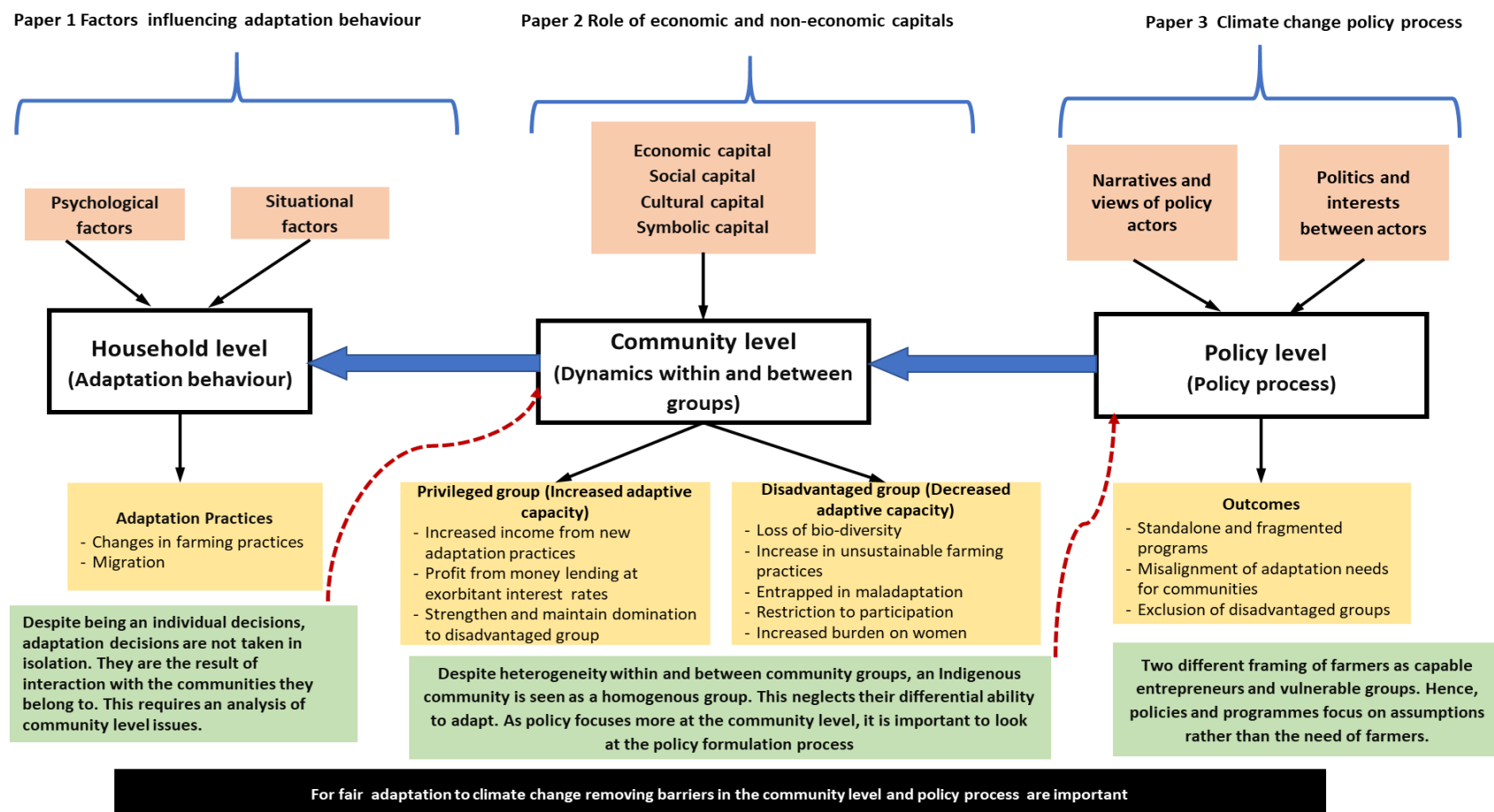


Figure 10. A multilevel framework: Policy process at the national level, conversion of capitals at community level and psychological and situational factors at household level

Notes: White boxes – Three level of analysis: Individual (micro), Community (meso) and Policy (macro); orange shading – Focus of analysis (Individual – Psychological and situational factors); Community (Capital and capital conversions); Institutional (Institutional arrangement, narratives and views, and Politics and interests of actors); Yellow boxes – Findings (Individual – Adaptation practices); Community (Two different groups with differential adaptive capacities); policy (Outcomes of the policy process); Black box: Final outcomes
Blue arrows – Relationship between different levels and how the impacts trickle down from policy level to differing social interactions at the community level affecting individual adaptation practices. Red dotted arrows – How each analysis at each level informed analysis at another level

The framework builds on the three empirical chapters (Chapters 2,3,4) and highlights how a multi-level analysis can deepen understanding of the multifaceted and complex nature of adaptation to climate change in agriculture and, also, deepening inequalities among different groups of Indigenous communities resulting from adaptation to climate change. Chapter 2 suggests that, in the absence of supporting institutions, farmers generally adopt traditional adaptation measures which do not require much support or finance. While their adoption might be easier, these types of adaptation practices may be less sustainable and may have negative impacts on Indigenous communities. These negative impacts include loss of traditional seeds exchange systems, and higher dependency on external inputs. Appropriate external technical and financial support and solutions, provided in a bottom-up approach, are crucial. Moving from the individual/farm level to the community level, Chapter 3 discussed inequality in the adaptation outcomes experienced by different Indigenous community groups. The most resource poor farmers have reduced ability to convert capitals and are more negatively affected compared to more privileged groups. Rich farmers can deploy and convert their capitals to achieve more effective technical adaptation whereas poor farmers are confined to traditional adaptation methods. As a result, adaptation practices can become an economic maladaptation trap for disadvantaged groups. This highlights the need to consider the heterogeneity within Indigenous groups rather than seeing them as a homogenous unit. Analysis of the policy process in Chapter 4, suggests that lack of participation of weaker groups in adaptation programmes further increases inequalities in adaptation since their interests are hidden from or not considered by elite groups. The interests and participation of powerful actors in the policy process overlooks the limited capacity of the most vulnerable groups and excludes from policies and programmes.

Overall, the findings suggest that a holistic understanding of adaptation from an individual, community and policy perspective is important to ensure equitable climate change adaptation. Current adaptation interventions in Nepal and other developing countries tend to focus on increasing economic benefits and ignore non-economic outcomes, including possible increased social inequalities. Without appropriate external interventions, climate change adaptation will exacerbate the vulnerability of the most resource poor farmers and benefit only the more privileged farmers. Thus, the findings from this study have implications for both policy and practice. This study suggests that future work should investigate the link between social inequalities and environmental sustainability in the context of adaptation to climate change.

5.3 Key contributions

This thesis research used a novel multi-level framework to understand climate change adaptation in agriculture, by examining the individual, community and policy levels. Although previous studies acknowledged that adaptation is a dynamic process that involves multiple levels (Dewulf et al. 2015), works on climate change adaptation in agriculture do not focus on the multilevel perspective in theory and practice. This integrated multilevel analysis fulfils the gap in climate change literature, which would enable better planning and implementation of climate change adaptation interventions in Indigenous communities. Overall, the thesis advances our understanding of the multifaceted and complex nature of adaptation to climate change in Indigenous farming communities. The contributions made by this research are discussed below.

5.1.1 Empirical contribution

Climate change is threatening the lands, livelihoods and cultures of Indigenous people, a segment of society overlooked by research and policy (Salick and Byg 2007, ILO 2017). The mountain region of Nepal is home to several Indigenous communities and the mountain ecosystems are being affected severely by climate change (Lama and Devkota 2009). Little is known about adaptation to climate change by Indigenous communities in the Himalayan region (Singh et al. 2011, Ford et al. 2016, ILO 2017, McDowell et al. 2019). This study contributes to filling this knowledge gap and allows a better understanding of which actions are effective and should be prioritised in the planning and implementation of adaptation policies and programmes.

5.1.2 Theoretical contribution

Chapter 2 responds to criticisms that climate adaptation studies lack a theoretical framing for their analyses of the influence of the different factors involved in farmers' adaptation behaviours (Arbuckle Jr et al., 2013b; Li et al., 2017). The study extends the Theory of Planned Behaviour (TPB), adapted from psychology discipline, by including situational factors to analyse farmers climate change adaptation behaviour. The modified TPB includes household level situational (farmer and farm characteristics) and psychological (norms, attitudes, perceived behavioural control, intention to adapt, psychological distance) factors. There is a limited research that explicitly examines how psychological and socioeconomic factors, in combination, affect the intention to adapt and adaptation behaviour of farmers. The study argues that on its own, the TPB cannot explain adaptation behaviour; it requires the inclusion of both situational factors. This is

important as previous studies on farmers' adaptation behaviours in developing countries mostly explored farmer and farm characteristics (Agrawal and Perrin, 2009; Below et al., 2012; Deressa et al., 2011; Zampaligré et al., 2014) overlooking psychological factors crucial for decision-making (Daxini et al., 2018) about climate change adaptation (Dang et al., 2019; Niles et al., 2016; Truelove et al., 2015). The results of the study confirm the validity of the proposed framework, which underlines that consideration of both situational and psychological factors is necessary to understand farmers' adaptation behaviour. Therefore, this study fills the gap in theory-based analyses in the climate change adaptation literature.

Chapter 3 contributes to the climate change adaptation literature by introducing Bourdieu's (1986) concept of conversion of economic and non-economic (social, cultural, symbolic) capital. An emerging strand of work on climate change adaptation by farming households in developing countries investigates some forms of capital (Valdivia et al. 2010, Ifejika Speranza et al. 2014, Orchard et al. 2019), but does not examine their conversion into other forms. This study builds on a small number of studies in other disciplines including education (Bathmaker et al. 2013), health (Veenstra and Abel 2019) and aging (Gilleard 2020) that argue need of understanding of conversion of capitals. Using the concept of 'privileged groups' and 'disadvantaged groups' in Indigenous communities, this study helps to understand how adaptation by some privileged groups affects adaptation by disadvantaged groups. The study argues that understanding conversion of capitals in Indigenous communities is important to understand inequalities in adaptation outcomes between privileged and disadvantaged groups within these communities.

5.1.3 Policy contributions

The findings have some important implications for climate change policy for developing country contexts. The findings show that to understand farmers' adaptation behaviours requires more than a household level analysis and should include enabling and constraining factors at the community level and policy level mechanisms. Therefore, climate change adaptation policies and programmes need to consider different factors at multiple levels to formulate and implement effective interventions.

At the household level (Chapter 2), the study showed that the subjective norm (perceived social pressure) is an important psychological factor influencing the intention to adapt, suggesting that

the adaptation decisions of farming households are affected by social and cultural influences of community. Therefore, the study suggests that adaptation efforts should be directed to cohesiveness and the building of mutual trust and shared relationships in the communities. Among the contextual factors, a significant relationship between access to loans and adaptation behaviour was revealed, underlining the importance of financial support in adaptation by farmers. This could be done via promotion of local credit groups and cooperatives, in the areas where formal financial institutions are not available. Also, the access to agri-technicians have significant and positive relationship with intention to adapt. Based on local needs and priorities, these adaptation interventions should include extension services and credit facilities and sharing of good practice in farmer groups and cooperatives.

This study (Chapter 3) argues that failure to appreciate the heterogeneities within Indigenous communities can disguise disparities related to the position of resources and their mobilisation and the benefits that accrue only to the most privileged groups. This research contributes to policy discourse on Indigenous communities by revealed the inequalities in adaptation outcomes to privileged and disadvantaged groups within the seemingly homogenous Indigenous communities. For example, adaptation to climate change became a 'new opportunity' for the privileged groups, but the same adaptation practice became a 'maladaptation and trap' for the most disadvantaged groups. This is an important finding since inequalities among Indigenous communities tend to be overlooked in academic and policy debates. Article 18(3) of the 2015 Nepal constitution makes provision for the protection, empowerment and development of Indigenous communities, which it assumes are homogeneous. In Nepal and elsewhere in the world, NGOs and government agencies working on climate change adaptation assume that 'one size fits all' in the context of adaptation programmes for Indigenous communities and ignore differences related to resources mobilisation, within the Indigenous communities. Therefore, the development agencies and governments should acknowledge the heterogeneity, both across and within Indigenous communities, to avoid vulnerabilities of disadvantaged groups being exacerbated and dominance of privileged groups being reinforced.

The study (Chapter 3) shows that climate change is causing indigenous crop varieties and traditional crops to disappear from the fields of the most resource poor Indigenous farmers. Loss of indigenous varieties shows conservation of traditional crops and varieties enabled by conversion of cultural to economic capital among Indigenous farmers, is being threatened by

climate change. In this sense, growing traditional crops and varieties is becoming less profitable and more riskier due to increased frequency and severity of climate induced disasters. This means, cultural capital, which embeds traditional knowledge and skills, cannot always accommodate the increased threats posed by climate change. This is an important finding; climate change adaptation policies and programmes focus on whether farmers are adapting and ignore the ecological, social and cultural impact of these efforts. For example, a shift from traditional to a new hybrid crop variety can lead to multiple problems including loss of traditional seed exchange system, increased crop diseases and increased dependency on chemical fertilisers, affecting the sustainability of the smallholder farming system. Although adaptation to climate change is important to reduce future losses, it can have a negative effect on society, culture and the environment. Therefore, this study argues that efforts to understand and co-produce a management system that conserves traditional crop varieties must be based on scientific and indigenous knowledge, and must consider both the economic and social, cultural and environmental impacts of adaptation.

The study (Chapter 4) argues that evaluation of the unfair distribution of adaptation benefits should consider how the narrative, power politics and interests of influential international and national actors are shaping policy process. This is relevant as prior studies emphasises on poor governance for the ineffective participation of marginalised farmers but exclude the role of international agencies. This study shows that unequal power relations and frictions among policy actors arise from their different interests in policy formulation and implementation, which lead to isolated and fragmented policy programmes that exclude vulnerable farmers. Based on the findings, the study suggests a national strategy is needed to include the most disadvantaged groups in the climate policy process. Such efforts require the changes in the existing approaches of influential international and national actors regarding adaptation policy and programs that do not take full account of most vulnerable farmers. Meaningful cooperation and collaboration between actors at all levels is necessary for fair policy process where actors realise each other strengths and weaknesses. In this regard, the role of international actors should be acknowledging local level knowledge and valuing and supporting national and local actors and giving space to their priorities. Similarly, the role of national and local actors as an intermediary should be in ensuring 'participation' and 'influence' of less powerful actors in all stages of the policy formulation and implementation, through the promotion of locally designed, owned and controlled climate change

policies and programmes. A starting point would be acknowledging the power dynamics at the community level and in national and international policy making to achieve equitable climate adaptation actions that benefit the most vulnerable farmers. Also, bottom-up approaches, such as incorporation of the opinions of Indigenous farmers when planning climate adaptation policies and programmes, are important, given that the business-as-usual top-down approach of planned interventions which focuses solely on introducing new adaptation practices, is neither sufficient nor effective.

5.2 Limitations and future research directions

This research has some limitations. First, it focuses on only 3 of the 59 Indigenous communities and locations in Nepal. The Tharus in the eastern region have different traditions and customs from those in the western region, which makes the generalisation of our results problematic. However, the aim was to show how adaptation outcomes are shaped differently within different segments of those communities, via interactions with individual, community and policy processes. As such, the general implication of the research is to consider the differences within and between communities when developing adaptation programmes. Second, this research is based on semi-structured interviews with ‘experts’ and ‘leader farmers’, which were recruited utilising purposive and snowball sampling (Yin 2017). Interviewees were selected based on their long-term experience of formulation, implementation and participation in a range of environmental and climate change policies and programs. To reduce selection bias, the researcher exploited his networks of local contacts to identify hard to reach interviewees, mainly from high-level policy actors in government and international agencies. However, these sampling techniques imply some level of selection bias.

Third, the research was cross-sectional. Limited time and resources made it impossible to measure temporal changes in the adaptation behaviours of farming households. Future research could conduct a study of adaptation behaviour based on experiments and longitudinal data, which would enhance understanding of the relationship between changing resources and adaptation. This refined approach would allow application of the results to other communities and other countries. Fourth, this research was based on self-reported behaviours. Self-reporting can result in exaggeration and what respondents believe to be ‘socially desired’ responses (Fisher, 1993) and agreeing with all the statements or questions (Hurd and Kapteyn 1999). The danger of this was reduced due to the researcher’s prior experience, understanding the study context and

use of different data collection methods which allowed triangulation. The researcher was aware of the risk of exaggeration if the farmer interviewees believed that this would result in financial or technical support within a development programme. It was made clear to them that the study was part of a doctoral research programme and there was no possibility of it resulting in a new development programme.

Although this research has provided several new insights, there are some unanswered questions that require further study. The results suggest that some farmers have a negative attitude towards adaptation to climate change which might be based on the degree of benefit they perceive from an adaptation practice. Further research could investigate the reasons for negative attitudes to specific adaptation strategies and explore the influence on different attitudes to adaptation practices. This would help the design of future interventions related to adaptation to climate risks. Migration to engage in off-farm work was revealed to be a prominent adaptation strategy which makes families of migrants increasingly dependent on external economic resources. Initially temporary migration often becomes permanent migration of a household member in the long run. Land abandonment due to migration and resulting lack of labour force, has resulted in large-scale social, economic and environmental changes and is affecting agriculture and food security in the study areas. Therefore, there is a value of research in exploring relationships among climate change, migration, land abandonment, an increasing informal economy and feminisation of agriculture. Many studies focus on the economic benefits and increased production resulting from adaptation, but ignore the social, cultural and environmental impacts. Future research should consider these effects, taking account of the heterogeneity within Indigenous communities.

The findings show that exclusion of the most vulnerable groups is an outcome of the climate adaptation policy process, in which powerful actors, including national government and international actors, apply a particular and already discredited approach. However, modes of interaction and outcomes vary greatly according to the political and institutional setting (Funder et al., 2018; McGregor et al., 2015), and the person who designed the strategy. Therefore, the results of this study should be generalised to other developing countries with some degree of caution, although the influence of international agencies on resource poor and donor dependent developing countries is likely to be similar. Future research could compare developing countries to understand the frictions arising from international agencies and national governments' participation in the policy process. This would increase development of locally owned, locally

designed and locally controlled climate change policies and programmes aligned to international climate adaptation policies.

5.3 Concluding remarks

Using a multidisciplinary and mixed method approach, and focussing on the individual, community and policy levels, the new multilevel framework provides a basis for a comprehensive understanding of the adaptation practices of Indigenous farmers. It adds to work on the TPB, conversion of capitals and climate policy process and includes them in this novel multilevel framework. Based on the results of this research, we would call for more multi-level analysis that recognises the need for an enabling environment to achieve equitable outcomes from adaptation and distributive fairness in adaptation, and avoids the benefits of adaptation being accrued mostly to privileged groups within Indigenous communities. The research contributes to ongoing debate on climate change adaptation and calls for policies that cater for heterogeneity within Indigenous groups. More work is needed on the participation and influence of less powerful groups at the local level (e.g. the most vulnerable farmers) and at the international level (e.g. governments of the resource-constrained developing countries).

The overall findings from this research suggest that it is important to consider different factors at the multiple level - household, the community and policy level - to ensure more equitable climate change adaptation outcomes. In the absence of multilevel analyses, adaptation planning and implementation will create mismatches in adaptation needs, and prescribed adaptation options become less effective or further increase inequalities. The proposed multi-level framework contributes climate change adaptation theory and practice and could enable development of more effective climate change policies and programmes that help Indigenous communities respond to the threats posed by climate change.

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7. Appendices

Appendix 1: Household survey questionnaire

(This survey is a part of PhD research on climate change adaptation in agriculture. The data will be anonymised in order to keep confidential. Care will be taken to ensure that information in the interview that could identify you is not revealed. You can ask to stop and leave interview at any time.)

Municipality

Village

Farm and farmer characteristics

Name	Age	Gender	Education level	Main Occupation	If away, where	Remarks

Household head :

1.1 Age:

1.2 Gender:

1.3 How long have been engaged in farming?years

1.4 Own land? Yes..... No Land size ... Ropani/Kattha

1.5 INFORMATION ACCESS

1.5.1 Do you listen weather forecast/information? Yes No

1.5.2 If yes from where?

1.6 Are you in contact with agricultural technicians? Yes No

1.7 CREDIT

In the last year (12 months), has any member of your household borrowed any money from the following sources? If **YES**, what did you use it for? How much did/do you have to repay? In addition to cash payments?

Source	Use	Total amount to repay (Rs)	Amount borrowed (Rs)

1.8 How have yields changed within the last 10 years?

Extremely worsened: 1: 2: 3: 4: 5 Extremely improved

6.5 Climate shocks

Within last five year, enter events such as drought, flood, hailstone which has affected the household badly?

Which mention , when

Event (Describe the event)	When happened (Date the event occurred)	Effect of the event	Response of event (How did you (household) recover and cope with the event?)

7 Adaptation

7.1 Have you changed in crop/livestock production or livelihood pattern in the past ten years?
What did you change in past ten years ? Why did you change?

		Changes	Reason for changing	Remarks
	Crop			
	Livestock			
	Livelihoods			

7.2 How much do you agree with the following statements? (Show card)

	Adaptation in agriculture is necessary to reduce the impact of climate change.	
	Adaptation in farming is important as without adaptation we cannot reduce the negative consequences of climate change in agriculture and our livelihoods.	
	Adaptation in farming is good for me and my family.	
	People think that all the sectors of the society be responsible and act equally in response to changing climate.	
	I have seen other farmers changing the farming practices to adapt to climate change.	
	I believe that all farmers should respond to climate change to protect their livelihoods.	
	Farmers can change farming practices according to the need or climate change.	
	Changing farming practices in response to climate change is up to me.	
	I intend to adapt my farming.	
	I would consider the practical solutions and recommendations for adaptation in my farming.	
	It is likely that I will change my farming practices.	
	I will apply my knowledge and skills on adaptation practices.	
	Climate change is not problem in our area.	
	Climate change will have only negligible impact for farmer like me.	
	Climate change will not affect us until next ten years.	

Appendix 2: Semi-structured interview (experts)

General

1. Tell me about you and your background.
2. Are you experiencing climate change? If so, how?
3. How the climate change is impacting the farmers?
4. What do you think about farmers capability in adapting to climate change?
5. Do you think they need external support? If yes, what kind?
6. Can you give examples of climate policies/programs you are involved in?

Policy/Program formulation

7. Who initiated the policy/program (1, 2, 3) and how it was formulated?
8. Who were involved in the development of the policy/programme? Were there any difficulties in terms of aims or objectives of each parties?
9. How was the coordination of the team to address the needs of the farmers? How do the farmers respond to the programme?
10. Did you experience any conflict/dissatisfaction during policy/program formulation? If so, please state.
11. What are your suggestions to reduce the difficulties/conflict/dissatisfaction during the formulation of the adaptation programs?

Policy/Program implementation

12. How it is being implemented by stakeholders at different levels? (Implementing partners, donor agency, target groups, farmers)
13. Did you experience any difficulties/conflict/dissatisfaction during program implementation?
14. What are your suggestions to reduce the dissatisfaction during the implementation of the adaptation programs?

Outcomes

15. What are the major outcomes of the policy/program (1,2, 3)?
16. What is the main weakness of the adaptation policy/programs you have involved in?
17. Do you feel that the outcomes of the program fulfilled the need of the farmers?
18. What are your opinions about improving the planning and implementation of the adaptation programs?

Appendix 3: Semi-structured interview (leader farmers)

General

1. Tell me about you and your background
2. What changes (including climate) have you observed in the village in recent (past 20) years?

Problems and solutions

- What problems (including climate change) are you facing in the village?
- How do they affect you? And others? How are you responding to the problems?
- Strategies of response in your village? (If organization/groups, to the members)
- What and how different factors are affecting the response to those problems?

Assistance/Support

Any external assistance for responding to climatic stresses?

Opinion about the organizations (government, NGOs, INGOs) for such response?

What did you think about government's policy/programs in climate change adaptation?

Probe, if required

Changes in cropping pattern, new farming practices, traditional (formal and informal) practices, communal practices, constraints for adaptation

Appendix 4: Focus group discussion topic guide

1. Introduction

- Thank you for coming and agreeing to participate in this focus group discussion.
- Research purpose, and introduction of the team and their roles.
- Duration of the discussion, and logistics information (provision of tea, water and biscuits)

2. Information and Consent

- The purpose of the focus group discussion is to understand your perception and experience of climate change risk, support mechanisms, and adaptation measures you have adopted.
- It is expected that each member will participate in the discussion and share their views.
- The information provided during the discussion is completely confidential. No identifying information will be recorded.
- We will take notes to ensure that your views are captured accurately.
- Your participation is voluntary, and you can leave at any time without giving any reason.
- If you are happy to participate and share your views, please stay.

3. Discussion topics

- Changes in the recent years (eg. past 20 years)
- Problems faced in your village (focus on climate extremes eg. hailstone, drought) and impacts
- Responses (what did you do? How did you do?)
- Support received from organisations

Probes for the discussion, if required:

- Climate change and other stressors
- Migration pattern and changes
- Changes in income from farming
- Collective action and local informal groups

4. Concluding remarks

This concludes our activity. If you have any thoughts and you would like to add more, please come and talk to me. Thank you for your participation and patience.

Appendix 5: List of focus groups

No	Focus group discussions	Village	District	Total
1	Village municipality office	Sahebganj	Sunsari	24
2	Amaduwa Primary School	Amadhuwa	Sunsari	20
3	COPPADES Office	Ilampokhari	Lamjung	22
4	Jan Jagaran Saving and Cooperative	Mohoriyakot	Lamjung	18
5	Nurbuling School	Kiul	Sindhupalanchowk	23
6	Village municipality office	Helambu	Sindhupalanchowk	21

Appendix 6: List of meeting/discussion in participant observation

SN	Purpose of institution/ groups	Number	Village, district	Main issues of discussion
1	Local groups for wildlife conservation (anti-poaching)	11	Helambu, Sindhupalanchowk	Crop depredation by wild animals and compensation by the Langtang national park
2	Religious (Buddhism)	16	Kiul, Sindhupalanchowk	Collective action for ongoing <i>Ghyang</i> construction in Chimi
3	Sugarcane production	9	Amaduwa, Sunsari	Non-repayment of the sugarcane stalks by the sugarcane factories
4	Microcredit and agriculture development	54	Amaduwa, Sunsari	Saving and borrowing, purchase of farming machineries by the cooperative
5	Village administration	13	Helambu, Sindhupalchowk	Village level (agricultural) program planning
6	Community based micro hydropower	10	Ilampolkhari, Lamjung	Monthly payment, and maintenance management
7	Community forest conservation	15	Ilampokhari, Lamjung	Cardamom plantation in the forest and penalty for trespassing
8	Microcredit and small business	41	Mohoriyakot, Lamjung	Low price of ginger and marketing strategy

Appendix 7: Lists of semi-structured (experts) interview

Participant no	Organisation type	Position in the organisation
1	International agency	Researcher/consultant
2		Deputy Director
3		Researcher/consultant
4		Senior Officer
5	Government organisations	Senior Officer
6		Senior Officer
7		Senior Expert
8		Planning officer
9		Planning officer
10		Local Development Officer
11		District Officer
12		District Officer
13		District Officer
14	NGOs	Senior Technical Officer
15		Program Manager
16		Director
17		Program Coordinator
18		Researcher

Appendix 8: Lists of semi-structured (Leader farmer) interview

Participant no	Organisation/Farmer type	Role	District	Village
19	Farmer cooperative	Chairperson	Sunsari	
20	Farmer group	Chairperson	Lamjung	Mohoriyakot
21	Community micro-hydropower	Secretary	Lamjung	Ilampokhari
22	Farmer group	Treasurer	Sunsari	Amaduwa
23	Sugarcane producer group	President	Sunsari	Amaduwa
24	Leader farmer	Women group leader	Sunsari	Sahebganj
25	Leader farmer	Local leader	Lamjung	Mohoriyakot
26	Leader farmer	Leader farmer	Lamjung	Ilampokhari
27	Leader farmer	Leader farmer	Lamjung	Ilampokhari
28	Farmer cooperative	Vice-chairperson	Sunsari	Amaduwa
29	Forest user committee	Treasurer	Lamjung	Ilampokhari
30	Farmer group	Chairperson	Sindhupalckhowk	Kiul
31	Leader farmer	Local leader	Sindhupalchowk	Kiul
32	Leader farmer	Leader farmer	Sindhupalchowk	Helambu
33	Leader farmer	Local leader farmer	Sindhupalchowk	Helambu
34	Anti-poaching committee	Chairperson	Sindhupalchowk	Helambu
35	Farmer co operative	Vice Chairperson	Lamjung	Mohoriyakot
36	Leader farmer	Leader farmer	Sunsari	Helambu

Appendix 9: Letter to village office informing about research

Date:

..... Gaunpalika

.....

RE: Request for permission to conduct fieldwork

I am a PhD student at the University of Sussex. My PhD research aims to investigate farmers' adaptation practices, and role of different institutions and institutional arrangements in supporting adaptation process. To investigate this research question, I have selected three different districts, Sunsari, Lamjung, and Sindhupalchowk, with diverse communities, cultures, and agricultural practices to get an overview of farmers based at different agro-ecological zones.

During the fieldwork, I will spend up to one month in your village. Hence, I am writing to inform you about my research, research purpose and fieldwork plans. During my fieldwork, I will be collecting data on farming households, conduct interviews with key local stakeholders, organise focus group discussions, have informal discussion with locals and observe village level meetings with respect to climate change.

I confirm that there are not any commercial or political motive for the research. All the information collected will be for research purpose only, kept confidential and used for writing the thesis. No information will be collected to identify household name or information, wealth information apart from household livelihood capitals, political affiliation or any sensitive issues.

With this letter, I request your permission to access relevant participants and collect necessary information. In the preparation of the data collection, I will need access to i) voter list for random selection of household to include in data collection, ii) meeting halls to organise formal and informal discussion, and iii) village profile to get an overview on various socio-economic and demographic data.

If you have any questions, you can contact me at

Thank you for your support.

Lokendra Karki

.....

Phone no.

Email:

Appendix 10: Information Sheet for the consent of the participants

Study title: Adaptation to climate change in agriculture: A multi-level analysis of climate change adaptation among farming communities in Nepal

Invitation

You are being invited to take part in a research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully.

What is the purpose of the study?

This research aims to investigate farmers' adaptation practices, and role of different institutions and institutional arrangements in supporting adaptation process. To investigate this, I have selected three different districts, Sunsari, Lamjung, and Sindhupalchowk, with diverse communities, cultures, and agricultural practices to get an overview of farmers based at different agro-ecological zones.

Why have I been invited to participate?

You have been invited to participate in the interview as you or organisation you belong has been identified as an important stakeholder of climate change adaptation policies and programs.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep. If you decide to take part you are still free to withdraw at any time and without giving a reason.

What will happen to me if I take part?

If you decided to take part, you will be asked questions on how you and/or your community/organization are responding to climate change, and the programmes/initiatives on climate change adaptation among farmers or in agriculture. The interview/discussion will take approximately one hour.

What are the possible disadvantages and risks of taking part? (

Taking part in this study will not cost you anything. The only thing you may consider is it will take an one hour of your time. To sum up, there is no risk and costs at all.

What are the possible benefits of taking part?

Your contribution is highly appreciated, since this will add to my research exploring climate change adaptation. This study will further add to the wider academic body of knowledge in the field of adaptation to climate change in agriculture. The research will gain insight about appropriate strategies on planning and implementation of climate change policy and programs in agriculture.

Will my information in this study be kept confidential?

The information collected will be used only for my research purpose and all information collected from you will be kept strictly confidential and will not pass to anybody.

What should I do if I want to take part?

If you are willing to take part in the study as described, please inform me indicating your consent to be interviewed.

What will happen to the results of the research study?

The study will be used to inform a PhD Thesis. It will be published and copy of the dissertation can be requested from the University.

Who is organising and funding the research?

This research is as part of my PhD at the University of Sussex, UK. There is no funding for this fieldwork.

Contact for Further Information For further information, you can contact myself.

Lokendra Karki

.....

Phone no.

Email:

Thank you for taking time to read/ listening the information sheet. I kindly ask you to participate in the meeting, discussion and interview. This will help my research in understanding climate change adaptation in Nepalese agriculture. Your voluntary participation will be much appreciated.

Thank you !