LABOR MIGRATION AND AGRICULTURAL PRODUCTION IN NEPAL

by

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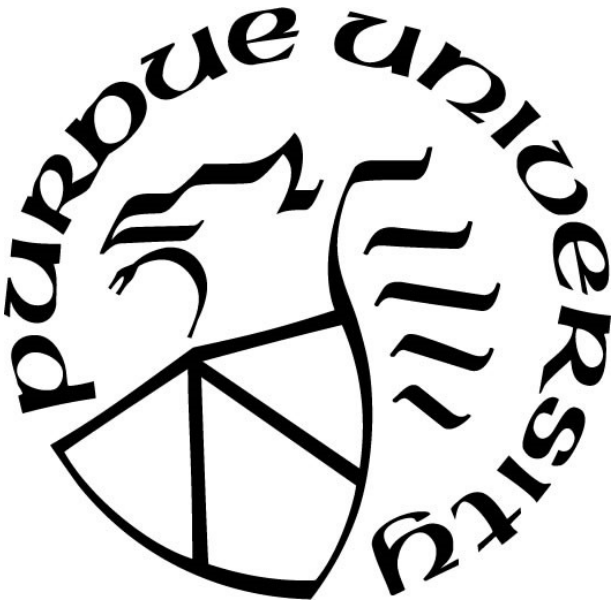

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Dedicated to my parents Mrs. Sabitri/Mr. Mahadev Bist and my loving wife Nirmala

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ABSTRACT

Continued migration from rural areas and the associated growth in remittance inflows are changing basic characteristics of Nepal's agrarian economy. Using cross-sectional household survey data covering agricultural production during the 2013 growing season, this thesis investigates the linkages between migration and agricultural production in twenty districts of Nepal. This study focuses on understanding what household and farm characteristics are associated with migration decisions and destination choices using multinomial logit model. I also gauge the impact of labor migration and remittance receipts on maize yield and input levels. Results reveal that the households highly dependent on agriculture have a higher likelihood of migrating to India and other international destinations. The probability of migration to India and other countries increases by about 7 percent and 11 percent, respectively for highly agriculture-dependent households. A unit increase in land ownership increases the probability of staying at the place of origin by about 16 percent. Rural households tend to migrate within Nepal and to India while urban households prefer migrating to other countries. Higher maize yields are associated with households that have migrants within Nepal. Households that have migrants in countries beyond India have higher costs of maize production but without additional yield gains. Results reveal that, among households in the sample, spending on inputs for maize crop production is not strongly related to remittances. These results help to understand migration decisions and destination choices, as well as the impacts of these on spending for crop production. The findings can help inform agricultural and migration policies in Nepal.

CHAPTER 1. INTRODUCTION

This thesis studies the relationship between the characteristics of Nepalese households, in particular their migration decisions, destination choices, and remittance inflows on crop production, yields and input use. Nepal is a small country, both in area and population, landlocked between China to the north and India to the east, west and south. Although Nepal's topography is very diverse, almost three-fourths of it is covered by rugged hills and mountains. Geographically, Nepal is divided into three ecological zones: mountains in the north with alpine climate; hills in the middle with temperate and sub-tropical climate; and the *tarai*, a part of the Gangetic floodplains, in the south with tropical climate. Nepal is also a small-sized, lower-middle income economy with GDP of USD 30.6 billion (Figure 1.1) and per capita GDP of USD 1071 (Figure 1.2) in 2019 (The World Bank, 2020). The GDP of Nepal was 4.86 billion USD in 1996, and doubled by 2007, reaching 10.33 billion USD. It then doubled again in 2015, reaching USD 21.41 billion. Similarly, the per capita GDP of Nepal has been rapidly growing in recent times. GDP per capita of Nepal was around 200 USD in 1996 which doubled in 2008 and reached around USD 470. The GDP per capita further doubled in 2017 and reached around USD 910 (The World Bank, 2020). Recent economic growth can be attributed to high remittance inflows from a large, rapidly growing stock of migrant workers abroad (NPC, 2020). Large numbers of these migrant workers originate from farming communities in rural parts of the country. Studying push factors of migration that are inherently agricultural in nature, and the use of remittances received, would help us to recognize the supposedly evolving vulnerabilities faced by farmers and the overall agriculture sector of the country leading to sustainable food production and food security.

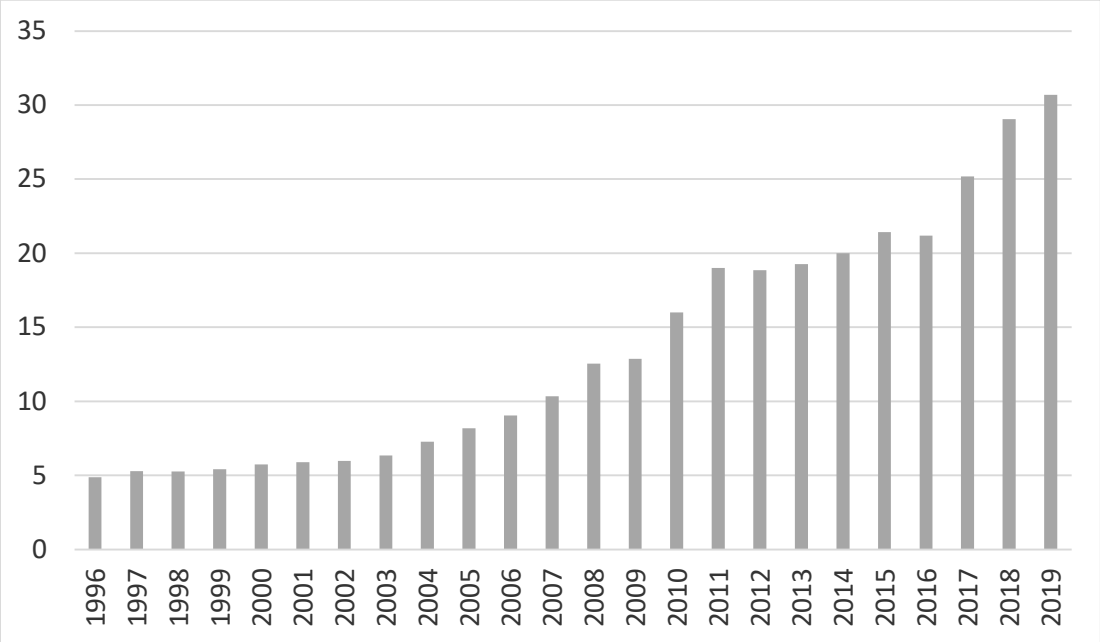
There is no universal definition of migration although it broadly refers to the movement of an individual or a group from one geographic location to another. The United Nations migration agency– the International Organization for Migration (IOM) – defines migration as "movement of persons away from their place of usual residence, either across an international border or within a State" and a migrant as "a person who moves away from his or her place of usual residence, whether within a country or across an international border, temporarily or permanently, and for a variety of reasons". The United Nations Department of Economic and Social Affairs (DESA) reports that the number of international migrants is estimated to be 272 million in 2019 comprising 3.5 percent of the global population, an increase from 2.8 percent in the year 2000, and the number

of international migrants worldwide is growing faster than the world's population. Rapid migration brings various socio-demographic and economic changes in the destination countries and the countries of origin. This thesis deals with labor migration considering Nepal as a country of origin. The characteristics of destination countries for Nepali expatriates and the immigrant population in Nepal are excluded because of their limited relevance with the subject matter of this thesis.

The low- and middle-income countries (LMICs) received a record high USD 554 billion in remittances in 2019, an increase in 5.3 percent over 2018, thus making remittance flows larger than foreign direct investment (FDI) and official development assistance (ODA) flows. Similarly, LMICs received USD 529 billion in remittances which was an increase in 9.6 percent over 2017. Remittances to South Asia increased by 5.7 percent in 2017, and by 12.3 percent in 2018. The top remittance recipients in 2018 were India, China, Mexico, the Philippines and Egypt while the countries with highest remittance share of GDP in 2018 were Tonga, Kyrgyz Republic, Tajikistan, Haiti and Nepal (The World Bank, 2019). The remittance flow to LMICs are estimated to decrease in 2020 by 7.2 percent to USD 508 billion due to global COVID-19 pandemic. The total remittances received worldwide also reached a record high USD 654 billion in 2019, an increment of USD 15 billion from 2018. According to United Nations Department of Economic and Social Affairs (UNDESA) Population Division, the total stock of international migrants is always increasing. There were 153 million migrants in the world in 1990 that increased by 20 million at the end of twentieth century. The number of international migrants in 2005 was around 191 million that increased to 220 million in 2010. In 2019, the stock of international migrants in the world is estimated to be around 271 million, an increase by 23 percent from 2010, which is around 3.5 percent of the global population. It is estimated that about 63.5 percent of international migrants migrate for employment-related reasons (ILO, 2018). These figures show the profound importance of remittances for economic development of LMICs like Nepal.

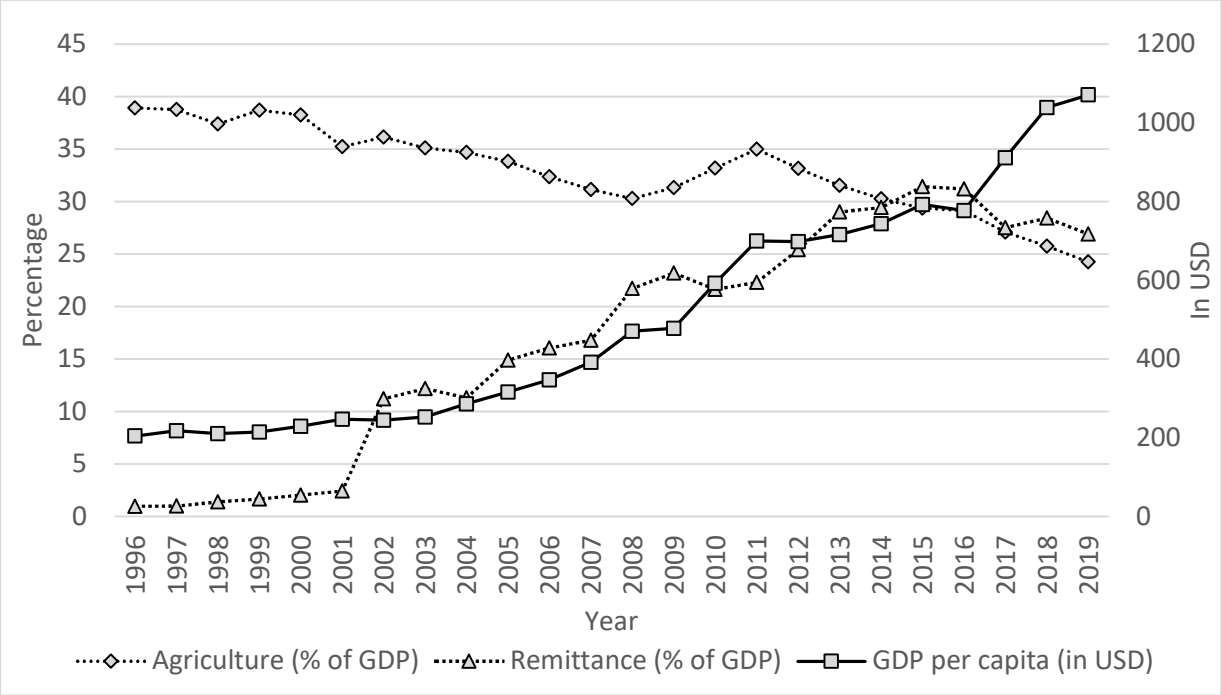
Nepal is historically an agrarian economy although the agricultural sector's share in total GDP has been falling over the years. Agriculture comprised 24 percent of GDP in 2019, down from 35 percent in 2011 (The World Bank, 2020). On the demand side, remittance-induced high consumption dominates the economy of Nepal, accounting for about 80 percent of the GDP in 2019 (ADB, 2020). In 2019, remittance inflows accounted for almost 27 percent of total GDP of Nepal (Figure 1.2). Figure 1.2 presents the trend of remittance inflow in Nepal from 1996 to 2019. Remittance flow in Nepal shows an upward trend. Before mid-1990s, very few Nepalis went

abroad for employment. The remittance inflow grew remarkably in 2000s due to surge in the number of migrants. The remittance further increased in last two decades comprising of more than one-fourth of the GDP since 2012. Figure 1.2 also illustrates the percentage share of agriculture sector in total GDP of Nepal. The contribution of agriculture sector, forestry and fisheries combined, is in decreasing trend. In mid and late 1990s, agriculture contributed more than one-third of the GDP of Nepal which has decreased to less than 25 percent of GDP in 2019. It shows the systemic changes that are occurring in Nepalese economy in recent times. The economy of Nepal is transforming from an agriculture-based economy to a remittance-based economy. The key statistical information related to Nepal is presented in Table 1.1. A major challenge faced by Nepal as the structure of the economy changes is to use remittance income in productive sectors, including agriculture. When invested in agriculture, remittances could have a profound impact on economic upliftment of the rural population and could strengthen food security and promote greater food self-sufficiency of the country. The latter half of the thesis is an inquiry on the effects of remittance inflows on crop production and productivity of farming households.



Source: Statista (https://www.statista.com/statistics/422672/gross-domestic-product-gdp-in-nepal/)

Figure 1.1 GDP of Nepal in current prices from 1996 to 2019 (in billion USD)



Source: The World Bank https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=NP, https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=NP,
The Global Academy https://www.theglobaleconomy.com/Nepal/remittances_percent_GDP/

Figure 1.2 Agriculture and remittances as a percentage of GDP, and GDP per capita of Nepal in current prices from 1996 to 2019

1.1 Migration history of Nepal

The major event in Nepal's internal migration history dates to 1950s when deadly malaria was successfully eradicated from southern *tarai* region, and government resettlement programs stimulated massive hill-to-*tarai* migration of Nepalese households (Sunam 2014). The *tarai* region became, and remains, a promising migration destination for people in the hilly and mountainous regions of Nepal. Vast stretches of natural vegetation were cleared for farming and habitation in the *tarai*. The plain topography, fertile land and higher agricultural productivity, and improved development infrastructures there offered an attractive migration destination choice for people in the hills facing poverty and food insecurity. As a result, the population grew rapidly in the *tarai* due to internal migration, eventually shifting the population centers of the country. Similarly, Nepalis also migrate from rural to urban areas in pursuit of better opportunities for employment, education, health services and other favorable living conditions. The populations in big cities are rapidly increasing and many new towns and cities are coming into existence due to migration.

The early accounts on international migration from Nepal refer to the recruitment of Nepalese men in armies of foreign nations. The first reported Nepalese migrants were the men who joined army of sikh ruler Ranjit Singh of Lahore (present day Pakistan) in early nineteenth century (Thieme and Wyss 2005). After the Anglo-Nepal war of 1814-1816, the Treaty of Sugauli was signed between Nepal and British East India Company that allowed hiring of Nepalese men in British army (Seddon, Adhikari and Gurung 2002). Impressed by the bravery of Nepalese soldiers in war fronts, British rulers set up three Gurkha regiments (named after the kingdom of Gorkha that annexed many fragmented kingdoms to form modern day Nepal) after the treaty was signed. Hundreds of thousands of Nepalese youths fought in overseas fronts for allied forces under the British army in the two world wars (Seddon 2005). Nepalese have also served in the Indian army since 1950. Employment in armies of the UK, Hong Kong, Singapore and India are still considered good opportunities for Nepalese youths. Trans-Himalayan migration linkages also existed between Tibet and Nepal but migration to India was much more common due to bare minimum linguistic, cultural and legal barriers. Migration to India is also cheaper than migration to other countries. The open border policy of Nepal and India allows movement of people along the 1870 km-long open border between the two countries. There are no visas or other proof document requirements for Nepali nationals to go and seek employment opportunities in India. Migration to India is mostly undocumented and thus data are lacking on the number of Nepali migrants residing in India. Many Nepali migrants work in the informal sectors like restaurants, or as security guards, porters, and domestic helpers in India. According to the National Population and Housing Census of 2011, 37.6 percent of the total absentee population had migrated to India – the most popular migration destination for Nepalis (CBS 2012).

Migration of Nepalis to Persian Gulf States such as Qatar, Saudi Arabia and the United Arab Emirates, Malaysia and South East Asian countries for employment started after the Foreign Employment Act of 1985 which legitimized labor contracts and the export of Nepali workers for foreign employment. Restoration of multi-party democracy in 1990, followed by liberalization of the Nepalese economy, opened labor markets to promising international labor demand centers (Seddon, Adhikari and Gurung 2002). The decade-long Maoist insurgency and civil war that began in 1996 displaced many Nepalis within the country precipitating migration of rural people to urban centers. The employment opportunities were meagre in the country due to political instability and ongoing violence. During this period, youths migrated to India and other countries in large

numbers, a pattern that persisted even after the restoration of peace with the signing of Comprehensive Peace Accord in 2006 (Bohra-Mishra and Massey 2011). The Department of Foreign Employment issued over 4 million labor approvals for time-bound employment contracts to Nepali workers in last decade since 2008/09. In the fiscal year 2018/19, a total 236,208 labor approvals were issued by the Department of Foreign Employment for 128 different countries. The major documented labor migration destinations for Nepali migrant workers in 2019 are Qatar (31.8%), the United Arab Emirates (26.5%), Saudi Arabia (19.5%), Kuwait (6.8%) and Malaysia (4.2%) (MOLESS, 2020).

1.2 Motivation for the study

Nepal, a small agrarian economy, is observing an unprecedented scale of youth migration from rural communities to different national and international labor markets in last few decades. International migration is so widespread that at least one in three households receives remittances from a migrated family member and annual remittances equal one-quarter of Nepal's total GDP (The Global Academy, 2018). Based on destination, Nepal's migration pattern can be broadly categorized into three types: internal migration to towns and cities of Nepal, migration to India and migration to other countries such as Malaysia, Saudi Arabia, the UAE, Qatar, etc. Most of the migrating youths originate from households that are traditionally engaged in agriculture. Nepalese agriculture is characterized by subsistence-oriented, labor-intensive, low-productive homestead food production systems built upon small landholdings. In this study, I assume that temporary labor migration is a household decision and the decision to send migrants to different destinations is influenced by various household characteristics. For a farming household, the agricultural characteristics of household should be relevant to its migration decision and destination choice. The question that motivates this this is the following: what agricultural characteristics influence migration decisions and destination choices of Nepalese farm households? I hypothesize that farm households use migration as an income expanding and diversifying strategy to reduce their dependency on agriculture. Identifying the agricultural determinants of migration decision and destination choice would help us understand the vulnerabilities faced by the agriculture sector of Nepal's economy and the causes of labor migration from Nepal.

Nepal receives one-fourth of its GDP in remittances. Remittances drive the demand of consumption goods in Nepal. The amount of remittances received by Nepalese households depends on the destination countries where migrants are employed. Nepalese migrants in India have less income than that of migrants in Malaysia, GCC nations and developed countries in the west. Households may spend remittances in consumption goods or make productive investments. Agriculture production, engaging two-third of the population, is the traditional income source for Nepalese households. Rice, maize, wheat and millet are major staple crops grown in Nepal. Although maize ranks after rice in area and production, it is the most important crop for hilly region of Nepal with 25 percent of total cereal crop production and about 3.15 percent of the GDP (MoAD 2018). Migration of working-age population from the households can affect crop yield and the level of agricultural inputs used in crop production due to loss of available labor force. Remittances when invested in crop production can raise productivity and input levels but may have neutral or negative effect when invested elsewhere. The effects of remittances on crop yield can also vary based on the migration destinations. This study aims to outline the relationship of migration to different destinations, and remittance receipts on maize yield of Nepalese farmers.

1.3 Objectives of the study

The major objectives of this study are:

- To identify and assess the effects of household and farm characteristics on migration decision and destination choices of Nepalese households;
- To test whether dependence on agriculture influences household's migration decision and destination choices; and
- To assess the effects of migration and remittance inflow on maize crop yields and input levels.

Table 1.1 Key statistics of Nepal

Official Name	Federal Democratic Republic of Nepal
Total Area	143350 sq. km
Population	28.6 million
Geography	Divided into three ecological zones: Mountainous region from altitude of 3000 to 8848 meters above mean sea level (mamsl); hilly region from 300 to 3000 mamsl and tarai region from 60 to 300 mamsl
Governance	Three levels of governance: federal, seven provincial and 753 local governments i.e. municipalities and rural municipalities.
Population growth rate (percentage)	1.8
Economic growth rate (percentage)	6.9
Growth rate of agriculture sector (percentage)	4.2
Growth rate of non-agriculture sector (percentage)	8.0
Inflation (percentage)	4.6
GDP per capita (USD)	1071
Labor force participation rate above 15 years (percentage)	38.5
Population living below the poverty line (percentage)	18.7
Human Development Index (HDI)	0.602 (142)
Wealth based Gini coefficient	0.31
Life expectancy at birth (year)	69.7
Literacy rate (5 years and above; percentage)	65.9
Households with access to electricity (percentage)	88
Population with access to improved drinking water (percentage)	21
Families with access to motor transport within 30 minutes of travel (percentage)	82
Population with access to internet (percentage)	65.9
Irrigable land with all year-round access to irrigation (percentage)	33
Agriculture productivity of major crops (MT/ha)	3.1
Population having access to banking and financial services (percentage)	60.9
Population covered by life insurance (percentage)	19
Ratio of remittance to GDP (percentage)	25.4
Farmers affiliated to agriculture insurance (percentage)	1
Agricultural labor productivity in USD (per capita per hectare)	549
Cultivable land productivity (USD per hectare)	3134

CHAPTER 2. LITERATURE REVIEW

2.1 Competing economic views of migration

Ravenstein (1885) is an early example of an attempt to explain human migration in economics terms by drawing general inferences on migration patterns and their causes using data from the United Kingdom and across Europe. By the mid-twentieth century, many seminal works on the causes of migration surfaced and comprehensive conceptual frameworks began to develop. Some microeconomic theories such as neoclassical theory and new economics of labor migration (NELM) theory assume that migration is caused by the characteristics pertinent to migrants' place of origin. In contrast, macroeconomic theories such as the dual market labor theory and the world systems theory view the structure of modern economies and globalization as causes of migration (Massey et al. 1993). These theories differ with respect to assumptions regarding the decision-making unit and the initiation of the migration process. Neoclassical theory assumes that migration is an individual decision of the migrating person while NELM theorists suggest that migration is the collective decision of the household. This study employs a micro-level approach from the migrant's place of origin and therefore it is useful to briefly review these theories.

2.1.1 The Neoclassical Theory of Migration

This theory is an application of neoclassical economics principles to explain causes of migration. This was the earliest comprehensive theory conceptualized on "labor migration in the process of economic development" (Massey et al. 1993) and still remains the most popular and prominent theory on labor migration. Neoclassical economics studies migration from two different approaches: macroeconomic model and microeconomic model. The macroeconomic model stands on the seminal works of Lewis (1954), Ranis and Fei (1961), Todaro (1969), Harris and Todaro (1970). According to the macroeconomic theory of neoclassical economics, migration is caused by the geographical differences in labor supply and demand. The decision to migrate depends on the overall wage differentials between the geographical locations. Equilibrium market wages are lower in the places/countries with large endowment of labor relative to capital. The wages are higher in the regions with limited endowment of labor relative to capital. Migration occurs from labor-rich capital-poor regions to labor-poor capital rich regions. The migration decreases labor

supply and increases wages in the capital-poor regions while labor supply increases and wages fall in capital-rich regions until reaching an equilibrium. The wage differential at the equilibrium should equal the costs of migration. Microeconomic theory of neoclassical economics carries the same principles as the macroeconomic model discussed above, yet it focuses on the individual choice model for a rational utility-maximizing individual as an actor in the migration decision (Sjaastad 1962; Todaro 1969; Todaro and Maruszko 1987). A potential migrant estimates the costs and benefits of movement to different potential locations, and migrates to the location where the discounted net returns are expected to be highest over time (Borjas 1994). The individual stays at the same location if the expected discounted net returns are negative and the individual is indifferent to migration if the expected discounted net returns is zero.

2.1.2 New Economics of Labor Migration (NELM) theory

The new economics of labor migration theory developed based on the works of Stark and Levhari (1982), Stark and Bloom (1985), Katz and Stark (1986), Lauby and Stark (1988), Stark and Taylor (1989) and Stark and Taylor (1991). This theory challenges the individual choice model and purports that migration is a collective decision by a family or household. It further claims that income maximization is not the sole objective of migration. According to NELM theory, the goal of migration is also to minimize risks and to insure the household against market failures. This theory takes migration as a rational household strategy to diversify income sources and a hedge against failure of capital, insurance and future markets (Abreu, 2012). According to NELM theory, migration may not stop when the wage differential is zero. Instead of maximizing income, households try to maximize family welfare and depending on the relative value of income obtained from various sources for a household, maximizing income may not be equivalent to maximizing family welfare. The "relatively deprived" households are more likely to migrate than the better-off households (Stark 1991). Unlike the neoclassical economics, NELM includes the role of remittances in the decision to migrate. Households may decide to move one or more of its members so that remittances can be used by the remaining household members for different purposes (Stark and Bloom, 1985). The new economics of labor migration does not take migration and household production as mutually exclusive outcomes. Households may engage in both migration and local production, and invest the remittances received in local production to maximize household

welfare. NELM theory is considered a more relevant model to explain labor migration from farming communities of developing countries.

To summarize, both neoclassical theory and new economics of migration theory are essentially micro-level decision models that assume drivers of migration initiate from the migrant's place of origin. The two theories differ in their assumptions regarding (i) the decision-maker unit (individual or household), (ii) what is maximized or minimized (income or risk), (iii) the market (complete and well-functioning market or missing and imperfect market) and (iv) the value of income in absolute or relative terms (Massey et al. 1993). This study follows the concept of NELM theory to test the effects of some household characteristics in migration decisions and destination choices made by the household.

2.2 Empirical evidence on migration decision and destination choices

Migration and remittances are frontier topics of national discussion and policy making for Nepal. Historically, migration studies from Nepal were more concentrated in the internal migration scenario but the focus has gradually shifted towards international migration after the surge of overseas migrants and the remittance inflow. Although migration-related issues dominate Nepal's public discourse, there is a scarcity of research studies on causes of migration from Nepalese households. Moreover, the multi-dimensional relationship of agriculture and migration is still largely unexplored by these studies. In this section, I summarize the relevant publications that deal with different factors affecting migration decisions and destination choices of households. In doing so, I begin with studies from Nepal and then proceed to the studies from other parts of the world.

Bhandari (2004) is a pioneer work on empirical testing of migration theories using data from Nepal. He tested the relative deprivation theory of migration in the context of Nepal using the size of cultivable land holding as the measure of wealth owned by households. Relative deprivation theory of migration, explained by Stark (1984, 1991) and Stark and Taylor (1991), states that individuals who feel relatively deprived as compared to a reference group in a community tend to migrate to raise their household income higher than the group. According to relative deprivation theory of migration, individuals from poorest households have the highest incentive to migrate and the incentive gradually decreases for the richer households. Bhandari (2004) studied a total of 1465 household samples from Chitwan district of Nepal to predict the

relationships between migration and relative deprivation using logistic regression models. He categorized sample households into five categories based on the size of cultivable land owned by the households (less than 0.33 ha, 0.33 ha to 0.66 ha, 0.67 ha to 1 ha, 1.01 ha to 1.33 ha and greater than 1.33 ha) and designated the category that has the average size of landholding (0.67 ha to 1 ha) as the reference group. He found that the probability of migration from landless or near landless households could be as high as 85 percent than that of an average household while the most well-off household could be 42 percent less likely to send its family members away for migration. He also observed that - the tendency to migrate increases with increase in family size, rural households are more likely to send away their members than urban households and the ethnicities indigenous to a region are less likely to migrate as compared to other ethnicities that have a history of migration. While Stark and Taylor (1991) had collected evidence on relative deprivation theory in income terms from Mexico, Bhandari (2004) argues that landholding is an important factor that affects the migration decision (yes or no) of Nepalese households including other factors such as family size, distance to market center and ethnicity.

Shrestha and Bhandari (2007) tests NELM theory studying the effects of environmental security on labor migration choices of households that heavily rely on natural resources by using the 1996 survey data from 1074 households of Chitwan district, Nepal. It employs multinomial logistic regression to estimate the effects of change in time required for collecting firewood in 1993 and 1996 on labor migration choices: no migration, internal migration and international migration. The results of this study suggest that Nepalese households take migration as an alternative strategy to manage environmental insecurity. The study further reports that an hour increases in time required to collect firewood in three years increases the likelihood to migrate within Nepal or abroad equally by about 14 percent. They argue that the effects are equal because most international migrants chose India as their destination at the time and open borders, familiar culture and geographical proximity to India did not offer huge differences between the two destination choices. Larger households are more likely to send individuals abroad for work. The effects of ethnicity on international migration are in line with Bhandari (2004) while ethnicity does not affect internal migration. Individuals from rural households are more likely to migrate within Nepal. Size of landholding affects both types of migration equally.

Bohra and Massey (2009) uses the 1996 Chitwan Valley Family Survey (CVFS) data of 1773 households to further improve the logistic regression models by classifying migration

patterns into four outcomes: no migration as base outcome, within district, to other districts and to other countries. All international migration destinations were categorized into the same group because sample size of migrants to countries other than India was very small. The predictors of migration are classified into six different conceptual categories: physical capital, social capital, human capital, migration-specific human capital, neighborhood characteristics and demographic characteristics. According to Bohra and Massey (2009), the effect of education is more pronounced for migration within district and country. A person having a salaried job is more likely to migrate within district and within Nepal, and less likely to migrate abroad. An individual with prior military service is 77 percent more likely to migrate abroad. Increase in age decreases the likelihood migration within district and international migration while age is non-significant for migration within Nepal. Females are more likely to migrate within the district while males are more likely to migrate within Nepal and much more likely to migrate out of Nepal. Those who own businesses are less likely to migrate to any of the three destinations. According to Bohra and Massey (2009), access to development infrastructures such as electricity reduces the likelihood of migration to other districts but increases the probability of international migration. The lower-caste hindu ethnicities are most likely to migrate out of Nepal while both upper-caste hindus and lower-caste hindus are more likely to migrate to other districts of Nepal.

Lokshin, Bontch-Osmolovski and Glinskaya (2010) uses national level household survey data (3620 households) from Nepal Living Standard Survey (NLSS) second round (2004) conducted by the Central Bureau of Statistics (CBS), Nepal to estimate household migration decision model. There are three outcomes of migration decisions in the model: no migration (base outcome), domestic migration (migration within Nepal) and international migration. Larger households are more likely to have migrants and the likelihood of domestic migrants is higher in large households. Households with a higher proportion of working-age men are more likely to have domestic migrants. The households with larger share of women and elderly are more likely to have both types of migrants but the likelihood of domestic migrants is still higher. The lower-caste hindus, muslims and indigenous ethnicities are less likely to migrate as compared to upper-caste hindus (*brahmins* and *chhetris)*. This study does not find a significant relation between size of landholding and migration decision. Distance of household to market center does not affect migration choices. However, the households from rural areas and other towns are more likely to

engage in migration as compared to the country's capital, Kathmandu. The poorest and the wealthiest households are more likely to have international migrants.

Piotrowski, Ghimire and Rindfuss (2013) estimates the effects of several agricultural characteristics such as size of landholding, land tenure, farming portfolio and agricultural inputs on rural out-migration from household level data from Nang Rong, Thailand and Chitwan, Nepal using multinomial probit models. This study selects the 876 youths of age 15 - 19 years at baseline year 1996 for Chitwan and follows them for next six years to study their migration decisions. Three outcomes of migration decisions are identified based on the distance of migration: no migration (base outcome), within district and outside district. This study finds strong evidence to suggest agricultural characteristics significantly affect migration patterns in an agrarian society. Results show that youths from households that own land are less likely to migrate within the district by around 34 percent. Smaller the landholding, higher the likelihood to migrate. Ownership of land, being the most secured form of land tenure, has more significant effect on migration decisions than that of sharecropping and renting land. Maintaining a diverse crop portfolio has very little effect on migration choices for Chitwan district but pig rearing decreases the likelihood of migration to outside the district. Men are more likely to migrate out of the district than that of women. The young individuals considered in the study have increased likelihood of migration when they grow. Farm mechanization such as using a water pump increases the likelihood of migration out of the district. Most of the irrigation is rainfed and migration gives an opportunity to afford the technology and improve crop productivity.

Chapagain and Gentle (2015) studies the effects of water-related environmental hazards on crop productivity that lead to abandoning from agrarian livelihoods, and migration. Based on the geographical distribution of Nepal and environmental risks exposed to agriculture, this study selects three clusters as study sites: Lamra village in Jumla district from mountainous region with erratic precipitation and drought, Bangsing Deurali in Syangja district from mid-hills with landslides and Tikapur, Kailali district from southern plains with flash floods. The water hazards in these regions adversely affect local farming systems decreasing crop productivity and farm income. Households use migration as a strategy to cope with the risks of water hazards that they are exposed to. The study identifies chain migration patterns to different destinations from these areas. According to this study, due to decreasing crop productivity, households first send one of their productive members away from home to work and send back cash income to sustain their

livelihood. The destination of migration depends on the household's capacity to afford the cost of migration. Individuals from poor households migrate to cities of Nepal and India while relatively affluent households migrate to middle-income and high-income countries. Secondly, households explore new potential locations to move and find off-farm employment opportunities and finally the households exit from their places of origin and agriculture.

Hatlebakk (2016) studies the intergenerational determinants of migration from Nepal using household survey data from Morang district, Nepal and finds that landlessness reduces the probability of overseas migration for a household. The study reveals that households that migrated to terai region from hills are less likely to migrate abroad in the same generation. These households take a generation to settle in the terai region before they send individuals to overseas labor markets. Poor households are more likely to send migrants to India instead of other countries.

Gautam (2017) describes the seasonal migration patterns as the strategy to strengthen livelihood resilience for farming households of Humla district, one of the poorest and remotest districts of Nepal, using household survey data from 2014. It reports that most migrants from Humla district cannot afford the costs of international migration other than India. This study also suggests that climate change is not the most important causal factor for migration yet in Humla district but in future climate change effects could acutely drive migration. It claims structural poverty to be the root cause of seasonal migration from Humla district.

Regmi, Paudel and Bhattarai (2020) estimates the effects of different push factors on migration decisions and destination choices by Nepali households using household survey data of 395 farming households from eastern part of Chitwan district. The different factors included in this study are broadly categorized into three types: individual characteristics of the migrant, household characteristics and social network characteristics. The effects on decision to migrate (yes/no) is estimated using a probit model while two multinomial logit regression models are used to estimate the effects on destination choices: one with no migration, internal migration and international migration as possible outcomes and the other with four choices for international migration (India, Malaysia, GCC countries and others). It reports that young males are more likely to migrate. Households having larger landholding are less likely to migrate and an increase in wealth increases the probability of migration from poor households. A multinomial logit model with three outcomes for migration destination choice (no migration, internal migration and international migration) reveals that the probability of both internal and international migration is

high for men. Educated individuals are more likely to migrate to international destinations but after a certain level, education does not have a significant effect on destination choices. Households having larger landholding are more likely to send migrants to GCC countries but less likely to India and Malaysia. According to this study, for a household with an additional unit of land holding, the probability to send migrants to India and Malaysia decreases by 1.3 percent and 0.5 percent respectively but increases by 1.4 percent for GCC countries.

Zhao (1999) studied the rural to urban labor migration of China during 1994 – 1995 and reports that the land holding and the number of laborers in the household are relevant factors that influence migration decision. According to this study, probability of migration increases by 42 percent when the number of family laborers is increased by one. Also, the probability of migration increases by 14 percent when the size of land is decreased by one unit. It also reported significant influence of age and education of laborer, transportation and communication facilities in the study area and amount of cash before the migration decision period.

Dodd et al. (2016) studied the influence of individual and household characteristics on temporary labor migration in southern India and reported that temporary labor migration is linked with livelihood diversification strategy by accessing to off-farm employment opportunities. Households opt for temporary labor migration to cope with deprivation or to accumulate resources for the well-being of the household and its members. However, the study finds that the households are less likely to send migrants if it participates in the employment opportunities controlled by the household itself such as agriculture, livestock and local businesses. It also reports that the households that belong to historically disadvantaged caste are more likely to have migrants while the historically powerful castes have lesser tendency to migrate. According to this study, land holding also influences temporary labor migration. Households owning marginally small piece of land are more likely to have at least one migrant while large farm size indicates less odds for migration.

2.3 Empirical evidence on agricultural production and input use

A study from mid hills of Nepal, Maharjan, Bauer and Knerr (2013), reports that migration of male family members causes labor deficit which is not adequately compensated by other inputs leading to a decline in crop production levels. The study argues the reduction in labor inputs and production levels is due to the negligence of migrating households towards crop production. Tuladhar,

Sapkota and Adhikari (2014) studied the effects of migration and remittances on rice yield of Nepal using a national level household survey data. This study reports a direct negative effect of migration on rice yield. Migration creates labor deficit and results into decreased yields. According to this study, a reduction in 163 kg per hectare rice yield is associated with an additional migrant worker. However, the effect of remittances is statistically insignificant but negative which suggests that remittances do not compensate for the reduction in rice yield due to migration. The authors argue that the remittances in Nepal are not spent in growing agricultural capital.

Gray (2009) studies the smallholder agriculture of Equador and reports that migration has the negative effects on crop production due to lost labor while remittances have positive effects on maize and bean production. This study shows the countervailing effect of remittances from international migration that increases hired labor. Migration of females decreased the reciprocal labor but increased hired labor. International remittances increase the use of chemical inputs. Maize production decreases with increase in number of male migrants and increases with remittance receipts.

Veijanoska (2021) reports that remittances promote adoption of organic fertilizers among Ugandan farmers by relaxing their liquidity and credit constraints. It posits that remittance receipts significantly increase the capacity of resource-poor farmers to cope with risks and imperfect credit markets of developing countries. Using panel data, the study tests the impact of remittances on organic and inorganic fertilizer usage separately and finds that the adoption of inorganic fertilizer does not increase due to past remittances. The author argues that increase in cost of production due to high prices and volatility in inorganic fertilizer market hinders their adoption. This study finds that households invest past remittance receipts in livestock production, a more profitable farm enterprise, and the externality of livestock production – organic fertilizer – is utilized by the farmers in crop production.

2.4 Contribution of the study

The interrelationship of migration decisions made by Nepalese households and their agricultural characteristics are not explored adequately by past studies. Although labor migration is a widely discussed and hotly debated policy issue in Nepal, there is a dearth of empirical evidences on factors affecting migration decisions of Nepalese farmers. Past studies have investigated the migration choices based on individual and household characteristics of migrants including farm

characteristics such as landholding. This study adds to the existing literature by explicitly testing dependence on agriculture as a factor influencing migration decision and destination choice of the household. While effect of household's income and wealth on migration is reported by past studies, this thesis explores household's income source as a potential influencer on migration decision.

This thesis uses relatively larger data sample covering wider study area. Past studies on Nepalese migrants are centered almost entirely in Chitwan district of Nepal while this study relies on data from twenty different mid-hill districts of Nepal stretching from east to west. Data used in the study are representative of hilly region of Nepal. Little is known about role of migration and remittances on food crop production of Nepal in existing literature. This study takes maize, the most important staple food crop for hilly regions of Nepal, as a representative food crop to outline how labor migration and remittances receipts are changing food crop production systems of Nepal. This thesis reports empirical findings on maize yield and inputs used as influenced by migration and remittance receipts. The findings from this study would help policy makers to better understand the role of migration and remittances in maize yield and input use.

CHAPTER 3. DATA AND METHODS

3.1 Data

Data used in this study come from a survey conducted in 2014 in support of the project "Adoption of Improved Maize Varieties in the Hills of Nepal and the Impact of Community Based Seed Production," which was implemented by the International Maize and Wheat Improvement Center (CIMMYT) in partnership with Local Initiatives for Biodiversity, Research and Development (LI-BIRD) and the Forum for Rural Welfare and Agricultural Reform for Development (FORWARD Nepal) (FORWARD Nepal, 2014). The survey was conducted as an end-line survey for the Hill Maize Research Project fourth phase (HMRP IV) – 1999 - 2014 implemented by CIMMYT in collaboration with multiple national partners including the Department of Agriculture (DoA), the Nepal Agriculture Research Council (NARC), and a number of non-governmental organizations (NGOs). HMRP IV was implemented in 20 hill districts (see Table 3.2) of Nepal in four phases: the first three phases were funded by the Swiss Agency for Development and Cooperation (SDC) from 1999 to 2010; the fourth phase was jointly funded by USAID and SDC. HMRP focused on research and extension activities targeted to improve productivity, farm income and economic and social outcomes of resource-poor farmers who were dependent on maize-based cropping systems. A key achievement of the HMRP was the development and release of 10 open pollinated varieties (OPVs) of maize, a result of which was an increase in the production of improved maize seed in Nepal from 7 tons in 2000 to 1460 tons in 2014 (Gautam et al. 2020)

The data cover 20 hill districts, stretching from the east to the west in Nepal. Of these, 10 districts were selected as HMRP implementation districts and 10 were not included in HMRP. Within project implementation districts, not all households were direct beneficiaries of the HMRP project. The data set contains a total of 1223 households. Of these, 348 produced maize seed through Community Based Seed Production (CBSP) groups under the assistance of HMRP. Apart from information on maize production, the survey included detailed data on households' demographic and farm characteristics, including input use and information on migration and remittances, which makes the dataset especially useful for this study. Although the survey was conducted to evaluate the outcomes of HMRP through a quasi-experimental study design, this thesis is not directly concerned with the HMRP, but instead focuses on migration dynamics of

farming communities in the mid-hills of Nepal. The sample is broadly representative of farm households living in the hilly region of Nepal, and findings are likely relevant for agricultural households residing in the mid-hills of Nepal that depend on a maize-based farming system. The results of this study would also have meaningful implications for farmers in other parts of the country or in other developing countries with similar characteristics; however, extreme caution is advised on the part of readers while interpreting results and drawing conclusions, especially for non-maize farmers and those outside the sample areas.

The survey employs a multistage sampling method with three sampling stages. The first, second and third sampling units are district, Village Development Committee (VDC) and farming household, respectively (Table 3.1). The underlying sample population for the survey includes all maize farmers in the hill region of Nepal. There were 39 districts in hill region of Nepal in 2014: 16 in the Mountain region and 20 in the *tarai* region. From these, 20 districts were selected at the first stage. Ten districts were randomly selected from 20 HMRP implementation districts and 10 districts were selected randomly from 19 HMRP non-implementation hill districts. In the second stage, 60 Village Development Committees (VDCs) were sampled, 30 each from 10 project districts and 10 non-project districts. In the third stage, households were randomly selected from each VDCs to build the data set, which consists of 1260 households in total. For this study, 33 households were dropped due to missing information for relevant parameters and other inconsistencies, and 1223 households were retained for analysis. A structured household questionnaire was pretested and administered, and the collected information was triangulated and verified through multiple Focus Group Discussions (FGDs), Participatory Rural Appraisal (PRA) and Key Informant Interviews (KIIs). Table 3.2 presents the district-wise distribution of sampled households. Figure 3.1 presents the map of Nepal indicating the surveyed districts.

Table 3.1 Summary of multistage random sampling for the survey

HMRP Implementation area	First stage	Second stage	Third stage
	Districts (number)	VDCs (number)	Households (number))
Yes	10	30	348
No	10	30	875
Total	20	60	1223

As sample selection criterion in this data is based on households' involvement in community-based maize seed production program supported by HMRP, we may expect that sampling bias could be a potentially confounding factor for this study. For example, project participation might be a confounding factor that influences migration decisions, destination choices, crop production, productivity, and resource use. The relevance of project participation by a household is explored and addressed in the subsequent analysis where the general conclusion is that the phenomena under examination do not appear to be correlated with elements of sample selection criterion.

Table 3.2 District-wise distribution of population and the sample

District	Share of Nepal's total households by each district (%)	Number of sampled households	Percentage of sampled households from each district
Surkhet	1.34	80	6.54
Dailekh	0.90	83	6.79
Gulmi	1.20	82	6.70
Palpa	1.09	81	6.62
Dhading	1.36	80	6.54
Rukum	0.77	42	3.43
Arghakhanchi	0.86	41	3.35
Tanahun	1.44	42	3.43
Gorkha	1.22	40	3.27
Nuwakot	1.09	41	3.35
Khotang	0.79	82	6.70
Ramechhap	0.81	81	6.62
Sindhupalchowk	1.23	79	6.46
Kavre	1.49	80	6.54
Baglung	1.13	83	6.79
Illam	1.19	42	3.43
Dhankuta	0.69	41	3.35
Bhojpur	0.73	41	3.35
Udayapur	1.23	41	3.35
Makwanpur	1.57	41	3.35
Total	22.15	1223	100

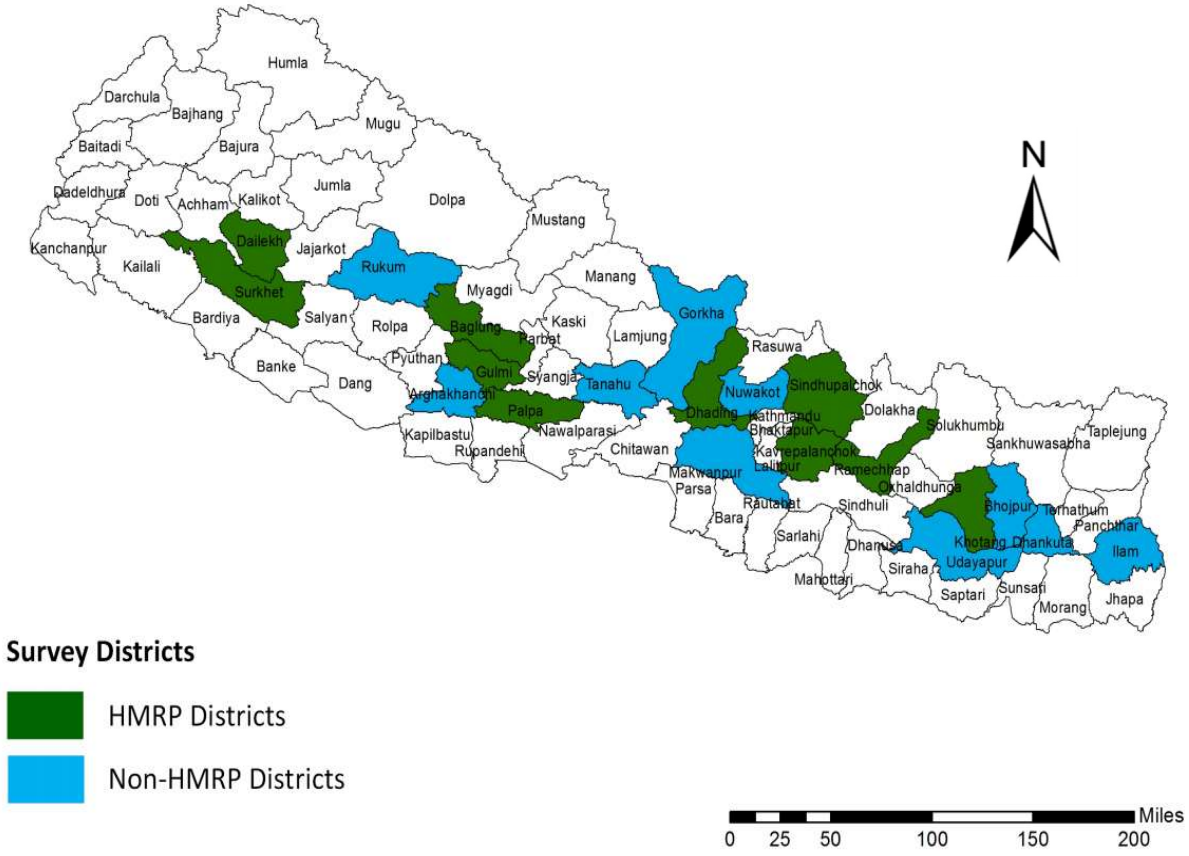


Figure 3.1 Map of Nepal showing surveyed districts (Source: CIMMYT Nepal, 2014)

3.2 Empirical approach

3.2.1 Migration decisions and destination choices

To study the migration patterns of Nepalese farm households, the sample households are categorized on the basis of their migration decision. Apart from staying at home, individuals from the households can seek work by moving to (ii) elsewhere within Nepal (ii) India; and (iii) countries other than India. Although some households may have multiple migrating members who seek work in more than one of these locations/categories, I use the location of the farthest distance of migration as the defining factor. For example, if a household reports two migrating members, one of whom migrated to India and one of whom migrated to a country other than India, then for purpose of categorizing the migration status of the household we assign the household to the group 'migration to other countries.' Similarly, for a household with two migrating members, one to

India and one to a destination elsewhere within Nepal, the household is assigned to the group 'migration to India'.

In this study, a migrant is defined as "a person who moves away from his or her place of usual residence, whether within a country or across an international border, temporarily or permanently, and for a variety of reasons" (IOM 2019). The term 'migrant' used in this thesis is not necessarily limited to migrant laborers, but it also includes individuals that leave their homes for education, job transfers and starting new businesses. Nepalis who migrate to countries beyond India for non-employment purposes also get employed in those countries, either full time or part time, to sustain themselves and send some part of their income back to their families as remittances. Non-employment related migrants within Nepal and to India may not send back remittances but instead depend on their families back home for their expenses. Migration for non-employment purposes is not very common as compared to migration for employment. For simplicity of the research and limitations in data, I assume that all migrants in the study area migrate for employment-related purpose. This assumption may overestimate the influence of household and farm characteristics on migration decision and destination choices for migration within Nepal and to India. However, the impacts of migration on maize yield and input levels would remain consistent as migration, regardless of the purpose, drains labor from the household.

The explanatory variables are selected by testing the differences in mean and distribution for different migration destinations to non-migrating households. Two sample independent t-test, a parametric test, is used to test the difference in mean between migrated households of each category and non-migrated households. The differences in the probability distributions of the sub-samples are tested using a non-parametric two-sample Kolmogorov-Smirnov (KS) test.

A series of multinomial logit (MNL) regression models are used to test the probability of migration to different destinations with respect to various household and farm characteristics. The MNL model assumes the independence of irrelevant alternatives (IIA). This assumption is tested using the Hausman-McFadden test (Hausman & McFadden, 1984). The nominal discrete outcome variable in the model is the migration decision with four possible outcomes: (i) no migration; (ii) migration within Nepal; (iii) migration to India; and (iv) migration to an international destination other than India. Explanatory variables in the model include a range of household characteristics. The testing variable is a binary indicator for whether agriculture is the major income source for household. The control variables include age of the household head, square of age of the household

head, sex of the household head, ethnicity of household, percentage of household members that belong to the economically active age group (15-65 years), total area of land owned, square of total area of land owned, distance from the nearest market, square of the distance from the nearest market, and binary indicator for whether members of household work as hired farm labors.

The variables included in the model are presented in Table 3.3. A household head is actively involved in household decision making. Individual characteristics of household head can have prominent influence on household decision making. Age and sex of the household head are included in the model to control for these effects. Economically active age group percentage refers to the percentage of individuals in a household who are between 15 and 65 years of age out of all members of the household. It is a proxy for age distribution in a household.

$$\text{Economically active age group (\%)} = \frac{\text{number of individuals between 15-65 years of age}}{\text{Total number of individuals in household}} \times 100$$

Ethnicity of a household can affect migration decisions. Nepalese society is multiethnic and diverse comprising of 125 different castes and ethnic groups (CBS 2011). Based on ethnicity, Nepalese society can be broadly categorized as: Indo-Aryan "upper-caste" hindus (*brahmins/chhetris*), Indo-Aryan "lower-caste" hindus (*dalits*) and indigenous nationalities (*adivasi janajatis*). "Upper-caste" hindus is generally a privileged ethnicity while Indo-Aryan "lower-caste" hindus (*dalits*) comprise of underprivileged section of Nepalese society. Among the indigenous nationalities, few of them are advanced and better-off while others are still subjugated sections of the society. Unlike other ethnicities, Indo-Aryan "lower caste" hindus (*dalits*) were historically discriminated and ostracized as "*untouchables*". Although caste-based discrimination ("untouchability") was legally abolished from Nepal in 1963, "*dalits*" still are marginalized sections of the Nepalese society largely deprived from social, economic and political equality. I use ethnicity as a binary variable with two categories: Indo-Aryan "lower-caste" hindus and remaining all as "others". Unlike other ethnicities, individuals from *dalit* neighborhoods of far western and mid-western Nepal tend to migrate to India together in groups. The group is usually led by a group leader(s) who originates from the same locality in Nepal and is currently working in India. The group leader coordinates the logistics of travelling and finding jobs in India for new migrants. The variable ethnicity is introduced in the model to control for employment networks involved in the migration of *dalit* migrants.

Land is a regular source of income for farmers. Land also provides employment opportunity. Land is an asset and a measure of wealth. The area of land measured in hectares is used in the model to test its effects on migration decision. The quadratic forms of continuous variables are used to allow for non-linear effects. Distance from main market is an indicator for household location. The longer the distance from main market, the rural the household. A unit of time taken is used instead of actual distance from main market because many places in hills and mountains of Nepal are not connected by roads or any other modern means of transportation. Measuring distance using a time scale can give an accurate measure for the location of farming household with respect to market. This variable is included in the model to control for the difference between rural and urban farms.

A dummy variable, source of farm labor, is used to study the migration choices of households that work as hired farm labors in farms of others. These households are the sources of farm labor in their community. Another interesting variable is dependency on agriculture. First, I compute the annual income from agriculture along with the annual household incomes from all sources. The income from agriculture, here, refers to the value of all the produce from farm which includes domestic consumption, transactions in kind and cash. If the ratio of income from agriculture to the total annual income is more than half, the household is referred as highly dependent on agriculture. If the ratio is less than half, the household is considered as less dependent on agriculture. The household having multiple sources of income is likely to be less dependent on agriculture.

Table 3.3 Variables included in the multinomial logit model

Variables	Description
Outcome variable	
Migration status	Whether the households have migrated family members; no migration = 0, migration within Nepal = 1, migration to India = 2 and migration to other countries = 3
Testing variable	
Dependence on agriculture	1 if household derives more than half of its annual income from agriculture; 0 otherwise.
Control variables	
Age of household head	The age of the household head in years.
Age of household head square	Square of age of the household head
Sex of the household head	1 if female; 0 if male.
Economically active age (EAA) group percentage	The percentage of family members that belong to economically active age group (15-65 years).
Economically active age (EAA) group percentage square	Square of percentage of family members that belong to economically active age group (15-65 years).
Ethnicity of household	1 if household belongs to Indo-Aryan "lower caste" Hindu ethnicity (d*alits*); 0 otherwise.
Total land holding (ha)	The total area of land owned by the household in hectares.
Total land holding square	Square of total area of land owned by the household in hectares.
Distance from main market (hours)	The time taken to travel to the nearest main market from the household in hours.
Distance from main market square	Square of the time taken to travel to the nearest main market from the household.
Source of farm labor	1 if household members work as hired farm labors; 0 otherwise.

The MNL model used in this study is developed based on Wooldridge (2000), McFadden (2001) and Wooldridge (2010). The four possible decisions on migration for individual *i* from household *j* can be expressed as:

$$y_{ij} = \begin{cases} 0\ if\ household\ does\ not\ have\ any\ migrated\ family\ member \\ 1\ if\ household\ has\ family\ member(s) migrated\ within\ Nepal \\ 2\ if\ household\ has\ family\ member(s)\ migrated\ to\ India \\ 3\ if\ household\ has\ family\ member(s)\ migrated\ to\ other\ countries \end{cases} \quad \text{.....(i)}$$

The reduced regression form, based on the theory and assumptions of a multinomial logit model, taking "no migration" as the base outcome can be expressed as follows:

$$\ln \frac{\Pr(m_{ij} = 1, 2, 3)}{\Pr(m_{ij} = 0)} = \gamma_0 + \gamma_{ij}\, t_{ij} + \delta_{ij}\, c_{ij} + \varepsilon_{ij.} \quad \text{.....(ii)}$$

In the above equation, m_{ij} represents migration destination choices (0 = no migration, 1 = migration within Nepal, 2 = migration to India and 3 = migration to other countries), t_{ij} represents the testing variable (a binary indicator for household's dependence on agriculture), c_{ij} represents control variables and ε_{ij} represents the random error term.

3.2.2 Maize yield and input levels

This study assumes a non-linear production function for maize yield. The explanatory variables considered in the basic production are chemical fertilizers, labor and seed source. Chemical fertilizers applied by the farmers are computed in NPK/ha units. Labor used in maize production from land preparation to harvesting and storage is recorded in man days/ha units. Seed source is a binary variable indicating the source of maize seeds used for the production year. Farmers can obtain seeds from formal and informal sources. Formal sources refer to the regulated seed suppliers (government research centers and farms, private seed companies, registered seed suppliers and traders) that supply high quality seeds of improved and hybrid varieties. Seeds from informal sources such as neighbors or previous harvest from own farm are generally low-quality seeds of local unimproved varieties. The dependent variable in the production function, maize yield, is calculated as:

$$\text{Maize yield } (kg/ha) = \frac{\text{Total quantity of maize produced (kg)}}{\text{total area under maize cultivation (ha)}}$$

There are seven households in the data that have zero maize yield. Those households are dropped from the further analysis. Equation (iii) represents the basic production function (Model A) for maize yield.

$$\text{Yield} = \alpha_0 + \alpha_1 \text{ Fertilizer} + \alpha_2 (\text{fertilizer})^2 + \beta_1 \text{ Labor} + \beta_2 (\text{labor})^2 + \gamma \text{ Seed source} + \varepsilon \quad \ldots\ldots\ldots (iii)$$

In the above equation, α_1, α_2, β_1, β_2 and γ are ordinary least square (OLS) estimates for fertilizer, quadratic of fertilizer, labor, quadratic of labor and seed source, respectively. α_0 is the intercept and ε represents error term. The effects of migration to different destinations are estimated by introducing dummy variables for three migration destinations (Model B) as in equation (iv).

$$\text{Yield} = \alpha_{0'} + \alpha_{1'} \text{ Fertilizer} + \alpha_{2'} (\text{fertilizer})^2 + \beta_{1'} \text{ Labor} + \beta_{2'} (\text{labor})^2 + \gamma' \text{ Seed source} + \delta_1 \text{ Mig}_{\text{Nepal}} + \delta_2 \text{ Mig}_{\text{India}} + \delta_3 \text{ Mig}_{\text{Other countries}} + \varepsilon_1 \quad \ldots\ldots\ldots (iv)$$

Here, Mig_{Nepal}, Mig_{India} and $Mig_{Other\ countries}$ are dummy variables for the three migration destinations – Nepal, India and Other countries. The value of Mig_{Nepal} is 1 for households that have migrants within Nepal, 0 otherwise; Mig_{India} has value 1 for households with migrants in India, 0 otherwise. $Mig_{Other\ countries}$ has value 1 for households having international migrants except India, 0 otherwise.

Annual remittances received by households are computed for the cropping year of 2013. It is assumed that migration and remittance receipts do not change during the maize cropping period so that labor and remittance availability remains same before and after maize production. The difference in mean and probability distribution between remittance receipts from each destination is tested using independent two-sample t-tests and KS tests, respectively. Remittances are introduced in the non-linear forms (Model C) as shown in equation (v).

$$\text{Yield} = \alpha_0'' + \alpha_1' \text{ Fertilizer} + \alpha_2'' (\text{fertilizer})^2 + \beta_1'' \text{ Labor} + \beta_2'' (\text{labor})^2 + \gamma'' \text{ Seed source} + \rho_1 \text{ Remit} + \rho_2 (\text{Remit})^2 + \varepsilon_2 \quad \ldots\ldots\ldots (iv)$$

The pathways of migration and remittance effects on maize yield can be different due to varying levels of inputs used. For example: farmers may spend remittances to purchase chemical fertilizers used in maize production; farmers may hire farm labor for maize production if household labor is deficit due to migration or to increase the scale of production; the variable costs incurred in maize production may be higher for households with migrants as they have decreased labor supply and loosened cash constraints due to remittance inflows. I estimate the ordinary least square estimates of migration destination choices and remittance receipts on input levels: chemical fertilizers applied (kg NPK/ha), hired labor (man day per ha), labor and non-labor costs (thousands of Nepali Rupees per ha) used in maize production taking several household characteristics as control variables to identify the pathway of changes in yields. The description of control variables used in regression to estimate the migration and remittance effects on input levels are presented in Table 3.4.

Table 3.4 Control variables included in ols estimates for input levels

Symbol	Name	Description
Age_HHH	Age of household head	The age of the household head in years
Sex_HHH_female	Sex of household head	1 if female; 0 if male
Edu_HHH	Education of household head	1 if literate; 0 if illiterate
Ethnicity_dalits	Ethnicity of household head	1 if Indo-Aryan "lower caste" Hindus (d*alits*); 0 otherwise
Land_ha	Landholding	Land owned by household head in hectares
Membership_yes	Membership in farmer groups/cooperatives	1 if household is member of farmer groups or cooperatives
Distance_market	Distance of household from market	The time taken to travel to the nearest market from household in hours

CHAPTER 4. RESULTS AND DISCUSSION

4.1 Migration decisions and destination choices

4.1.1 Descriptive statistics and variable testing

Of total 1223 households in the data set, 560 (46%) households do not have migrated individuals. The number of households with members migrated within country, to India and to other countries are 258 (21%), 123 (10%) and 282 (23%), respectively. The descriptive statistics of variables used in the model are presented in Table 4.1. About 79 percent households are highly dependent on farm income for their livelihood. The average age of household head is about 51 years. About 18 percent of household heads are women. It is very common to find households headed by men in Nepal because Nepalese society is essentially a patriarchal society. About two-third of the family members belong to economically active age group of 15 to 65 years in a typical sample household. About 12 percent households in the sample are Indo-Aryan "lower caste" Hindus (*dalits*). Nepalese agriculture is characterized by large number of small farms under household farming system. The average area of land owned by the households is about 0.5 hectares. The average time taken to travel to main markets from farming households is about 1.2 hours. About 42 percent households work as hired agriculture labor in farms of other households.

Table 4.1 Descriptive statistics of variables used in the multinomial logit model

Variables	Variable label	Mean	Standard deviation	Minimum	Maximum
Migration status	0 = No migration, 1 = Migration within Nepal, 2 = Migration to India, 3 = Migration to other countries	1.104	1.213	0	3
HHH Age	Age of household head in number of years	50.618	13.208	21	90
HHH Age square	Age of household head squared	2736.512	1387.226	441	8100
HHH Sex	Sex of household head; 1 = Female, 0 = Male	0.179	0.384	0	1
EAA group percentage	Percentage of household members that belong to economically active age group (15 to 65 years)	68.934	21.577	0	100
EAA group percentage square	Square of EAA group percentage	5217.019	2918.245	0	10000

Table 4.1 continued

Ethnicity	1 = Indo-Aryan "lower caste" Hindus (*dalits*); 0 otherwise	0.124	0.329	0	1
Land holding	Area of land owned by household (hectares)	0.491	0.482	0.017	6.45
Land holding square	Square of land owned	0.473	1.632	0.000	41.602
Distance from main market	Time (in hours) taken to travel to the nearest main market	1.195	1.115	0	20.5
Distance from main market square	Square of distance from main market	2.672	12.623	0	420.25
Source of farm labor	1 = members of household work as hired farm labor; 0 otherwise	0.420	0.494	0	1
Dependence on agriculture	0 = Less dependent; 1 = More dependent	0.793	0.405	0	1

Results from independent t-tests and KS tests show that the households having migrants in Nepal, India and other countries differ from the households without migrants in various characteristics included in the MNL model (Table 4.2). The mean and probability distribution of household head's age for non-migrated households is significantly different than that for migration within Nepal and migration to other countries except India. Heads of the households without any migrated member are significantly younger than the households with members migrated within Nepal and to other countries. Economically active age group percentage in a household is different between no migration and the three migration destinations. Households without migrants have lesser proportion of working age individuals. Households with migrants in India have smaller land holding while the land holding is statistically same for households without migrants and households with migrants in Nepal and other countries. Households with migrants in overseas countries are located closer to urban regions as compared to households without migrants while individuals migrating to India come from rural households.

4.1.2 Hausman-McFadden test for IIA assumption

The validity of a multinomial logit regression depends on 'independence of irrelevant alternatives' (IIA) assumption. IIA assumption states that the relative probability of two outcomes is not affected by any other alternative outcome. Hausman-McFadden test shows that the null hypothesis of IIA assumption is not rejected for this model (Table 4.3).

Table 4.2 Hausman-McFadden test

Migration decision	Chi-squared	Df	p>chi-squared
No migration	-1.041	22	-
Within Nepal	-6.893	22	-
India	-4.031	22	-
Other countries	2.177	23	1.000

Table 4.3 T-tests and KS tests for different migration destinations with no migration

Variables	No migration	Within Nepal			India			Other countries		
	Mean	Mean	t-value	D-statistics	Mean	t-value	D-statistics	Mean	t-value	D-statistics
HHH Age (years)	48.957 (13.17)	53.698 (12.39)	-4.982***	0.212***	50.016 (12.60)	-0.837	0.095	51.362 (13.75)	-2.429**	0.133***
EAA group (%)	64.859 (23.53)	74.350 (18.69)	-6.199***	0.212***	70.599 (20.47)	-2.737***	0.136**	71.343 (18.82)	-4.327***	0.152***
Land holding (ha)	9.828 (8.57)	10.233 (10.96)	-0.524	0.058	7.990 (0.95)	2.457**	0.114	10.261 (11.10)	-0.575	0.040
Distance from market (hr)	1.144 (1.27)	1.282 (0.95)	-1.738*	0.113**	1.302 (0.95)	-1.647	0.167***	1.172 (1.01)	-0.357	0.051

(Note: Figures in parentheses represent standard deviation. ***, ** and * represent statistical significance at 1 percent, 5 percent and 10 percent level, respectively.

4.1.3 Age of household head

The results from multinomial logit regression model are presented in Table 4.4. Results reveal that age of household head has negative effects on migration. Households with younger heads have higher probability to send migrants. The probability of migration from a household decreases with the increase in age of the household head up to a certain age and then starts to increase. With an increase in age of household head by a year, the probability of staying at home increases by 1.5 percent. Age of household head is statistically significant for migration to other countries. A year increase in the age of household head decreases the probability of international migration beyond India by 1.6 percent. The increase in probability of migration when household head grows old is because the children, who live in the same household as a joint family, become adult by the time and choose migration.

4.1.4 Sex of household head

The multinomial logit regression estimates show that the probability of migration is very high in a female-headed household. Men are more likely to engage in migration from Nepalese households. When men migrate, in the absence of adult men, the responsibility of coordinating day-to-day activities of household fall upon women. As a result, households with migrated individuals are more likely to have female household heads. If a household does not have a migrated individual, the probability of women heading the household decreases by about 24 percent. When individuals migrate to India and to other international destinations, the probability of women heading the household increases by 8 percent and 15 percent, respectively. This indicates that the role of women in the household has grown due to migration.

4.1.5 Economically active age group percentage

If the household has higher proportion of individuals belonging to age 15-65 years, the probabilities of migration to all destinations except India increases up to a certain point and decreases afterwards. One percent increase in the proportion of working-age individuals in the household, decreases the probability of staying at home by about 3 percent. The probability of migration within Nepal and to other countries except India increases by 1.3 percent and 1.4 percent, respectively, when the percentage of economically active age group increases by unity. Working

age (15-65 years) individuals are more likely to migrate. Higher working age percentage indicates higher availability of breadwinners for the family and higher proportion of dependent age group, children, and elderly, indicates higher living costs for the households, both being the motivating factors for migration.

4.1.6 Ethnicity

The estimates from the model show that Indo-Aryan "lower caste" Hindus (*dalits*) are more likely to migrate to India as compared to other ethnicities of Nepal. If a household belongs to *dalit* community, the probability of migration to India increases by about 6 percent. *Dalits* are marginalized section of the Nepalese society that face discrimination and inequality in Nepal. Dalit households are the source of unskilled labor force and have poor capacity to afford costs of migration to international destinations beyond India. *Dalits* of Far-western and Mid-western Nepal migrate to Indian towns and cities for menial and farm jobs.

4.1.7 Land holding

Farm size has negative effects on migration. An increase in area of land by one hectare increases the probability of staying at home by individuals of the household by about 16 percent. However, size of landholding does not affect the migration destination choices of farm households. Although increase in farm size has negative relation with probability of migration within Nepal, to India and to other countries, the results are statistically not significant. The marginal effect estimates show that the decision to migrate depends on farm size, but farm size is not associated with migration destination choices. About 85 percent of Nepalese migrants obtain the cash required for migration from informal sources like neighbors, relatives, and local lenders and only 5 percent of migrants seek banks and other formal financial institutions to acquire funds for migration (Shrestha 2017). Although larger landholdings indicate more income, but income obtained from farming is usually for subsistence rather than the cash requirements for migration. Households may use land as a collateral for obtaining loans to fund migration, but the results show that the size of landholding is not associated with migration destination choices of farmers.

4.1.8 Distance from main market

The results show that an additional hour of time required to travel to main market from a household decreases its probability to avoid migration by about 12 percent. As the distance of household increases from main market, the probability of staying at home increases. It shows that households closer to market areas are more likely to send migrants irrespective of the destination choices. Households in urban and peri-urban regions have access to transportation and communication facilities making migration an accessible employment alternative for them as compared to people living in remote villages.

Rural households prefer migration within Nepal and migration to India while households closer to towns and cities prefer migration to other countries. A household that lies at an additional one-hour distance from main market is more likely to have migrants within Nepal and to India by about 10 percent and 8 percent, respectively. The probability of migration to international destinations beyond India increases by 5 percent when a household is closer to main market by a one-hour distance. It is because international migration beyond India is expensive and rural households may not have access to enough cash required for overseas migration.

4.1.9 Source of farm labor

Households that are source of hired farm labor in the community are more likely to stay at home. If a household has individuals that work as hired farm labor in other farms, the probability of staying at home for the individuals in the household increases by about 6 percent. The poor and marginalized households have individuals that work as hired labor force in farming because employment as farm labor is seasonal and unstable characterized by low wages and high drudgery. These households cannot afford the costs of migration easily.

Farm labor is unskilled, seasonal, and low-paying employment. The employment opportunities for unskilled labor are scarce in Nepal. India is a major migration destination for unskilled labor force of Nepal. Low-income households tend to migrate to India because of the low cost of migration as compared to other countries. The local farm labor supplying households are negatively associated with migration to India. If individuals from a household work as hired farm labor, the probability of migration to India for the household decreases by about 6 percent. The marginal effects are not significant for migration within Nepal and to destinations beyond

India. The differential choice of migration destination by farm labor force reflects that those individuals who would otherwise work as hired farm labor have migrated to India.

4.1.10 Dependence on agriculture

Dependence on agriculture has different effects on migration decision and different migration destination choices. Households highly depending on agriculture are less likely to have migrants within Nepal. Migration to India and other countries is more common for these households. The probability of migration within Nepal decreases by about 16 percent if the household relies on agriculture for more than half of its annual income. The probability of migration to India and other countries increases by about 7 percent and about 11 percent, respectively for highly agriculture-dependent households. Most Nepalese farmers grow crops for their subsistence and have little opportunity of generating cash income to meet living costs. Households that do not have other income source apart from farming may suffer from low, unstable income and poor living conditions. There are limited opportunities for off-farm employment in Nepal. The results show that the agrarian households are increasingly choosing out-migration as a strategy to diversify and expand their income.

Table 4.4 Multinomial logit model results for migration decisions (base outcome: no migration)

Variables	No migration	Within Nepal		India		Other Countries	
	ME	Coeff.	ME	Coeff.	ME	Coeff.	ME
HHH Age	0.015*	-0.051	-0.002	-0.014	0.003	-0.116**	-0.016**
	(0.01)	(0.05)	(0.01)	(0.06)	(0.00)	(0.04)	(0.01)
HHH Age square	-0.000**	0.001	0.000	0.000	-0.000	0.001***	0.000***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
HHH Sex: female	-0.239***	0.761***	0.001	1.478***	0.084***	1.329***	0.153***
	(0.03)	(0.24)	(0.03)	(0.25)	(0.03)	(0.21)	(0.03)
EAA group percentage	-0.028***	0.140***	0.013***	0.085***	0.001	0.141***	0.014***
	(0.00)	(0.03)	(0.00)	(0.03)	(0.00)	(0.03)	(0.00)
EAA group percentage square	0.000***	-0.001***	-0.000**	-0.000**	-0.000	-0.001***	-0.000****
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Ethnicity: "lower caste" Hindus	-0.064	0.293	0.023	-0.719**	0.061**	0.098	-0.020
	(0.04)	(0.26)	(0.04)	(0.28)	(0.03)	(0.25)	(0.03)
Land holding	0.157**	-0.811**	-0.078	-0.900	-0.044	-0.588	-0.035
	(0.07)	(0.38)	(0.05)	(0.57)	(0.04)	(0.37)	(0.05)

Table 4.5 continued

Land holding square	-0.065** (0.03)	0.321** (0.15)	0.030* (0.02)	0.266 (0.25)	0.008 (0.02)	0.300** (0.15)	0.027 (0.02)
Distance from market	-0.124*** (0.03)	0.823*** (0.23)	0.098*** (0.03)	1.133*** (0.36)	0.076** (0.03)	0.121 (0.13)	-0.050** (0.02)
Distance from market square	0.024*** (0.01)	-0.157*** (0.05)	-0.018** (0.01)	-0.239** (0.10)	-0.017** (0.01)	-0.018 (0.02)	0.01** (0.00)
Source of hired farm labor	0.060** (0.03)	-0.132 (0.16)	0.005 (0.02)	-0.804*** (0.23)	-0.058*** (0.02)	-0.204 (0.16)	-0.007 (0.02)
Dependence on agriculture	-0.030* (0.03)	-0.569*** (0.18)	-0.158*** (0.03)	1.110*** (0.35)	0.072*** (0.02)	0.703*** (0.22)	0.115*** (0.02)
Constant		-6.055*** (1.43)		-6.312*** (1.71)		-4.402*** (1.27)	
Pseudo R^2		0.0918					
N		1223					

(Note: ME stands for marginal effects and coeff. stands for coefficient. Figures in parenthesis represent standard error. ***, ** and * represent statistical significance at 1 percent, 5 percent and 10 percent level, respectively.)

4.2 Remittance income from different migration destinations

An average household receives approximately NRs. 65 thousand (USD 693)[1] in remittances. International migrants send higher remittances than internal migrants. On an average, a household receives approximately 63 thousand NRs. (USD 673) from internal migrants. Households sending migrants to India receive around NRs. 106.4 thousand (USD 1138) annually. The annual remittance receipt is highest for migration beyond India which is around NRs. 176.7 thousand (USD 1891). The descriptive statistics of remittances receipts based on migration destination are presented in Table 4.5. Figure 4.1, Figure 4.2, and Figure 4.3 illustrate the frequency distributions of internal migration, migration to India and migration to other countries, respectively. The kernel density plots (Figure 4.4) show that the frequency distributions of remittances are highly skewed towards the left which means most households receive less than the average remittances.

[1] Average exchange rate of 2013: 1 USD = 93.46 NRs

Table 4.5 Summary statistics of remittance income (in thousands of NRs.)

Type of migration	N	%	Min.	First Quartile	Median	Mean	Third Quartile	Max
No migration	556	46	-	-	-	-	-	-
Within country	257	21	0	0	40	62.94	100	300
India	123	10	0	30	80	106.4	150	400
Other countries	280	23	0	80	150	176.7	250	600
All	1216	100	0	0	0	64.75	100	600

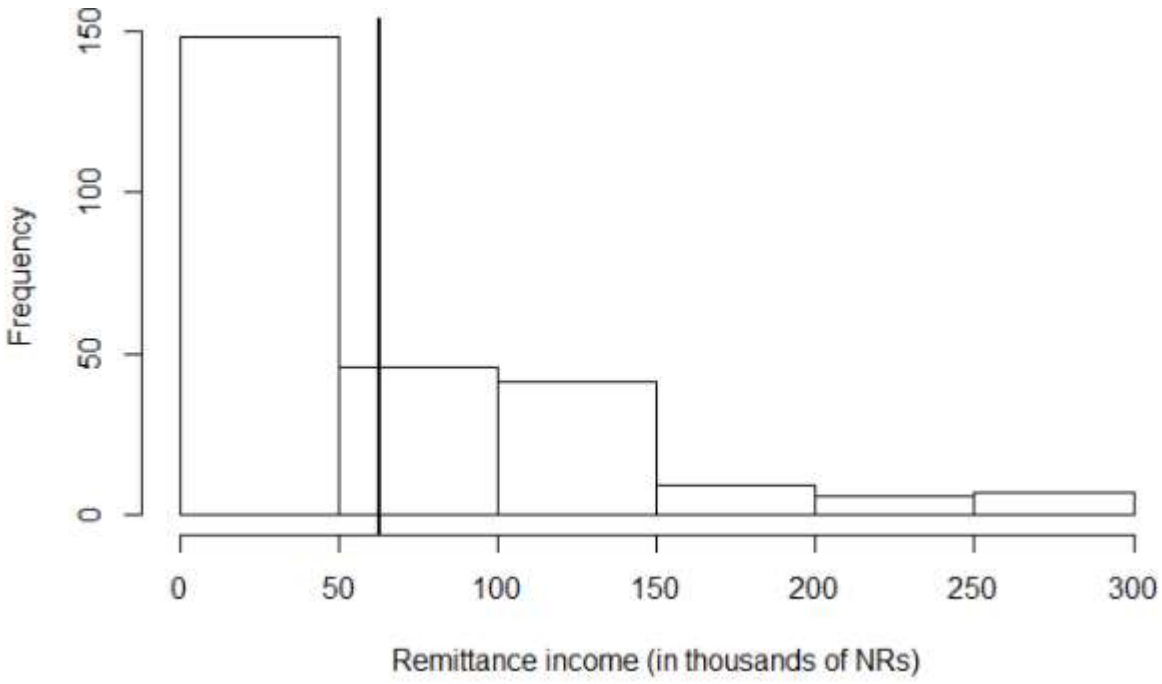


Figure 4.1 Frequency distribution of remittance income from migration within Nepal

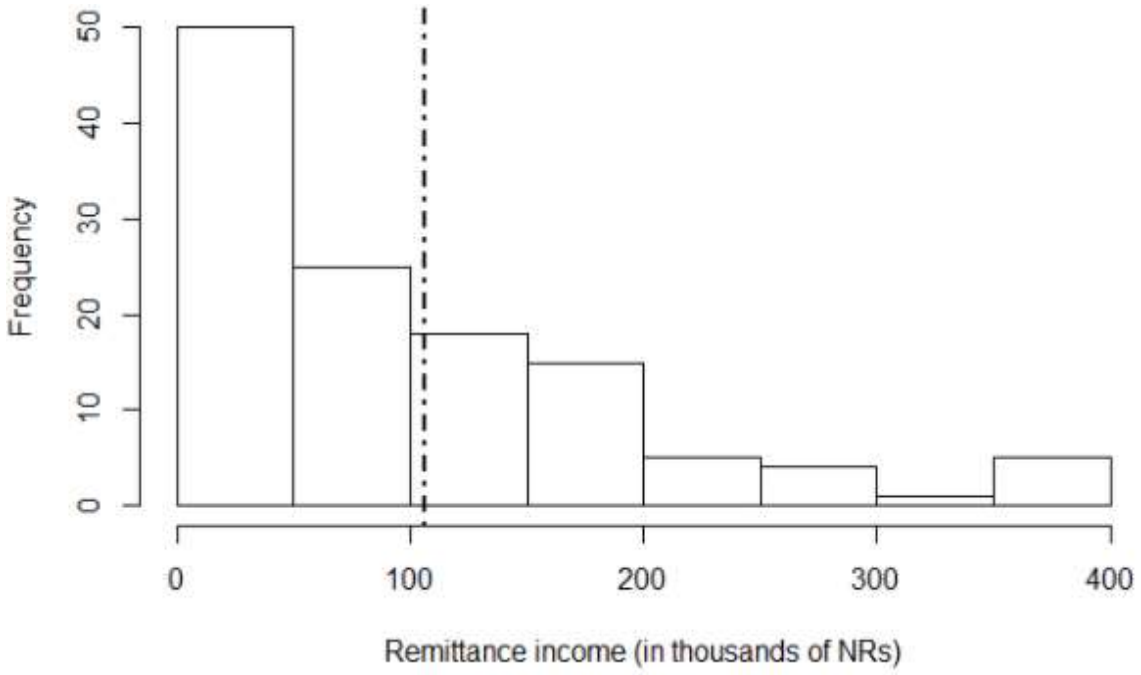


Figure 4.2 Frequency distribution of remittance income from migration to India

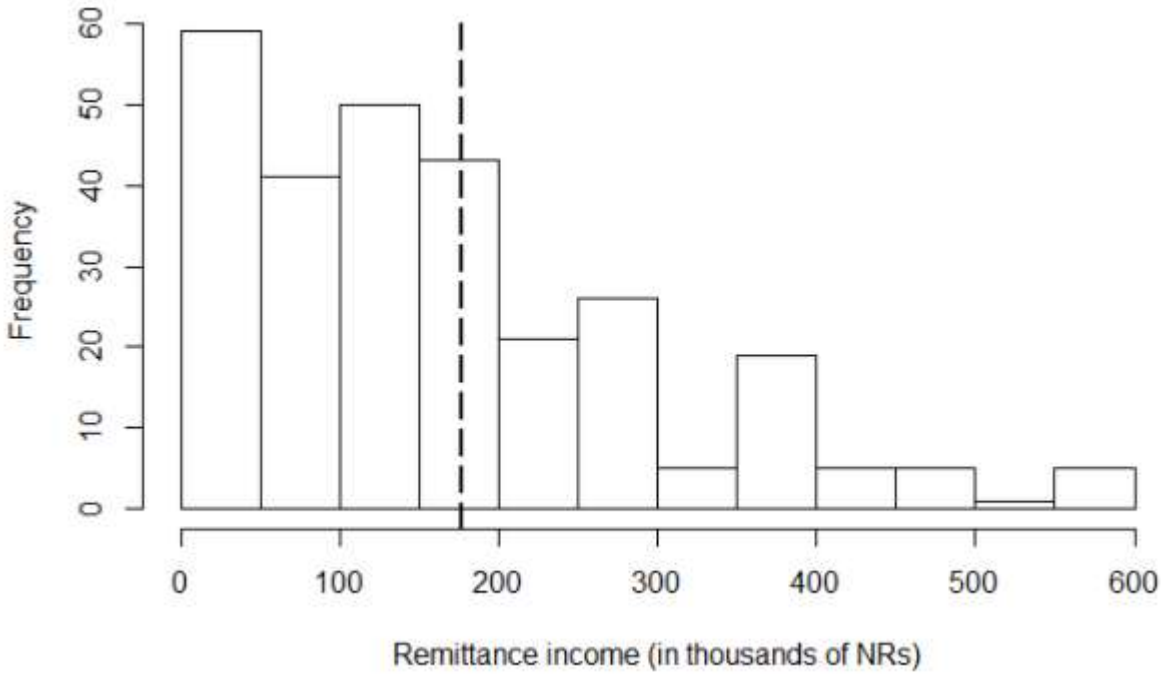


Figure 4.3 Frequency distribution of remittance income from migration to other countries

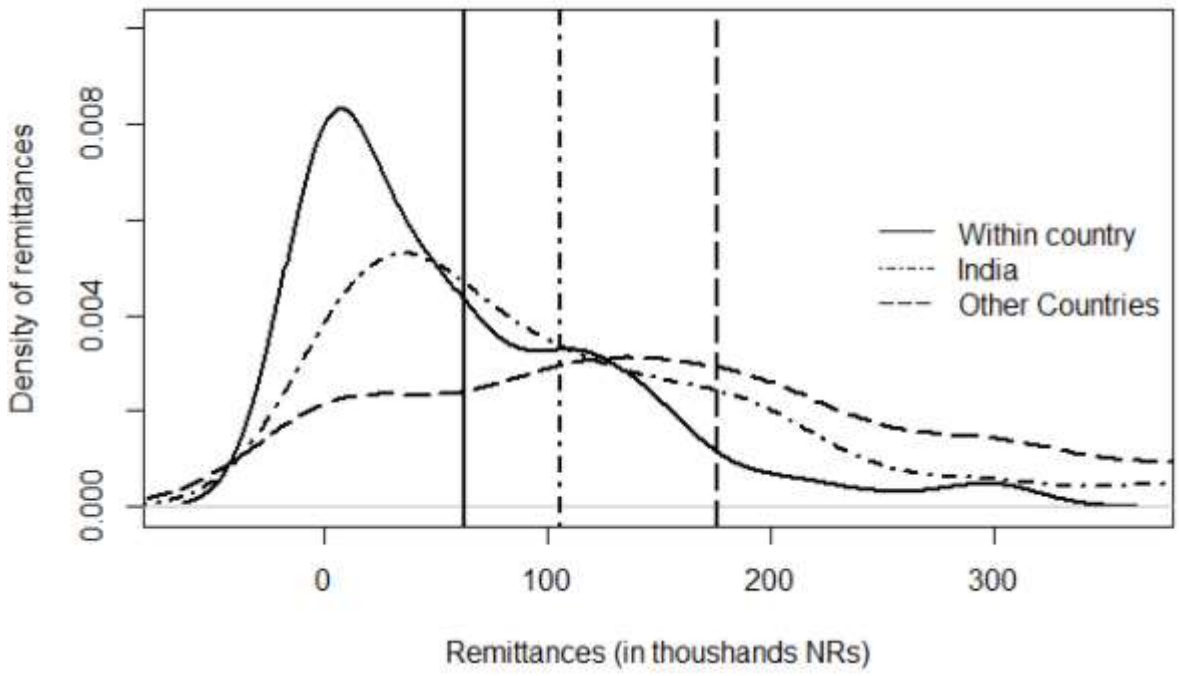


Figure 4.4 Kernel density plots of remittance income (in thousands of NRs.)

The results from Welch two sample t-tests and two sample Kolmogorov-Smirnov (KS) tests are presented in Table 4.6. Results from t-test indicate that the mean of remittance income from the three types of migration are significantly different from each other at a 1 percent level of significance. KS test results indicate that the probability distributions of remittance income from migration within country, to India and to other countries are significantly different from each other.

Table 4.6 T-test and KS test between remittance income from different migration destinations

Migration destinations	t-value	D-statistics	p-value
Within Nepal vs. India	-4.419***	-0.233***	1.928e-05
Within Nepal vs. Other countries	-12.055***	0.428***	2.2e-16
India vs. Other countries	-5.810***	0.268***	3.851e-09

(Note: *** indicate statistical significance at 1 percent level.)

The empirical cumulative distribution function (ECDF) plots in Figures 4.5., Figure 4.6. and Figure 4.7 show that the remittance income increases with the increase in distance of migration. The ECDF curve of remittances from migration to other countries is on the right, followed by remittances from India and migration within Nepal, respectively. This indicates that remittances

from other countries are the highest followed by remittances from India and the remittances from internal migration are the lowest.

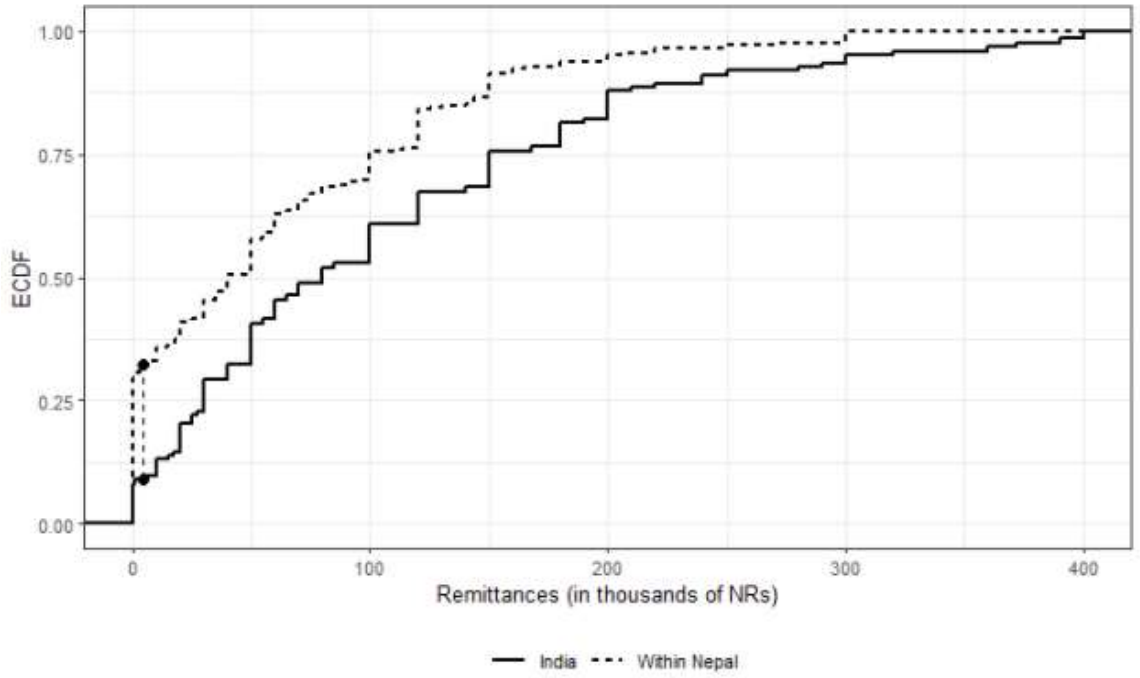


Figure 4.5 ECDF plots of remittance income from migration within Nepal vs India

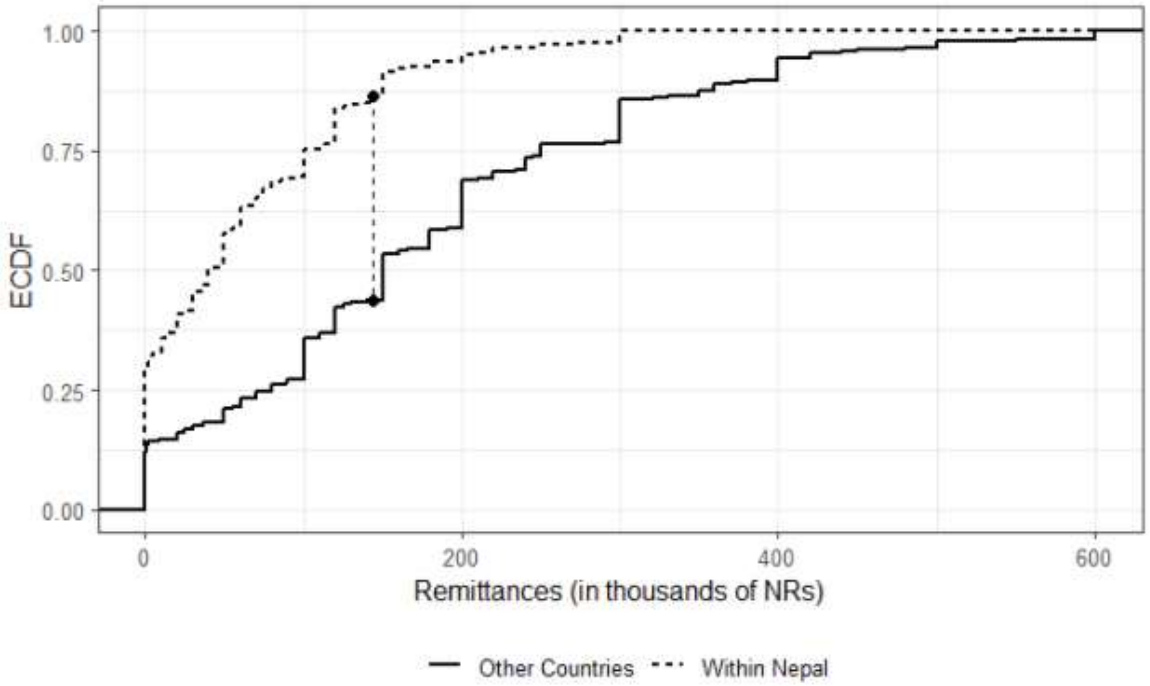


Figure 4.6 ECDF plots of remittance income from migration within Nepal vs other countries

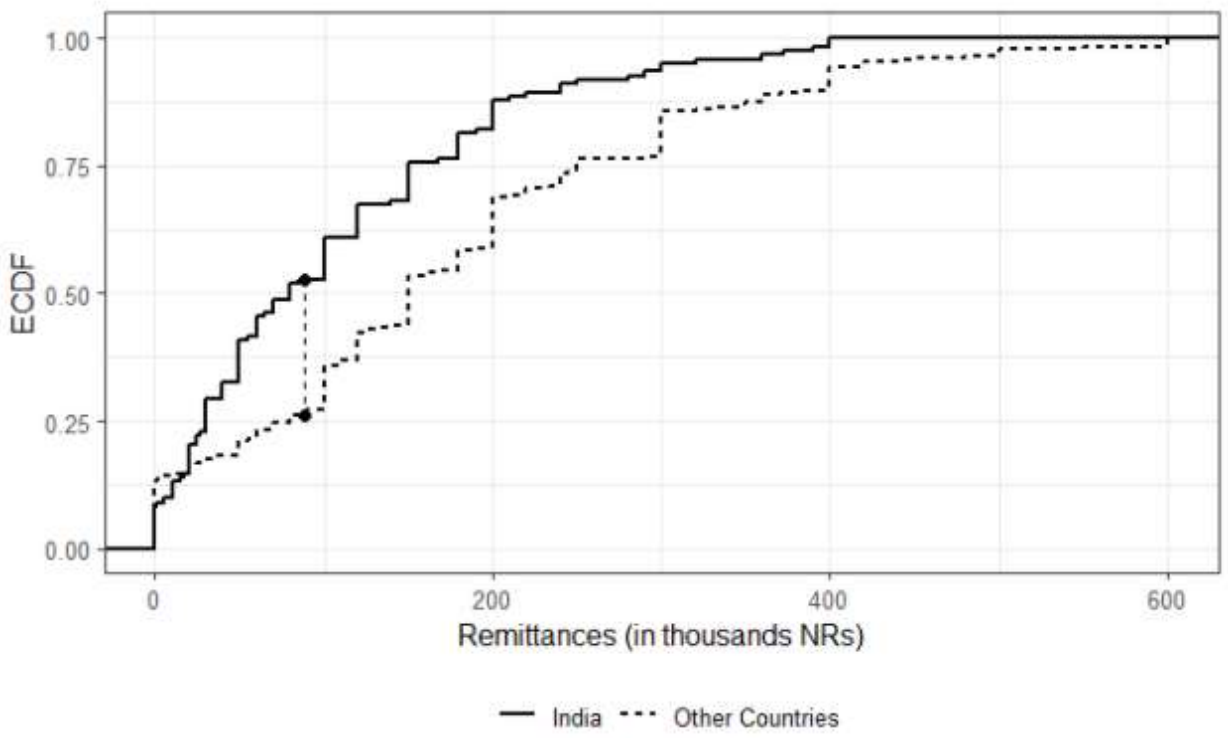


Figure 4.7 ECDF plots of remittance income from migration within India vs other countries

4.3 Migration, remittances, and maize yield

The descriptive statistics of variables used in maize production function are presented in Table 4.7 and Table 4.8 presents the regression estimates. The results from basic regression model (Model A) show that maize yield depends on quantity of fertilizers applied, labor used and source of seed. A unit increase in fertilizers per ha (kg NPK/ha) increases the maize yield by about 3.7 kg. The rate of increase of yield with fertilizers, however, is decreasing. After a certain limit, the effect of fertilizers on yield becomes negative. Labor also has positive effects on maize yield. An additional man day of labor per ha increases the maize yield by about 6.4 kg. The rate of increase of yield is increasing with labor. If the household uses seeds obtained from formal sectors, the yield increases by about 406 kg/ha.

Table 4.7 Descriptive statistics of variables used in production functions of maize

Variables	Mean	Min	Max.
Maize yield (kg/ha)	2358	122.8	47160
Fertilizers (NPK/ha)	51.98	0	3593.77
Labor (Man days/ha)	152.61	4.64	2807.14
Seed source (dummy)	0.35	0	1
Migration within Nepal (dummy)	0.211	0	2
Migration to India (dummy)	0.10	0	1
Migration to other countries (dummy)	0.23	0	0
Remittances (in '1000s NRs)	64.75	0	600

4.3.1 Effects of migration destination choices

Results presented in Table 4.8 (Model B) show that migration within Nepal has significant positive effect on maize yield. Migration to India and migration to other countries do not affect maize yield significantly, though the estimates are positive. Households having migrants in Nepal produce about 279 kg more maize in one hectare as compared to households without migrants. Migration within Nepal is seasonal. Many internal migrants return to their homes in summer season. Summer season in Nepal is characterized by hot and humid climatic conditions with frequent and heavy monsoon rains. Summer season is the main season for maize cultivation in Nepal. The effects of other variables such as fertilizer, labor and seed source on maize yield remain largely similar to that of base model (Model A).

4.3.2 Effects of remittances

The estimates from Model C of Table 4.8 show that effects of remittances on maize yield are statistically not significant. The estimates of remittances are positive which indicates a positive relation between remittances and maize yield. Introducing remittances in the model does not affect the estimates of other variables by a large margin. The effects of fertilizer, labor and seed source are virtually same as that of base model (Model A).

Table 4.8 Estimates of maize yield production functions

Predictors for maize yield (kg/ha)	Estimates in Model A	Estimates in Model B	Estimates in Model C
Fertilizers (kg NPK/ha)	3.723*** (0.67)	3.692*** (0.67)	3.664*** (0.67)
Fertilizers (kg NPK/ha) Squared	- 0.001*** (0.00)	- 0.001*** (0.00)	-0.001*** (0.00)
Labor (Man days/ha)	6.387*** (0.53)	6.335*** (0.54)	6.509*** (0.54)
Labor (Man days/ha) Squared	0.001*** (0.00)	0.001*** (0.00)	0.001** (0.00)
Seed source (dummy)	406.200*** (103.40)	411.200*** (103.40)	408.400*** (103.30)
Migration within Nepal (dummy)	-	279.300* (128.70)	-
Migration to India (dummy)	-	18.170 (170.00)	-
Migration to other countries (dummy)	-	36.670 (125.70)	-
Remittances (in '1000s NRs)	-	-	0.677 (1.10)
Remittances (in '1000s NRs) Squared	-	-	0.001 (0.00)
Intercept	1026.000*** (90.61)	963.900*** (107.00)	949.600*** (100.10)
N	1216	1216	1216
Multiple R-squared	0.3815	0.3840	0.3845

(Note: Figures in parenthesis represent standard deviation. ***, ** and * represent statistical significance at 1 percent, 5 percent and 10 percent level, respectively.)

4.4 Migration, remittances, and maize input levels

Migration destination choices do not influence the quantity of chemical fertilizers (kg NPK/ha) used in maize production (see Appendix A, Table A.1). Labor hired for maize production is higher for households with internal migrants by 26 men days per hectare as compared to households without migrants. Migration to international destinations does not change the hired labor used in maize production. The higher maize yield for households having internal migrants is attributed to the higher labor used by those households (Table 4.9). Maize cultivation in hilly region of Nepal relies on manual labor. Sloppy, rugged terrain and scattered land hinder agricultural mechanization in hills of Nepal. The households gain yields by increasing labor applied in improved crop cultivation practices such as proper land preparation, improved fertilizer application methods and increased frequency of weeding. Hiring of farm labor is not necessarily a cash transaction in mid-hills of Nepal. A traditional labor exchange system, called '*parma*', between neighboring households is common among Nepalese farmers. There are limited off-farm employment

opportunities for internal migrant laborers who are employed in construction industries, brick factories and other outdoor works in summer due to torrential monsoon rains. Summer is also a holiday season for many other internal migrant workers. Internal migrants return to their homes in summer and get involved in maize cultivation activities which increases their labor use and results into yield gains.

Households with international migrants beyond India have significantly higher total variable costs per hectare for maize production. A household that has sent migrant overseas spends about Nepali Rupees 12400 (USD 133) per hectare more than that of non-migrating household, an increment by about 23 percent. However, the yield gains are not realized for these households. It shows that although households sending migrants to countries beyond India spend more on maize cultivation, the maize yield does not increase significantly. It indicates towards a deteriorating maize production system for households that have migrants in overseas countries. It also indicates that these households are not utilizing their resources efficiently.

I do not find statistically significant association of remittance receipts and inputs used in maize production such as fertilizers, hired labor and total variable cost. Remittance receipts are associated with neither an increase nor a decrease in maize yield or input levels used in maize production.

Table 4.9 Migration, remittances, and maize input levels

Variables	Hired labor (Man days/ha)		Total Variable Cost (thousands of NRs.)	
Age of HHH (years)	0.305 (0.43)	0.440 (0.43)	0.006 (0.19)	0.003 (0.19)
Sex of HHH: female	-15.588 (14.85)	-13.570 (14.81)	-5.135 (6.42)	-5.616 (6.39)
Education of HHH	11.393 (12.12)	11.490 (12.13)	5.875 (5.24)	5.990 (5.24)
Ethnicity: *dalits*	4.193 (16.76)	3.142 (16.73)	1.869 (7.24)	1.078 (7.23)
Landholding (ha)	-9.901 (11.63)	-9.601 (11.63)	-13.867** (5.03)	-13.560** (5.02)
Membership: yes	27.592* (11.57)	28.900* (11.56)	5.316 (5.00)	5.699 (4.99)
Distance from market (hr)	13.214** (4.90)	13.490** (4.89)	0.709 (2.12)	0.670 (2.11)
Migration within Nepal (dummy)	26.002* (14.48)	-	5.723 (6.26)	-
Migration to India (dummy)	-11.266 (19.26)	-	-6.485 (8.32)	-
Migration to other countries (dummy)	-1.423 (14.20)	-	12.415* (6.14)	-
Remittances (in '1000s NRs)	-	-0.127 (0.12)	-	-0.004 (0.05)
Remittances (in '1000s NRs) Squared	-	0.000 (0.00)	-	0.000 (0.00)
Intercept	39.649 (28.22)	40.210 (28.20)	50.263*** (12.20)	50.490*** (12.18)
N	1216	1216	1216	1216
Multiple R-squared	0.0167	0.0141	0.0127	0.0114

(Note: Figures in parenthesis represent standard errors. ***, ** and * represent statistical significance at 1 percent, 5 percent and 10 percent level, respectively.)

CHAPTER 5. CONCLUSION

I studied the effects of some agricultural and household characteristics on migration decision and destination choices made by farming households of Nepal. I used cross-sectional survey data from twenty hill districts of Nepal. The data used in this study represent household farming systems of Nepal. This study depicted that three distinct migration patterns are observed in Nepal based on destination choices of migrants: migration within Nepal, migration to India and migration to other international destinations such as Malaysia and the Persian Gulf countries. The households sending migrants to these three destinations also differ with each other in their household characteristics. The results from this study also indicated that agricultural characteristics of households influence migration decisions and destination choices.

Marginal effects estimates from multinomial logit regression showed that (i) households highly dependent on agriculture are more likely to send migrants to India and other countries but less likely to send migrants within Nepal; (ii) households that supply hired farm labor force in Nepal are less likely to migrants in India; (iii) farmers who own larger farms are less likely to migrate but destination choices of migrants are not influenced by the farm size; (iv) rural households are more likely to migrate; (v) rural households prefer closer destinations like Nepal and India while urban households prefer migration to countries beyond India; (vi) marginalized ethnicity, Indo-Aryan "lower caste" Hindus prefer are more likely to migrate to India (vii) higher proportion of working-age individuals in household means higher preference to migrate to all destinations but only up to a certain limit; (vi) households with international migrants are more likely to have female household heads; (vii) migration to international destinations except India decreases with the age of household heads but starts to increase after the household heads reach certain age.

Remittances receipts increase with distance of migration. Overseas migrants send significantly large number of remittances annually followed by migrants from India and migrants within Nepal. Households having migrants within Nepal have higher maize yields which is associated with higher labor used in maize production. Migration to India and other countries does not influence maize yield. I do not find evidence of crop yield reduction due to loss of labor from household caused by migration. However, households having migrants in countries beyond India incur higher variable costs in maize production without corresponding yield gains. I argue that the

labor is not deficit in migrating households to cause yield reduction of staple food crops like maize and households send surplus labor to migration without compromising food production but food crop production systems of households with migrants in countries beyond India is deteriorating probably due to inefficient use of resources. Remittance receipts do not influence maize yield and input levels. Households are not spending the remittances they receive in maize production: they are neutral to investing remittances in agricultural inputs required for maize production.

5.1 Limitations of the study

This study has some limitations which are discussed as follows: This study does not differentiate between the objective of migration and assumes all migrants as migrant workers. Although large section of expatriates from Nepal migrate for employment related reasons and send remittances back to their families, all of them are not necessarily the migrant workers. Based on the purpose of migration, a different set of factors may influence non-employment related migration.

The data used in this study is representative of hilly region of Nepal, but it does not cover *tarai* region. The southern plainland is an agricultural production center of the country widely known "granary of Nepal". The migration behavior of farmers in hilly region may widely vary with that of farmers in plainlands. The findings of this study should be cautiously examined before extrapolating for farming households of southern Nepal.

The data constitute of maize grain and seed production systems, but this study does not differentiate between the grain producers and the seed producers. Seed producers, in addition to maize seed, also produce grain maize. In this study, I compute maize grain yield for seed producers by adding the total seed production and the remaining maize grains that do not qualify for seed. Seed producers tend to use higher levels of inputs realized with higher total maize yield. Although this study can be generalized for maize grain production systems, it does not give insights for maize seed production and the difference between grain and seed production systems. The maize grain yield and input levels used by seed producers are likely to be higher than that of grain producers. The interlinkages between migration, remittances, and maize yield and input levels could be different for seed producers and grain producers which are not explored in this study.

This study does not explicitly identify causal relationship of agricultural characteristics to migration and migration and remittances to maize yield and inputs used. Future research are recommended to explore the causal relationship between agriculture, migration, and remittance

receipts. The time when households make decisions to migrate and the time period when they actually migrate may widely differ. This study does not consider the time lapse between the migration decision and migration. Also, in this study, I have categorized households based upon the distance of migration. However, a household may have migrants in two or more different migration destinations. The interlinkage between migration patterns are not explored in this study.

5.2 Policy implications and suggestion for future research

The findings from this study have important policy implications: this study reflects that subsistence farming system of Nepal does not provide enough income to sustain a quality life for farming households. Farmers who do not have additional income sources are migrating to expand and diversify their income. However, migration is not a sustainable solution to problems faced by farmers unless the remittances are utilized in productive sectors of economy. Nepal has a huge scope of agricultural development through remittance spending in agribusinesses. Policy makers should focus on policies that encourage remittance receiving households to invest in commercial agricultural enterprises and develop agricultural capital. Migration entails social and economic costs and risks to migrants and migrating households. The costs and risks are higher for international migration. Small to medium scale agriculture-based industries can generate employment opportunities for Nepali youths within Nepal, exempting them from negative impacts of international migration, and simultaneously boost Nepalese economy. Government of Nepal should foster investment friendly environment for private sector to establish agriculture-based industries and agribusinesses.

The multi-faceted relationship between migration, remittance receipts and agricultural development is not explored extensively in context of developing countries and needs further in-depth investigations. Future researchers can focus on effects of migration and remittance inflow on other farm enterprises including livestock production. Researchers can also study the effects of migration on resource use efficiencies in migrant sending communities of countries like Nepal. Scholars can carry out empirical studies on identifying role of migration on agricultural transformation of developing countries like Nepal. Future researches can study the effects of migration on resource used.

APPENDIX A. MIGRATION, REMITTANCES AND FERTILIZER USED IN MAIZE PRODUCTION

Table A.1 Migration, remittances and chemical fertilizers used in maize production

Variables	Chemical fertilizers used (kg NPK/ha)	
Age of HHH (years)	-0.212 (0.34)	-0.165 (0.34)
Sex of HHH: female	2.931 (11.65)	4.450 (11.61)
Education of HHH	0.379 (9.51)	0.157 (9.51)
Ethnicity: *dalits*	14.345 (13.15)	14.030 (13.12)
Landholding (ha)	-12.191 (9.12)	-11.690 (9.12)
Membership: yes	7.406 (9.07)	7.977 (9.06)
Distance from market (hr)	0.324 (3.84)	0.377 (3.84)
Migration within Nepal (dummy)	9.256 (11.36)	-
Migration to India (dummy)	0.688 (15.11)	-
Migration to other countries (dummy)	15.020 (11.14)	-
Remittances (in '1000s NRs)	-	0.045 (0.10)
Remittances (in '1000s NRs) Squared	-	-0.000 (0.00)
Intercept	55.579* (22.14)	56.530* (221.10)
N	1216	1216
Multiple R-squared	0.0060	0.0044

(Note: Figures in parenthesis represent standard errors. * represent statistical significance at 10 percent level.)

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