Addis Ababa University
College of Development Studies
Center for Rural Development

Rural-Urban Migration, Crop Productivity and Multidimensional Poverty among Households in Gurage Zone, SNNPR, Ethiopia

PhD Dissertation
By

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Addis Ababa, Ethiopia

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A Dissertation Submitted to the Center for Rural Development; College of Development Studies; Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of

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DISSERTATION APPROVAL

ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

This is to confirm that the dissertation prepared by Mesfin Agza Kerga entitled "**Rural-Urban Migration, Crop Productivity and Multidimensional Poverty among Households in the Gurage Zone, SNNP, Ethiopia"** and submitted in partial fulfillment of the requirements for the Doctor of Philosophy in Rural Development**,** is compliant to university regulations and meets recognized standards of originality and quality.

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Chair of the Centre or Graduate Program Coordinator

DEDICATION

I dedicate this treatise to my beloved father, Agza Kerga; I missed him at this special time in my life. May the Almighty God rest his soul in Heaven!

STATEMENT OF THE AUTHOR

I, Mesfin Agza, affirm that this treatise entitled "**Rural-Urban Migration, Crop Productivity and Multidimensional Poverty among Households in the Gurage Zone, SNNPR, Ethiopia"** is my own original work and has been submitted to the Center for Rural Development, College of Development Studies, Addis Ababa University, in partial fulfillment of the requirements for the Doctor of Philosophy in Rural Development. With the help and supervision of my professors, I sincerely declare that I have proceeded with my research autonomously. I appreciate the opinions of research participants in the preparation, data collection, data analysis, and execution of this treatise and comply with the ethical standards of scientific research and the rules and regulations of Addis Ababa University. All scholarly works used in the treatise have been cited. I hereby confirm that all the sources of all the data used in the production of this treatise have been correctly recognized. I declare that this dissertation will not be submitted to any other institution to obtain a degree, diploma, or certificate from anywhere in the world. Simple citations in this dissertation may be used without special permission as long as the source is accurate and fully acknowledged. Requests for extended citations or copies of all or part of this work may be approved by the head of the center for rural development or the dean of the college of development studies for the purposes proposed. However, all other cases require permission from the author of the thesis.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF TABLES IN THE APPENDICES

LIST OF FIGURES IN THE APPENDICES

LIST OF ABBREVIATIONS

AEZ	Agro Ecological Zone
ATE	Average Treatment Effect on Population
ATEN	Average Treatment Effect on Non-treated Groups
ATET	Average Treatment Effect on Treated Groups
CIA	Central Intelligence Agency
CSA	Central Statistical Authority
DASP	Distributive Analysis Stata Package
DF	Degree of Freedom
DFID	Department for International Development
DRF	Dose Response Function
FAO	Food and Agriculture Organization
FTC	Farmer Training Center
GDP	Gross Domestic Product
GIS	Geographic Information System
GZARDD	Gurage Zone Agriculture and Rural Development Department
GZFEDD	Gurage Zone Finance and Economic Development Department
HDI	Human Development Index
HHS	Household Size
IFAD	International Fund for Agricultural Development
IOM	International Organization for Migration
MLE	Maximum Likelihood Estimate
MPI	Multidimensional Poverty Index
MS	Mean sum of squares
MSHHs	Migrant Sending Households, respectively
NCF	Number of cultivated fields
NELM	New Economics of Labor Migration
NMHH	Non-Migrant Households
PSM	Propensity Score Matching
SD	Standard Deviation
SDG	Sustainable Development Goals

SE	Standard Error
SFA	Stochastic Frontier Analysis
SNNPR	Southern Nation, Nationalities and People Regional State
SS	Sum of Squares
TE	Technical Efficiency
TFP	Total Factor Productivity
TLU	Tropical Livestock Unit
UN	United Nations
UNDESA	United Nations, Department of Economic and Social Affairs
UNDP	United Nation Development Program
VIF	Variance Inflation Factor
WB	World Bank
WFP	World Food Program

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ABSTRACT

Human migration and its consequences are being studied as a global development issue. Analytical data on these topics is critical for the government, and scientific research is continually needed to address knowledge gaps. This dissertation investigated the link between rural-urban migration, crop productivity, and multidimensional poverty in Ethiopia's Gurage Zone. The dissertation, specifically, investigated the determinants of rural-urban migration, conducted a comparative analysis based on technical efficiency and multidimensional poverty index, and investigated the impact of rural-urban migration on household livelihood security, multidimensional poverty, and households' productive efficiency. 384 rural households from three different agro-ecological zones were selected using multistage sampling to collect both quantitative and qualitative cross-sectional data. Descriptive statistics and econometric models such as ivprobit, multidimensional poverty index; propensity score matching; dose response function, and stochastic production frontier models were employed to analyze the quantitative data. The results of ivprobit regression revealed that livestock ownership, family size, access to information, number of cultivated fields, soil fertility, distance to the nearest town, and distance to the farmers' training center are all important determinants of rural-urban migration. The dose response model revealed that remittance has a positive significant effect on household livelihood security with a local minimum dose of roughly 40%. The mean technical efficiency of non-migrant households, migrant-sending households, and total samples is 45.5%, 72.3%, and 57.4%, respectively. The household head's age and distance from a neighboring town have a detrimental effect on technical efficiency, whereas schooling, soil infertility, migratory experience, and distance to a nearby market have a positive impact. Rural-urban migration results in a 19.4% decrease in crop productivity for households that send migrants. The mean total factor productivity of migrant-sending, non-migrant, and pooled samples, respectively, was 9.87, 10.23, and 10.03. The adjusted headcount ratio of the non-migrant households and migrant-sending households was 19.8% and 10.5 %, respectively. Poverty affects 43.5% of non-migrant households and 25% of migrant-sending households. Non-migrant households and migrant-sending households contributed 70.5% and 29.5%, respectively, to the adjusted headcount ratio of the total sample. The finding indicate that household size and the educational level of the household heads are significant and positively associated with households' multidimensional poverty, whereas the number of migrant household members and livestock ownership are negatively associated with households' multidimensional poverty .The average poverty-reduction effect of rural-urban migration is 4.7% for migrant-sending households, with a 0.6% counterfactual outcome. Overall, this study discovered that rural-urban migration is caused by a variety of factors and has a beneficial influence on poverty reduction but a negative impact on agricultural productivity. Regulating the underlying causes of rural-urban migration as well as its impact on crop production and household poverty reduction requires the active participation of all stakeholders. Various specific recommendations are made to stakeholders for the successful management of rural-urban migration and its advantages in enhancing local programs related to crop production enhancement and multidimensional poverty reduction in the study area.

Keywords: Rural-urban migration, crop-productivity, multidimensional poverty, Gurage zone, Ethiopia.

1. CHAPTER ONE: INTRODUCTION

1.1 Background

Ethiopia, next to Nigeria, is Africa's most densely populated country, with a population annual growth rate of 2.53% (Countrymeters, 2021). The country is recognized for its high dependency ratio (70.6 % youth and 6.3% elderly dependency ratio) (CIA, 2021) . Recently, 21.2 percent of the country's population lives in cities, with an annual urbanization rate of 4.63 percent (Ibid). The country is in the midst of a demographic change, with the majority of the population working in agriculture and living in rural areas. The agriculture sector is the largest economic sector in the country, employing a significant number of the workforce and accounting for 41% of GDP (Eyasu, 2018). Besides, with a 52 percent share of income spent on food, it supplies the greatest export commodities (almost 75 percent) and plays a critical role in the production and provision of food (Lulit & Ermiyas, 2016). Ethiopian crop production increased by 8% for the years 2010 and 2016 according to a government statistics report (Eyasu, 2018). However, Ethiopia remains heavily reliant on aid. The sector's modernization, as measured by the use of advanced farming technology, is quite low. Also, the rural population has stayed poor (IFAD, 2008; 2013). Furthermore, the country's farming sector is vulnerable to weather fluctuations and price instability. Similarly, the county's existing farming enterprises provide limited seasonal job, which do not give sufficient income to support residents' livelihood requirement throughout the year. Furthermore, the sector's poor adoption of modern farming methods leads to low output and efficiency.

As a result, rural-urban migration becomes the country's mainstay and a fundamental component of human population movement. Migration, in general, is an important component of economic growth and a means of balancing resource gaps between different sectors of the economy. In the majority of circumstances, it is a global phenomenon and a common survival strategy for a substantial segment of the population in developing countries, including Ethiopia, especially in agriculture dependent societies (Fei & Ranis, 1964; Harris & Todaro, 1970; Ikramullah, Shair, & Rehman, 2011; John, Linda, & Vollan, 2014). In addition, its association to various events such as rural-urban linkages and agriculture has raised researchers' interest (Bilsborrow, 2002; David, 2009). The focus of this study is on internal migration, particularly rural-urban migration. The term "rural-urban migration" refers to the movement of people, either short-term or long-term, between rural and urban locations for a variety of reasons. Rural-urban migration might take place on a short-term or long-term basis. Seasonal migrants are members of rural households who travel to destination places for a limited length of time and then return to their original location. On the other hand, long-term migrants are those who left their home area and have settled permanently in new destination area. A rural household is referred to as a migrant-sending household in this study if at least one of its members migrated to new location to obtain wage income, either on a transitory or permanently. According to the theoretical literature, there is no single reason for migration that can be identified as the sole motivator for people to migrate, whether temporarily or permanently. Rather, in source communities, there are numerous conflicting perspectives (WB, 2006; Siddiqui, 2012; Akher & Bauer, 2014). There are a lot of evidences in the literature that migration is essentially a livelihood strategy; this is especially true for youth, who also often rely on family assistance to bear the costs of relocation (Gubhaju & De Jong, 2005; Konseiga, 2007; Daniel, 2007). Moreover, the migration decision-making process is intertwined with the larger family system, and the family may exercise authority and oversight over young migrants by explicitly stated intentions, occasional physical visits, or surveillance through extended social networks (De Brauw & Harigaya, Seasonal migration and improving living standards in Vietnam, 2007; Pickbourn, 2011).

Potential migrants are leaving their homes in various parts of the world in order to receive higher wages for their labor. People continue to migrate from rural to urban or from lower to higher pay centers, according to various migration models, until the earnings in rural areas are comparable to those in metropolitan ones (Fei & Ranis, 1964; Lewis, 1954). Rural level challenges, such as a lack of finance, low crop production, tiny land holdings, high poverty, low wage rates, and poor social amenities, such as education, health, and entertainment facilities, are also frequently cited as key causes of rural-urban migration (Mahmud, Musaddiq, & Said, 2010; McMillan & Rodrik, 2011; Ikramullah, Shair, & Rehman, 2011; Douglas, David, & Michael, 2014; Imran, Bakhsh, & Hassan, 2016). The benefits and drawbacks of rural-urban migration are manifested at the individual, household, and/or community level. There is a discrepancy in assessments of the effects of rural-urban migration on rustic communities' lives. According to some research, rural-urban mobility deprives rural areas of valuable labor force, is referred to as brain drain, and has a negative impact on the rural economy (Drissi, 2014; Sauer, Gorton, & Davidova, 2015). Other studies, on the other hand, have emphasized the beneficial aspects of migrants sending not only the necessary income to their families, but also social remittances in the form of innovative talents that can improve the livelihood of sending communities. It's also crucial to remember that the influence of rural-urban labor migration on the sending community is highly dependent on the size of the migrant, household structure, migrant characteristics, and local farming system factors. For example, in heavily populated areas with high unemployment rates, rural-urban migration can be seen as a boon to the local labor market, easing strain on land and local resources while also improving the livelihoods of those who left behind (IFAD, 2008; Rosenzweig, 2010; De Brauw, 2014). Additionally, in the case of seasonal migrants, cyclical migrations can provide employment throughout the lean agricultural season, thereby greatly increasing household income (IFAD, 2008) because remittances are expected to be more likely in all sectors of the economy. When remittances are directed toward investment, they have a significant impact on the appearance of non-farm income. Non-migrant households, in contrast to migrant-sending households, earned preferential agricultural income (Zahonogo, 2011; Imran, Bakhsh, & Hassan, 2016). However, migrant-sending households' agricultural revenue will suffer as a result of the loss of productive agricultural labor if it is not compensated by farm technologies. Remittances, on the other hand, can help farmers invest in their farms by resolving credit issues that prevent them from purchasing fertilizer and other essential commodities (Mendola, 2005; Taylor & López-Feldman, 2007).

Given the apparent benefits of labor mobility between rural and urban areas, one would wonder why migration rates aren't higher. Secondly, governments worried about food security, which often coincide with countries vulnerable to macroeconomic shocks, can enact policies that favor agricultural production over worker mobility. There is a growing body of evidence that the impact of migration and remittances on rural areas is mediated by changes in spending and investment patterns. Despite the fact that there have been several studies on migration as a development initiative, only little attention has been paid to topics such as measuring the impact of rural-urban migration on crop productivity, efficiency, and household multidimensional poverty. As a result, the purpose of this dissertation was to provide a quantitative and tangible understanding of the aforementioned rural-urban migration related concerns in rural parts of the Gurage zone.

1.2 Statement of the Problem

Migration is just one of the many complex issues that researchers and policymakers consider when thinking about development. The fact that migration's scale, motivations for the movement, and effects on development differ over time and places adds to the issue's complexity. Accepting migration's role in social and economic development has been a focus of development literature for a long time (Fei & Ranis, 1964; Timmer, 2014; Lewis, 1954). Numerous migration studies have been undertaken in various time periods around the world using the concept of migration as a household livelihood strategy for poverty reduction.

Due to three main variables, the magnitude of global human migration has considerably expanded in recent times (WB, 2016) . These are: the expansion of young population shares in LDCs, the quest for labor in advanced economies, and the pay gap between the dual economies. For decades, several developing countries, particularly in Sub-Saharan Africa, have faced increased demographic issues, which are exacerbated in rural areas (WB, 2015a; 2016). Because of the higher proportion of young people and the emergence of a modern economy, the magnitude of rural-urban labor migration in these countries, including Ethiopia, has increased and activated (Goldsmitha, Gunjalb, & Ndarishikanye, 2004; Beneberu, 2012), resulting in excess labor and a wage gap between agriculture and other economic sectors. Population pressure and insufficient food access (Markos & G/Egziabher, 2001), household poverty (Gebrehiwot & Fekadu, 2012), insufficient income and fragmented landholding (Sosina & Holden, 2014), ecological degradation and drought (Betemariyam & Michael, 2000; Markos, 2001; Gray & Mueller, 2012), government settlement policies (Belay K. , 2004; Hammond, 2008), and job opportunities elsewhere (Girma, Woldie, Gete, & Scott, 2008) are the major triggers for substantial rural-urban labor migration in Ethiopia. Rural-urban migration has recently widespread among Ethiopian young, owing to access to social media and social networks, where they are exposed to success stories of migrants (De Brauw, 2014; Kelemework, Zenawi, Tsehaye, Awet, & Kelil, 2017).

Year after year, a tremendous movement of rural-urban migrants to various urban centers of the country characterizes the studied area. According to Worku (1995), rural-urban migration of people from various parts of the area has been quite visible in multiple urban locations, and this has been referred to by others as "there is no place in Ethiopia where you cannot observe Land Rover and Gurage migrants." As it is deeply ingrained in society, it is challenging to determine the precise volume and distribution of rural-urban migration in these areas. Despite the disagreement over the size of the rural-urban migration, there is little dispute about its impact on community development through remittances. Long-term rural-urban mobility has been widespread for corporate purposes (Feleke, Pankhurst, Bevan, & Lavers, 2006; Worku, 1995). The majority of rural households in the research area are keen to send migrants to other locations around the country, and they see it as a primary risk diversification approach for reducing food insecurity, vulnerability and the high danger of food shortages (Feleke, Pankhurst, Bevan, & Lavers, 2006). As a result, seasonal rural-urban migration is practiced more during agricultural off seasons and school vacations. Additionally, for many rural individuals who are looking for work, permanent rural-urban migration is becoming a common option. Rural-urban migration is seen as a critical economic lifeline for youngsters, particularly those who finished Grade ten school and unable to enroll in preparatory schools. As a result, school-aged children are frequently involved in a home or market production, and income from such activities is regarded as an opportunity cost of their time in school. This is definitely behind the latest global Sustainable Development Goals to “ensure inclusion and quality education for all and promote lifelong learning” would have been achieved by 2030 (UNDP, 2015).

Migrants work in a variety of occupations in their destinations, ranging from menial and manual labor to minor trading and private companies. As a result, majority of migrants are involved in some form of urban activity, both in the informal and formal economic sectors, ranging from owning big hotels, industries, and jobs such as shoe-shining, lottery ticket hawking, etc. They also sell traditional supplies, gadgets, fruit, and vegetables. The migrants are largely men and women in their twenties and thirties. Nonetheless, children as young as ten years old also migrate to urban areas in search of job (Feleke, n.d; Ferework, 2007; Feleke, Pankhurst, Bevan, & Lavers, 2006; Worku, 1995).

The labor-lost and remittance effects are the two main effects of rural-urban migration on migrant-sending families. Rural-urban migration as a household risk diversification strategy results in a loss of productive labor by the side of sending households (Mazambani, 1990; Gunjan & B.V Chinnappa, 2015; Todaro, 1969). This is a serious and critical issue in the current study area that is hampering agricultural production where agricultural activities are performed by wage laborers coming from other zones and regions. Many of the migrant-sending rural households are becoming remittance-dependent and misusing their spare time in consuming alcohol (Feleke, Pankhurst, Bevan, & Lavers, 2006; Worku, 1995) and engaging in non-economic activities. This suggests that a number of migrant-sending households abandon economic activities in favor of leisure as their income levels rise due to remittance. If so, it is presumed that households in the study area who receive remittances have stayed away from labor-intensive jobs like crop cultivation and animal husbandry. This will delay crop production and reduce technical efficiency because the field is predicted to stay idle.

Even if migrant's remittance has a positive impact on crop output, it has a negative net impact when it is not used for agricultural investments (Taylor, Rozelle, & De Brauw, 1999; Adaku, 2013). As a result, rural-urban migration is likely to boost non-agricultural income while decreasing agricultural revenue. In contrast to migrant-sending households, non-migrant households are projected to earn higher agriculture income (Zahonogo, 2011), as rural-urban labor movement positively influences non-farm income while hindering agricultural earnings.

Generally, the influence of rural-urban migration on crop production performance can be stated in either a pessimistic or positive manner. In this scenario, a widespread pessimistic outlook suggested that rural-urban migration reduces agricultural income by lowering crop production efficiency and productivity due to the loss of productive workers (Ohajianya, 2005; Paris, Luis, Villanueva, Rola-Rubzen, Ngoc-Chi, & Wongsanum, 2009). Migrant-sending rural households had lower crop output and efficiency than non-migrant rural households, according to pessimistic research studies (Taylor, Rozelle, & De Brauw, 1999; Schmook & Radel, 2008; Gunjan & B.V Chinnappa, 2015). Optimistic perspectives, on the other hand, claimed that remittances from labor migrants boost rural household earnings and enable rural households to automate agriculture (Taylor, Rozelle, & De Brauw, 2003; McCarthy, Carletto, Davis, & Maltsoglou, 2006; Hull, 2007; De Haas, 2010; De Haas, 2012). Thus, migration optimistic studies argued that the remittance fund and mechanized agriculture, which improves crop production efficiency and productivity, can compensate for the possible negative effects of lost household labor on crop production (Richard, 2006; Richard & Cuecuecha, 2013; Akram, Chowdhury, & Mobarak, 2016). Other studies revealed that neither rural-urban labor migration nor remittances invested in crop production affect the performance of subsistence crop yields (Jokisch, 2002). This difference is validated by a survey-type poll undertaken in southern Ecuador, which concluded that migrant-sending households were never different from non-migrant households in terms of subsistence crop cultivation (Gray, Rural out-migration and smallholder agriculture in the Southern Ecuadorian Andes, 2009).

In general, all of the foregoing findings from the literature revealed that rural-urban labor migration had a complex and varied impact on crop productivity and efficiency. Many studies have been conducted to examine the impact of rural-urban migration on modern farming. The pessimistic analysis, for example, asserts that labor shortages caused by rural-urban migration lead to migrant-sending households rejecting indigenous farming systems (Raul & Luis, 1990). Black (1993) and Faist (2008), on the other hand, suggest that rural-urban labor migration spurs modern technology utilization in rural communities through remittance investments and the stimulating impact of new ideas and expertise carried back by migrants. Other studies have found that migrant-sending households use upgraded agricultural technologies to increase crop productivity and efficiency compared to non-migrant households (Simelane, 1995; Mendola, 2008).

As shown in the scenario above, a lot of studies on rural-urban migration have been undertaken in the past during various time periods and in both developed and developing countries. There is widespread agreement that migration and remittances help to alleviate rural poverty and improve household livelihoods. Ordinarily, migrant-sending households who get remittances have higher income and expenditure than non-migrant households that do not receive remittances (Taylor & Mora, 2006; Airola, 2007; Schmook & Radel, 2008; Wouterse & Taylor, 2008). A number of household survey studies found that migrant-sending households receiving remittances are more likely use long-lasting products and engage in productive activities than non-migrant households (Zarate-Hoyos, 2004; Richard, 2006; Taylor & Mora, 2006; Airola, 2007; Yousra & Julie, 2016). Many other researchers (Richard, 1998; Entwisle & Tong, 2005; Ford, Jampaklay, & Chamratrithirong, 2007; Garip, 2007) have found a favorable relationship between migration and household income, expenditure, and asset accumulation. The influence of rural-urban labor migration on household asset accumulation varies across migrant-sending households, according to these research papers.

In Ethiopia, significant empirical research works are conducted on labor migration, in general, and rural-urban labor migration, in particular. Several studies (Feleke, n.d; Berhe, 2011; Gebrehiwot & Fekadu, 2012; Atsede & Penker, 2016; Mohammed, 2016; Beneberu & Mesfin, 2017) assessed the pre-migration conditions, but they were unable to undertake a thorough analysis to evaluate the post-migration conditions. More research is needed on post-migration conditions, particularly concerns about how rural-urban migration impacts the livelihood security, crop productivity, technical efficiency, and multidimensional poverty of rural households. Furthermore, majority of the few studies available in the area of poverty analysis used traditional approach (income or consumption as a proxy) to examine the poverty status of rural households without taking into account other widespread deprivations or the decomposition of households based on migration status. Despite the fact that rural-urban labor migration is relatively common in the research area, it is difficult to locate quantitative studies that employ adequate analysis tools for evaluating the impact of rural-urban migration on crop production (total factor productivity and technical efficiency) and rural household poverty.

Previous migration studies in the research area, such as Worku (1995), Feleke et al., (2006), Ferework (2007), and Feleke (n.d), were particularly interested in social constructive knowledge claims that rely entirely on qualitative data. As a result, the quantitative components of these studies receive less attention, necessitating quantitative research to properly inform decision-makers. Besides, to quantify the relationship between rural-urban migration and crop productivity, multidimensional poverty, and livelihood security, a complete analysis taking into account agro-ecological aspects is needed. Due to the fact that the aforementioned situations have not been studied, this scientific inquiry is justified. The study used the pragmatic knowledge claim, which combines qualitative and quantitative elements, to investigate the factors affecting rural-urban migration and its impact on crop productivity, technical efficiency, livelihood security, and multidimensional poverty in the Gurage Zone of Ethiopia. Crop productivity and technical efficiency evaluation, particularly identifying causes of inefficiency, are critical components of agricultural strategies. Furthermore, based on key selected criteria, the study provides evidence for the distribution of multidimensional poverty across rural families as well as identifying the most common deprivations in the study area.

1.3 Research Hypothesis

1) Different agro-ecological zones have varying rates of rural-urban migration in the study area.

2) Rural-urban migration is inversely connected with the technical efficiency of rural households

3) Depending on migratory status, the determinants of technical inefficiency are varied among rural households.

4) In the study area, rural-urban migration has a negative impact on total factor productivity.

5) Rural-urban migration reduces households' multidimensional poverty in the study area.

6) Remittance enhances the livelihood security of migrant-sending households in the study area.

1.4 Objectives of the Dissertation

The overall objective of this treatise is to investigate the relationship between rural-urban migration, crop productivity, and rural household poverty in the Gurage zone, SNNP, Ethiopia, using cross-sectional data. The study considered the following specific objectives to achieve the overarching objective:

1. To determine the factors that cause rural-urban migration in the research area.

2. To quantify the impact of rural-urban migration on technical efficiency and total factor productivity

3. To examine the impact of rural-urban migration on multidimensional poverty and the livelihood security of rural households.

1.5 Contributions of the Dissertation

This dissertation investigates the impact of rural-urban migration on crop productivity, technical efficiency, and rural household poverty. Consequently, the study findings make a contribution by offering evidence to interested parties in the areas of managing rural-urban migration, crop productivity improvement, and poverty reduction initiatives appropriate for different agro-ecological zones. The quantified information on such issues helps agricultural and development policymakers to acquire a comprehensive picture in designing policies suitable for poverty alleviation. Furthermore, the study adds to the body of knowledge by widening the direction of existing work on the factors of rural-urban migration and its relationship to crop output and multidimensional poverty. In terms of methodology, the study contributes to the literature by employing appropriate econometric approaches in studying rural-urban migration and its impacts in specific settings and contexts rather than treating it as a national characteristic. Overall, this dissertation adds information onto the scarce research on rural-urban labor migration and its impact on rural household livelihood security, crop producers' technical efficiency, and multidimensional poverty in Ethiopia, specifically in the Gurage zone.

1.6 Scope of the Dissertation

This dissertation focuses solely on concerns such as rural-urban migration, crop productivity, and rural household poverty in Gurage zone. The topics that are covered in the study, however, are diverse, including identifying the driving forces of rural-urban migration and examining the impact of rural-urban migration on livelihood security, crop productivity and technical efficiency, and multidimensional poverty of rural households in the study area using a variety of econometric models. The study uses a sustainable livelihood framework as its methodological compass. Cross-sectional data, covering three agro-ecological zones and 384 sample rural households, was used in the study. The study takes into account characteristics such as demographics, resource ownership, services, perceptions, sociocultural issues, and others. For the analysis of the data, an endogenous iv-probit model was utilized to identify the driving forces of rural-urban migration; a dose response model was used to assess the impact of remittance on livelihood security; and a stochastic frontier model was used to estimate technical efficiency and its drivers. The OLS model was employed to measure the total factor productivity of crop production and the Propensity Score Matching (PSM) model to quantify the effect of rural-urban on technical efficiency and multidimensional poverty.

1.7 Limitations of the study

The current study investigated the relationship between rural-urban migration, crop productivity, and multidimensional poverty. Because it is a cross-sectional study, data from sample households was collected at a certain point in time to investigate the relationship between rural-urban migration and the factors of interest. As a result, it was not without flaws. Among the limitations, recall bias may have occurred during data collection when respondents were asked about previous exposures and an impact analysis was performed using a single time-series data set. As a result, research findings from diverse time series data sets, such as longitudinal studies, are required to substantiate the conclusions of this study. Because longitudinal studies frequently collect data from the same group over time, they can determine whether an effect is long-lasting or transient without being limited by resources such as money and time.

1.8 Structure of the Dissertation

Using cross-sectional data set, this dissertation investigates the relationship between rural-urban migration and crop production (total factor productivity and technical efficiency), and multidimensional poverty of rural households in Gurage zone, Ethiopia. The dissertation is divided into seven parts. The first chapter contains the dissertation's general introduction. It provides specific information on the background of the study, statement of the problem, objectives of the dissertation, hypothesis of the research, contributions of the dissertation, scope of the dissertation, the dissertation's conceptual framework, and the dissertation's limitation. The second chapter is devoted entirely to literature reviews. The chapter presents theoretical and empirical assessments of rural-urban migration and its impact on crop productivity and the multidimensional poverty of rural households. The third chapter discusses research methods, which cover study area description, sampling, research data, and data analysis tools. The fourth chapter covers all of the topics embraced in the dissertation's first manuscript, which looks at the dynamics that drive rural-urban migration and the effect of remittance on the livelihood security of migrant-sending households in Gurage zone. The fifth chapter presents the topics covered in the dissertation's second manuscript, which examines total factor productivity of crops, technical efficiency, the determinants of technical inefficiency, and the impact of rural-urban migration on the technical efficiency of crop-producing households in the study area. Chapter six, on the other hand, covers all the topics covered in the third manuscript, which focuses on the relationship between rural-urban migration and rural household poverty. The prevalence of multidimensional poverty (incidence of poverty and adjusted headcount ratio) in the research area, as well as the factors of multidimensional poverty and the effects of rural-urban migration on multidimensional poverty, are thoroughly investigated in this chapter. The seventh chapter is the synthesis, which contains the dissertation's general discussion, conclusion, and recommendations.

2. CHAPTER TWO: LITERATURE REVIEW

This chapter gives an overview of current theories and factors determining rural-urban migration as well as its consequences on crop production and household multidimensional poverty. The majority of current research on the theoretical underpinnings, causes, and impacts of rural-urban migration is speculative, with results varying depending on the study. The major reviews are covered in the following subsections.

2.1 Theoretical underpinnings of human migration from rural to urban areas

There has been a lengthy discussion in economic theory about migration and development from a broader historical perspective. Because migration is too diverse and multifaceted to be explained in a single theory, different researchers have developed distinct theories at different times and places. Some theories are geared on revealing the effects of migration on migrant-sending households and communities. Other theories have been raised in regards to determining the forces that drive migration. The following theories are frequently debated in various literatures among the numerous migration theories. The neo-classical theory (migration optimists), the structural theory (migration pessimists), the new economics of labor migration theory, network theory, wage theory, a theory of Myths & Reality, and mobility transition theory are all manifestations of these theories. The concept of these migration theories is described briefly below.

The neo-classical theory assumes that, in the long run, labor markets and economies tend in the direction of stability as a result of trade and migration. People relocate from places where labor is plentiful and wages are low to places where labor is scarce and wages are higher, according to this theory. Individual decisions to migrate are made based on the belief that lucky profits will offset the cost and risk of migrating in the long run (Lee, 1966). The theory considers migration to be an investment, as though the benefits of migration always outweigh the costs of migration (Borjas, 1989). Migration gains are defined as a flow of remittances, skills, knowledge, and experience that migrants possess and are expected to contribute in their communities of origin. Furthermore, this theory emphasizes the importance of pay differences and clarifies migration within the context of rural-urban labor migration by seeing it as a price balancing process (Todaro, 1969). This is where free labor movement is projected to create labor scarcity, resulting in higher salaries and increased marginal productivity in migrant-sending households and sending localities. This theory is used as a lens in this dissertation to determine if rural-urban labor migration has good results in terms of crop productivity and the reduction of multidimensional poverty among migrant-sending households and sending areas.

In contrast to the neoclassical migration theory, structural theory sees migration as a more depressing and painful experience. According to the theory, migrant remittances cannot compensate all of the losses experienced by migrant-sending households. Additionally, the theory's proponents try to persuade migration optimists by claiming that the amount of remittances sent home is insufficient to make a meaningful contribution to the national economy. Furthermore, the remittance that ensues exacerbates inequalities and it results in a brain drain among the community's origin due to the loss of relatively educated migrants (Richard, 1998). Besides, proponents of the thesis claim that remittances are often spent on eye-catching expenditure and unproductive investments (Lipton, 1980), and increasing inflationary pressures (Russell, 1992). Migration pessimists normally blame migration for a loss of productive labor, the magnification of remittance-dependent households, and asymmetrical distribution of material goods between urban and rural areas (Lipton, 1980). So, this theory is used in the dissertation to determine if rural-urban migration has a detrimental impact on migrant-sending households' crop productivity, technical efficiency, and multidimensional poverty.

The New Economics of Labor Migration theory, on the other hand, seeks to identify the primary drivers of labor migration. According to the notion, the decision to migrate is usually decided at the household level as a risk-spreading tactic (De Haas, 2006; 2010). Individual decisions (who migrates, where to migrate, for how long, what to do, etc.) are not made in isolation, but rather as a group within the domain of all household members. The decision-making unit's scale can sometimes extend to the meso level of extended families and larger communal organizations (Massey, Joaquin, Graeme, Ali, Adela, & J.Edward, 1993). The rational decision-making process includes not only salary and earnings optimization, but also risk diversification and aversion strategies for the household (De Haas, 2010; 2012). Thus, this theory is used in the dissertation to familiarize readers with the major purposes of rural-urban migration (the linear or directional push-pull forces) at the household level, as well as how rural-urban labor migration decisions are made in the study area.

Because of its numerous analytical focuses on structure, linkage, and process, network migration theory is a current migration theory that is commonly referred to as a fruitful and comprehensive framework for understanding migration (Dolfin & Genicot, 2010). According to the theory, migrants flock to locations where their friends and relatives have moved to avoid the unknown risk and to have a social support network when they arrive. The appeal of a network theory is that it allows for a more circular, multi-causal, and an interdependent view of migration, rather than a linear, unidirectional, push-pull movement, with the effects of change in one element of the system being verifiable through the remainder of the system (Thomas, 1997; 2008). Therefore, this theoretical framework is being followed in order to conceptualize the role of diverse social networks in driving significant rural-urban labor movement (other than the usual push-pull dynamics) as well as the degree of rural-urban labor migration in the studied area.

Among other migration theories, the Dual Labor Market Theory (wage theory) is commonly debated in relation to rural-urban migration, subsistence agriculture, and wage rates. According to the theory, agriculture in low-income countries is characterized by its subsistence nature, which is linked to labor excess, excess capacity, and a near-zero marginal product of labor. Agriculture in low-income nations is defined by its subsistence nature, which is linked to labor surplus, overcapacity, and a near-zero marginal product of work, according to the theory (Todaro, 1969). Consequently, rural-urban migration is seen as a means of coping with the surplus of agricultural workers. The dual economy growth models (Fei & Ranis, 1964; Lewis, 1954) and well-known migration theories (Harris & Todaro, 1970; Todaro, 1969) are founded on subsistence agriculture, surplus labor, and low pay rates. The central implication of this theory and dual economy models is that economic growth, structural transformation, and rural-urban migration can result in a labor shortage and higher wages in agriculture, and that labor will then become productive, which is also a foundation for crop productivity and efficiency. Furthermore, minimum wage regulations allow the government to engage in the labor market, notably in the subsistence and low farm pay sectors, which are widely seen as the sources of excess rural labor, in order to curb agricultural labor exploitation, which is a human rights concern. To address the problem of workers, the law instructs the government to intervene in the labor market and control all wages, including farm pay, based on globally accepted norms. If this is the case, laborers will be motivated, and labor's marginal product will rise, allowing for sufficient agricultural production, as well as the creation of non-farm income in rural areas with high capacity for absorbing excess rural labor (Fei & Ranis, 1964; Gray, 2009; Douglas, David, & Michael, 2014).

A theory of Myths and Reality, which evaluates the situation of the labor market and wages in modern agriculture, is another relevant theory on the subject of rural-urban labor mobility. The marginal productivity theory described in subsistence wage theory is attacked in this theory because the marginal product of labor is extremely seasonal, difficult to compute, and never zero (Lucas & Robert, 1990). Furthermore, the minimum wage law has been chastised for assuming a continuous agricultural pay that remains above the legal minimum. The central idea of the myths and reality theory, as well as the new economics of labor migration models, is that structural changes (from agriculture to other sectors of the economy) in national and state economies cause large-scale labor migration from agriculture, while rural development and poverty alleviation programs have greatly reduced the relative importance of agriculture in rural households' labor allocation decisions (Getnet, 2009; Edward & Hina, 2010; Todaro, 1969). As a result, the agricultural labor supply will be significantly reduced. On the contrary, enhanced farm technology, higher cropping intensity, increasing necessity of timely farming operations, and a noteworthy transformation in agriculture from a family-labor based approach to a life sort of activity of a corporate organization have all boosted farm labor demand dramatically. In this light, agriculture faces a severe labor crisis, rendering the concepts of surplus rural labor, zero marginal products, and opportunity cost of labor obsolete. A mobility transition theory is a migration theory that focuses on country shifts across time as demographic and socioeconomic phases change. According to this hypothesis, due to rapid demographic growth, there is a high rate of rural-urban labor mobility in the early phases of development, followed by a strong net migration towards higher economic centers. Urban economic centers, according to this hypothesis, are net importers of low-skilled workers from rural economic hubs. Rural-to-urban migration slows as countries become more industrialized and demographic trends slow, whereas urban-to-urban mobility and circular movement increase dramatically. In general, the dissertation is shaped by the blending of the aforementioned theories for identifying the drivers of rural-urban migration and examining its impacts on livelihood security, crop productivity, technical efficiency, and household poverty by focusing on two types of rural households: migrant-sending households and non-migrant households.

2.2 Factors that influence rural-urban migration

This part examines the factors that influence migration, with a focus on rural-urban migration, and highlights the significant approaches and conclusions in the literature that are relevant to this dissertation. Numerous migration studies have discovered numerous influencing factors for individual and family migration decisions. Many studies have been done on the causes and consequences of migration in various parts of the world. Castelli (2018) set out to find out why people migrate, with a particular focus on household-level determinants. Access to communication technologies, fragmented land holding size, and social media access all play a part in the final decision to migrate as a household livelihood strategy, according to the study. In the Habru district of Northeast Ethiopia, Beneberu & Mesfin (2017) performed a survey with the aim of examining variables that induce rural people to move to local and global ends. Conflict, the lack of a relief assistant, livestock ownership, field size, access to information, and family and individual traits such as family size and sex are the primary drivers of rural-to-urban migration. Similarly, Mohammed (2016) did a survey in Kutaber in Ethiopia with a primary view of ascertaining the significant factors of people migration from rural-urban areas. According to his findings, fragmented land, poverty, drought, the need to bond with friends and relatives, money generation, the need for a job and urban amenities, uncoordinated legal immigration procedure activities, and facilities in desirable states are all key factors in illicit migration. Furthermore, the study found that households with large family sizes are vulnerable to improper rural-urban migration. Tripathi & Kaur (2017) used census data on migrants as a unit of analysis to investigate the primary causes of rural to urban migration in India's major cities. Their findings indicate that urban unemployment rates have a negative impact on rural-to-urban migration. Furthermore, their research discovered that higher poverty headcount ratios and urban inequality have a depressing effect on rural-urban migration. However, according to their findings, providing fully connected electricity in a city has a positive impact on rural-urban migration decisions. Some of the most relevant household-level factors are included below, along with a brief discussion of each in relation to the dissertation's aim.

Age, gender, and educational level of the household head: According to several studies, the heads of migrant-sending households are often older and better educated than the heads of non-migrant households (Herrera & Sahn, 2013; Akher & Bauer, 2014; Ferrone & Giannelli, 2015).

The findings revealed that the older the household head, the better competent he or she is to diversify income. Similarly, the more educated a leader is, the better able he or she is to gather and evaluate the data needed to migrate. Household with heads aged 21–40 years were shown to be more likely to have members to migrate, according to research conducted by Osawe (2013). Female-headed households, on the other hand, have lesser potential earnings than male-headed households, and as a result, they are more likely to become migrant-sending households (Ackah & Medvedev, 2010). Gray and Mueller (2012) found same evidence in Ethiopia, and Kusuma (2012) found the same evidence in Senegal. Furthermore, Ratha, et al., (2011) indicated that each additional year of schooling for the household's head raises the possibility of sending migrants by 8%.

Household size: Larger households are more likely to use rural-urban migration as a risk diversification strategy. As a family's size grows, so does its per capita income and family members are expected to migrate to find work elsewhere. According to Thorat et al. (2011), adding one more person to a household raises the likelihood of sending a migrant by 8.7%. Similarly, a study conducted in Kenya by Agesa and Kim (2001) found that households with multiple dependents are more likely to choose migration as a source of income than their counterparts. Additionally, Ratha et al. (2011) discovered that the larger the household, the more likely a household member migrates in Ghana, Burkina Faso, Senegal, and Nigeria as part of the African Migration Project.

Household composition: Evidence from the literature suggests that the proportion of active members (15-64 years) and dependents (0–14 years old and the elderly) affects a household's income-generating potential and, as a result, increases households' propensity to have migrant member. Taylor (2001) shows that when a family has a large number of children, families tend to urge family members to move since they have a higher earning potential and are more likely to remit money. According to Mendola (2008), households with larger dependents are more likely to have migrant family member.

Social or extended family networks: Family and community networks play an important influence in influencing migration, particularly when it comes to minimizing relocation expenses (Dolfin & Genicot, 2010). According to migration research, the availability of social networks provides information about opportunities in probable locations and helps migrants find jobs before they arrive.

Assets base: Ownership of a portfolio of assets (i.e. land, livestock, farming tools & equipment, plantation crops, financial reserves) impacts whether a household needs to migrate for livelihood diversification and whether it can afford the financial costs of migration (Waddington & Sabates-Wheeler, 2003; de Brauw, Mueller, & Tassew, 2013). According to Mendola (2008), because of the high entry costs of migration, asset poor households obtain reduced migration returns. As a result, they join in internal migration, which, in comparison to foreign migration, does not assist them in achieving production improvement.

Gender: Many studies show that men and women have different migration tendencies, but there is a lot of diversity among different circumstances. Women are less likely to move than men due to their reproductive and care giving duties, as well as financial and decision-making limits (Awumbila, Kofi, Litchfield, Boakye-Yi, Deshingkar, & Quartey, 2015). Further evidence gathered by Brockerhoff & Eu (1993) in Sub-Saharan African countries across women supports this conclusion. Rural women, on the other hand, are 6.4 percent more likely to move to rural areas than men, according to Herrera and Sahn (2013), since they have less access to productive resources and are more susceptible. In certain circumstances, women relocate to alleviate economic inequity and to avoid gender obligations and social conventions that are oppressive (Zachariah, Mathew, & Rajan, 2001; UNFPA & IOM, 2006).

Ethnicity: Depending on their socio-cultural traits or the level of development in the places where they are located, the ethnic group's propensity to send migrants varies (Amin, 1974). Herrera and Sahn (2013) found that belonging to the Serere ethnic group reduces the risk of relocating to urban centers by 17 percent in Senegal.

Food insecurity and a lack of economic opportunities: Rural households in developing countries, in general, are prone to travel to other places in search of work, income, or food within the agriculture sector as off-farm activities and associated rural sectors such as forestry and fisheries (Akher & Bauer, 2014; Katie, Lisa, & Melissa, 2018). This shows that rural-urban labor movement is viewed as an alternative way out to malnutrition or hunger, as well as economic exploitation and other family threats experienced by rural households.

The spread of human, crop and animal diseases: It is well known that rural-urban migration of people is a key strategy for avoiding such diseases, with significant implications for agriculture, food security, and other areas (Chaudhuri, Jalan, & Suryahdi, 2002; Oni & Yusuf, 2007; Richard & Cuecuecha, 2013; Mohammed, 2016).

2.3 Empirical evidences on the ex-ante and ex post conditions of rural-urban migration

Internal migration is frequently viewed as mostly rural-to-urban, contributing to uncontrolled expansion and related rural-urban management issues in many developing countries. Macro-level policies, such as structural adjustment and economic reform, which affect both urban and rural populations, influence and frequently intensify rural-urban migration (Lucas, 2014; Potts & Mutambirwa, 1998). As a path to poverty, rural-urban migration creates both opportunities and drawbacks in both the origin and destination communities (FAO, 2018). When it comes to the origin, migrants send money or goods back to their family or communities in the form of remittances. The majority of data on the ex post conditions of migration refer to variations in earning opportunities between households and/or communities with and without remittances. In household surveys conducted by the Southern African Migration Program in Botswana, Lesotho, Mozambique, and Zimbabwe in 2005–06, remittances were the largest source of revenue. On average, remittances covered half of the food costs for almost 80% of recipient households (Crush, 2012). Similarly, Redehegn, Sun, Eshete, and Gichuk (2019) discovered that cash and property transfers made by migrants increased farm income and asset prices in Ethiopia's sending communities. Aside from remittances, rural-urban migration benefits farmers' use of arable land because it eases capital constraints, promotes entrepreneurship, and boosts technological endowment; however, it may have a negative effect on farmers' ability to produce crops in the sending community as urban areas encroach on nearby land (Laczko & Aghazarm, 2009; Ajaero & Onokala, 2013).

Demographic, farmland, and green vegetation losses may have occurred as urban centers expand into migrant-sending communities' surrounding territory. Migrant remittance, on the other hand, can increase crop-production, in sending communities, by easing capital limitations for farmers. Evidence from earlier data indicates that rural-urban migration can successfully enhance household incomes for sending migrants. For example, in China, on-farm salaries accounted for almost 40% of the rise (Chen, Hu, Sun, & Zhang, 2020) and were the biggest source of the per capita rural revenue growth in 2014-2018. Farmers' entrepreneurial spirit of shipping communities may also be encouraged in rural-urban migration, potentially improving the chances of increasing arable land use. On the one hand, previous research has shown that, in addition to increasing physical capital, rural-urban migration increases human and social capital. Return migrants have developed a novel business concept that may raise farmers' awareness of enterprises through urban-rural migration (Naudé, Siegel, & Marchand, 2017; Adamnesh, Oucho, & Zeitlyn, 2014). It can be reasonably expected to motivate farmers to invest more in agriculture, including expanded land size, through enhanced enterprise knowledge. Migration from rural to urban areas would change the technological ability of farmers in crop production and influences the decisions on land use. Rural-urban migration can, generally speaking, have beneficial and bad impacts on the farmers' technological capacity on crop cultivation. The first is that migrants returning may lack specific agricultural knowledge and experience of the conventional techniques because of their lengthy stretches of absences from agricultural activities (Zhang, Deng, Peng, Zhou, & Liu, 2020). Second, previous research suggests that experience of rural-urban migration could allow farmers to embrace new technologies to produce crop (Naudé, Siegel, & Marchand, 2017). But research disputes the good or negative impact of rural-urban migration upon farmers' upgrade technologies and use of arable land.

Using a dose-response function technique, Arapi-Gjini, Möllers, and Herzf (2020) investigated the dynamic effects of remittances on household poverty and inequality in Kosovo. The results of their investigation demonstrated that remittance reduces both acute and chronic poverty in households. Their research also found that short-term remittances have a larger impact on poverty reduction than long-term remittances. Following a binary treatment case, Seyfe & Marangu (2019) investigated the impact of remittance on poverty in South Africa. Remittance-receiving households have a lower headcount ratio than non-remittance-receiving households, according to their research. Tesfaye (2018) used meso level cross sectional data and the IV estimation technique to estimate the influence of remittance on household well-being. His findings indicated that remittances have a positive and significant impact on household consumption and asset accumulation, including cattle, land, and other farm equipment. The effect of remittance on household asset accumulation was also studied by Sey (2019) in Ghana, Chowdhury & Radicic (2019) in Bangladesh, and Redehegn, Sun, & Eshete (2019) in Ethiopia.

Their findings revealed that remittance receipts greatly boost household asset accumulation. In the context of rural-to-urban labor movement in Chongqing Municipality, Southwest China, Qin (2010) evaluated a conceptual framework combining rural household livelihoods as an integrative mediate factor between rural migration and the rural setting. His findings confirmed that labor-migrant and non-migrant households differed significantly in terms of livelihood activities, with labor migration decreasing household reliance on forest resources for fuel, which contributes to good land and forest conservation.

2.4 The link between rural-urban migration and crop-production

The relationship between agricultural productivity and rural-urban migration can be seen in a variety of ways. Rural-urban labor migration, as evidenced by remittance or loss of labor, can have impact on agriculture sector, according to economic theories. The following critical concerns are identified from the summary of the existing economic models to investigate the relationship between rural-urban labor migration and performance of crop production (productivity and efficiency).

1) Rural-urban migration is anticipated to put downward pressure on rural labor availability in sending communities. Assuming all other socioeconomic factors remain constant, the impact of rural-urban migration on crop-production is determined by the ability of the households left-behind to manage their farm and how they utilize remittances (Richard, 2006; Richard & Cuecuecha, 2013; Adaku, 2013). If the lost agricultural labor is not compensated, migrant-sending households may switch from double-cropping to single-cropping, fallowing agricultural land, reducing crop output (Liu K. , 2011). However, a household's loss of labor does not always imply a reduction in crop outputs, which could be compensated by increased access to capital for investments;

2) Changes in population distribution caused by rural-urban migration affect the social organization and patterns of crop production and use. This may shape both the supply of food and the types of food produced and eaten (IFAD, 2008; de Brauw, Mueller, & Tassew, 2013). For example, in migrant-sending communities, it might result in shifts in the population's age and gender makeup.

3) Remittance received from labor migrants has a substantial impact on households' crop output, investment, and labor allocation decisions, such as access to finance and insurance markets in the origin (Richard, 1998; Beneberu, 2012; Richard & Cuecuecha, 2013; Qin, 2010);

4) Rural-urban migration has the potential to alter the quality of human capital in rural communities, particularly when high-skilled migration is not compensated. In such instances, labor migration may have a detrimental impact on crop production unless remittances are available to invest in crop productivity and efficiency (Todaro, 1969).

5) Migration between rural and urban areas can have an impact on gender relations. According to Awumbila, et al. (2015), in places where males are leaving, there are more female-headed households in rural areas, and they are becoming farm managers in addition to other home chores. Along with the enjoyment of decision-making, this may subject women to a number of health risks and gender-based prejudice. As a result, this circumstance may have an impact on crop yields and agricultural income for migrant-sending households, in general.

6) Rural-urban migration is one of the powerful forces driving structural changes in the economy as labor moves from the agricultural sector to the non-agriculture economic sectors. Rural–urban migration is seen as the impetus of economic development (Lewis, 1954; Liao & Yip, 2018) because the agriculture sector is predominantly located in the countryside and the non-agriculture economic sectors (manufacturing and services) are located in towns and cities.

2.5 Empirical studies on the impact of rural-urban migration on crop productivity

The impact of rural-urban migration on total factor productivity and technical efficiency of crop-production, as well as the determinants of technical inefficiency are carefully reviewed in this section.

In Pakistan, Imran, Bakhsh, and Hassan (2010) used cross-sectional data and the Cobb Douglas production function to examine the impact of rural-out migration on crop yield. Their findings revealed that rural-urban migration has a detrimental impact on cotton production, whereas it has a positive impact on wheat productivity. Similarly, Liu (2011) used a survey data from 150 respondents in China to identify the various strategies for managing labor scarcity that was faced by migrant-sending households and to investigate the influence of rural-urban migration on the price of agricultural goods. Hiring labor during peak cropping season; renting property to others;

replacing machine power with human labor; and cultivating fallow farm land were all identified as key alternative tactics used by households to compensate for the lost labor. His findings also indicated that rural-urban migration has a significant impact on the cost of agricultural commodities in the origin. Furthermore, Iheke, Nwaru, and Onyenweaku (2013) used survey data from 120 respondents and employed stochastic frontier production analysis to investigate the effect of remittances on the technical efficiency of rural households engaged in crop production in Nigeria. Remittance-receiving households are less technically efficient than their counterparts, according to their research. Their investigation took into account household size, year of schooling, age, year of farming experience, and farm size as key drivers of crop-producing households' technical inefficiency. In China, Chen, Huffman, and Rozelle (2006) also identified the age of the farmer, the size of the landholding, and the rate of community migration as the key predictors of technical efficiency.

Nonthakot & Villano (2008), on the other hand, used stochastic frontier production functions to investigate the relationship between migration and farm productivity in Thailand. Their findings revealed that remittances from migrant workers boost maize-growing farmers' productivity. Besides, Belete (2020) investigated the factors that influence farmers' technical inefficiency in maize production in Ethiopia. His research found that the head of the household's gender and age, the amount of farm income, row planting practice, access to credit, the size of the working labor, landholding size, livestock holding size, and use of improved seed all have a significant impact on the level of technical inefficiency of maize producers. Similarly, Solomon (2014) agreed that having a year of education, practicing water and soil conservation, being poor, having animals, and using better seed are all key drivers of the technical inefficiency of major crops in Ethiopia.

Dessale (2019) investigated the sources of productivity and technical inefficiency among Ethiopian wheat farmers. According to his research, cropland size, fertilizer use, labor input, and ox size all have a significant impact on wheat yield. In his analysis, the stochastic production frontier model identified age of the farmer, degree of education, farm size, use of better seed, availability for training, and credit as major drivers of technical inefficiency. Using stochastic frontier models, Getachew & Bamlaku (2014) investigated the technical efficiency of smallholders in maize production and found the causes of technical inefficiency in Ethiopia's

Oromia Regional State. According to the authors, farm size, fertilizer, and improved seed were the most important elements in maize output. Their findings verified that maize farmers' average technical efficiency is 66 percent, implying that they may increase output or cut input costs by 34 percent to attain the same output by making better use of the existing resources. Their findings also revealed that a farmer's degree of education, age, landholding size, extension contact, and engagement in non-farm job are all important determinants in maize producing farmers' technical inefficiency.

Using a propensity score matching method, Ntakyo, Den Berg, and Mugisha (2019) compared the level of technical efficiency between cash crop and non-cash crop producers. The study's findings revealed that non-cash crop producers have higher technical inefficiency than cash crop producers. Similarly, in Cameroon, Julie, Engwali, and Claude (2017) used stochastic frontier models with a Cobb-Douglas production function to discern the efficiency of diversification and specialization of vegetable farms. Specified vegetable farmers are more technically efficient than varied vegetable farmers, according to the study. Age, gender, farm size, level of education, and availability of loans, mutual aid, and extension services were also found as major drivers of technical inefficiency in the study. Amare, Hohfeld, and Waibel (2011) found that migration has a favorable influence on rural household farm income escalation through remittance investment in crop productivity in rural areas.

2.6 The link between migration and multidimensional poverty and livelihood security

Understanding human migration as a livelihood strategy is critical for reducing poverty and improving livelihood security in areas where it occurs. As a result, numerous studies on the relationship between the aforementioned issues and their determinants have been conducted in order to obtain comprehensive data on development issues. Tanle, Ogunleye-Adetona, and Arthor (2020), for example, studied how migration affects the livelihoods of migrant-sending households in three Ghanaian communities. They discovered that migrant-sending families had greater access to health care, more educational opportunities, and higher agricultural income than non-migrant-sending families. According to Zhang (2003), household poverty is a driving force behind rural–urban migration, and anti-poverty work had also played a significant role in developing rural–urban migration adjustment system in China. In addition, Dehury and Mohanty

(2017) claim that the availability of sanitation, drinking water, and cooking fuel improved livelihood security, which in turn reduced migration.

Kuschminder, Andersson, and Seigel (2018) carried out a comparative study of well-being among migrant and non-migrant households, and also return migrant households. In terms of well-being, they discovered that migrant and returning migrant households outperformed non-migrant households. Furthermore, their findings emphasized the significance of considering migrants' destinations when determining the well-being of families left behind. They also found that households with a migrant in the North had better well-being outcomes than households with migrants in other destination countries. Using a difference-in-difference model and an inverse-probability of treatment weighting method, Degnet, Assefa, Habtemariam, and Padoch (2020) investigated the impact of human outmigration on household food security in Ethiopia. They discovered that population outmigration increased daily caloric intake per adult equivalent by about 22%. According to their findings, outmigration has reduced the food poverty gap and the intensity of food poverty by 7% and 4%, respectively.

According to Dereje, Abrham, and Alemu (2021), a slight increase in household resilience capacity resulted in a consistent decrease in multidimensional poverty in Ethiopia. They also reported that participation in wage labor, literacy, savings, and having more economically active household members all opened up opportunities for long-term multidimensional poverty escape. Meekaew and Ayuwat (2019) undertook a path analysis to identify factors affecting the livelihood security of fishing migrant households in Thailand. They reported that landholding size, household assets, and capital such as human, social, physical, and natural capital are important factors that have a direct relationship with household risks. However, the year of migration, reasons for migration, the frequency with which remittances are received, annual household income, farm income, and non-farm earnings all have an indirect significance effect on household risks.

2.7 Methods to measure multidimensional poverty

Poverty is widely recognized as a phenomenon associated with deprivation in a variety of indicators (Alkire & Santos, 2010; Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015). This understanding, however, does not always translate into multidimensional measurements. In most cases, poverty assessments necessitate the resolution of two major methodological issues (Alkire & Santos, 2013): identification (which units should be regarded as poor?) and aggregation (the transformation of data into poverty indicator). However, agreement on the dimensions, indicators, thresholds, and dimension and/or indicator combinations to be used, as well as aggregation and decomposition, is critical in multidimensional poverty measurement.

- **Dimensions** are the fundamental aspects (needs, capabilities, and rights) that households or individuals must meet in order to be considered not poor. The relevant dimensions for measuring poverty can be derived from conceptual frameworks such as Townsend's definition of relative poverty, the capability approach, international consensus, and/or legally protected rights. However, the dimensions taken into account in several multidimensional poverty measures are not always grounded in theoretical aspects (Alkire & Santos, 2013; Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015). Health, education, and living standards are the most important dimensions in multidimensional poverty assessment (Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015; Alkire & Santos, 2013; Alkire & Santos, 2010).
- **Indicators** are visible variables that show whether or not various dimensions have been met. They are drawn from the dimensions to show whether the household/person is deficient in each dimension. This implies that the indicator should be a one-of-a-kind manifestation of the phenomenon under consideration. According to Alkire & Foster (2011), as the number of indicators chosen increases, so does the percentage of the population classified as poor.
- **Thresholds,** also known as **deprivation cutoffs**, are the values of each indicator or the minimum level of achievement required to be considered not-deprived**.** In order to identify the poor, two types of cutoffs are used: indicator cutoffs zj and poverty cutoffs k (Alkire & Santos, 2013). The poverty cutoff k is the single poverty line that a person must cross in order to be classified as non-poor; however, the indicator cutoffs explain the count of (weighted) deprivations. In each indicator, a household or person is defined as deprived if his achievement is less than the corresponding indicators' cutoff. The poverty cutoffs, on the other hand, are used to determine who is poor. Choosing dual cutoffs, the same as dimensions and indicators, necessitates a credible argument based on national or global consensus or empirical evidence (Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015).
- **The dimensions and/or indicators combination** specifies the number of dimensions or indicators required to label a unit as poor. Various approaches to combining dimensions and/or

indicators are described in the literature. These are the approaches of union, intersection, intermediate, and weighting (Alkire & Foster, 2011; Alkire & Santos, 2013; Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015). By setting very low thresholds for each dimension, the union approach considers only one deprivation, making it overly inclusive and potentially exaggerating poverty. The intersection approach, on the other hand, considers the unit of analysis to be those who are deprived across all thresholds. This method, unlike the union approach, may understate poverty, resulting in low measures. The intermediate method combines the union and intersection requirements. In contrast to the previous methods, a weighed method has been used by specifying a specific number of indicators that are not the same as one, or a weighted proportion of them. All dimensions are given equal weights, however the weight of the indicators vary greatly depending on the significance of the dimension and the number of indicators within each dimension.

- **Aggregation** is a method of converting information about the poor's accomplishments into a real number. According to Alkire & Santos (2013), calculating the aggregate M_α measure is as simple as taking the mean across all people and indicators of the matched censored matrix $g^\alpha(k)$: $M^\alpha(x;z) = \frac{1}{nd}\sum_{i=1}^{n}\sum_{j=1}^{d} g_{ij}^{\alpha}(k)$ with $\alpha \geq 0$…………….................…………2.1

When α equals zero, the measure M0 is known as the adjusted headcount ratio, which is calculated by multiplying poverty incidence (the headcount ratio H) by the poverty intensity (A). i.e. M0 = HA. The percentage of the population who has been identified as multidimensional poor is referred to as poverty head count ratio. $H = q(k)/n$, where q (k) is a group of multidimensionally poor people based on parameter k $q(k) = \sum_{i=1}^{n} pk(xi, z))$ and n is the total population. Poverty intensity (A), also known as the breadth of poverty, is defined as the average deprivation share across the poor and is calculated by $A = \sum_{i=1}^{q} c_i(k)/(q(k) * d)$ ……………..2.2

Poverty intensity denotes the proportion of the d indicators from which the average multidimensional poor person suffers (Salazar, Díaz, & Pinzón, 2013; Salazar, Díaz, & Pinzón, 2013; Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015). When α equals one, the measure M1 is referred to as the adjusted poverty gap, which is the weighted sum of indicator-specific poverty gaps calculated by multiplying adjusted headcount ratio (M0) by the average poverty gap among the poor (G). In other words, M1=M0*G or H*A*G. The average poverty gap (G) is the depth of deprivation across all instances at which a poor person is deprived; remember that the gaps are divided among all positive normalized entries in the censored deprivation matrix. It is formulated as:

$$G = \sum_{i=1}^{d} \sum_{j=1}^{d} g_{ij}^{1}(k) / \sum_{i=1}^{n} \sum_{j=1}^{d} g_{ij}^{0}(k) \quad \text{.......} 2.3$$

When α equals two, the measure M2 is known as the adjusted squared poverty gap or poverty severity among the poor; it is the weighted sum of the indicator's squared poverty gaps calculated by multiplying the adjusted headcount ratio by the average squared poverty gap among the poor (S). To put it another way, M2=M0*S or H*A*S. The average squared poverty gap (S) is computed by dividing the total of the weighted squared gaps by all positive normalized entries in the censored deprivation matrix (Salazar, Díaz, & Pinzón, 2013; Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015).

$$S = \sum_{i=1}^{n} \sum_{j=1}^{d} g_{ij}^{2}(k) / \sum_{i=1}^{n} \sum_{j=1}^{d} g_{ij}^{0}(k) \quad \text{.......} 2.4$$

- **Poverty decomposition**: A key feature of multidimensional poverty measurement is the ability to decompose poverty into population subgroups. Urban vs. rural, religion, caste, ethnicity, or any other attribute that appears to indicate a relevant difference across households, such as the gender and age of the household head, could be important sub-groups (Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015). To decompose poverty by subgroup, dimension, or indicator, the data must be representative of those groups, which necessitates a review of the survey's representativeness. Furthermore, calculating the censored (adjusted) headcount ration for the population is a necessary step in decomposing poverty into subgroups, dimensions, or indicators and computing their contribution (Alkire & Santos, 2010; Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015).

$$M0_{population} = \frac{n_1}{N} M0g1 + \frac{n_2}{N} M0g2 \quad \text{.......} 2.5$$

Here, n1 denotes "subgroup 1," and n2 denotes "subgroup 2," and n1/ N is the population of subgroup 1 divided by the total population, and n2 /N is the same (assuming N= n1+n2). M0g1 and M0g2 are the censored headcount ratios of subgroups 1 and 2, respectively. Using this formula, the contribution of each subgroup to overall poverty is calculated as: Contribution of subgroup1$=\left(\frac{n1M0g1}{N}\right)*100)/M0_{population}$. The contribution of subgroup2 to the censored headcount ration of the population is computed in the same manner. Furthermore, the poverty decomposition by dimensions is calculated as:

$$M0_{population} = \sum_{j=1}^{d} \mu(g_{*j}^{0}(k))/d \quad \text{...} 2.6$$

In this case, $g_{*j}^{0}(k)$ is the j th column of the censored matrix g ^{0} (k). Dimension j also contributes to MO in the following ways: $Contribution_{j} = \mu(g_{*j}^{0}(k))/d)/M_{0}$.

In addition, the poverty decomposition by indicators is measured as:

$$M0_{population} = W_{1}CH_{1} + W_{2}CH_{2} + \cdots W_{i}CH_{i} \quad \text{...} 2.7$$

In this case, w_1 denotes the weight of indicator 1; CH_1 denotes the censored headcount ratio of indicator 1, and so forth for the remaining indicators, with $\sum_{i=1}^{d} w_i = 1$. On the other hand, according to Alkire & Santos (2010) the contribution of each indicator to the population's censored headcount ratio is calculated as follows:

$$\text{Contribution of indicator I to M0} = \frac{W_{i}CH_{i}}{M0_{population}} * 100 \quad \text{..} 2.8$$

The contribution of the other indicators is calculated in the same manner.

2.8 Multidimensional poverty and the factors that influence it

As evidenced by the literature, the extent of household multidimensional poverty and its determinants can vary depending on geographic location and the availability of social amenities. In India, for example, Sanusi et al. (2015) examined household multidimensional poverty and identified contributing factors using the AF method. In their study, they decomposed poverty into subgroups by categorizing households as rural or urban. They reported a high level of household poverty, with rural households being more likely to be impoverished than urban households. They also stated that sanitation, cooking fuel, child health, housing condition, and the household head's education were the factors that contributed to the multidimensional poverty of the household. Similarly, Sulaimon (2020) investigated multidimensional poverty using the ANOVA test and decomposed it across Nigeria's geopolitical regions. He discovered significant differences in multidimensional poverty between southern and northern regions, as well as most northern sub-regions. He also stated that the labor force and fertility rate had a significant impact on multidimensional poverty, with the former having a negative relationship.

In addition, Wang and Wang (2016) identified unsafe housing, family health, adult illiteracy, children enrollment rate, and fuel type as factors contributing to poverty. Nguyen (2018) also conducted research to identify the determinants of a household's multidimensional poverty in Vietnam's Khmer ethnic minority. He reported that the occupation of the household head, educational level, dependency ratio, involvement in health insurance, and communication services are all important factors in household multidimensional poverty, and that all of the identified factors, with the exception of dependency ratio, were inversely related to household multidimensional poverty. Furthermore, Amao, Ayantoye, & Fanifosi (2017) investigated household multidimensional poverty in Nigeria using the Alkire-Foster method. Using a poverty cutoff of 30, he calculated an adjusted (censored) headcount ratio of 41 percent and decomposed the results by geopolitical zones. Living conditions, education, health, and assets were all identified as major contributors to poverty, according to the report. Gebrekidan, Bizuneh, and Cameron (2021) also used the Alkire-Foster approach to investigate multidimensional poverty and the factors that contribute to it in northern Ethiopia. Their findings revealed that 60% of the households were multidimensional poor, and that socioeconomic factors like extension contact, the education of the head of the household, family size, plot size, annual household income, and access to hired labor all had a negative impact on multidimensional poverty.

Maity & Buysse (2017) calculated multidimensional poverty and identified its determinants using multiple-correspondence analysis. They reported a higher level of poverty in the study area, citing health, literacy, job opportunities, and monthly family consumption expenditure as major factors. Similarly, Megbowon (2018) investigated multidimensional poverty and its determinants in South Africa's Eastern Cape Province, then compared the findings between urban and rural households. He reported a higher adjusted poverty headcount ratio in rural areas, which was significantly influenced by a household head's education, access to electricity, and asset stock in both geographic areas. Fonta, et al., (2020) investigated multidimensional poverty and its influencing factors in the Mouhoun region of Burkina Faso, then deconstructed it using children aged 5 to 18. They claimed a higher prevalence of deprivation in terms of water, sanitation, and education. They also discovered that children who grew up in households with an academically inclined mother, were adolescent, and lived in cities were less likely to experience multidimensional poverty. Children from polygamous households, households with a head suffering from a long-term illness, families with debts, and households with more than five children, on the other hand, were the poorest.

2.9 Conceptual Framework of the Dissertation

This study used a modified version of the sustainable livelihoods framework as its conceptual framework. The sustainable livelihoods framework (SLF) is a useful tool for understanding the relationship between labor migration and household well-being. The dissertation used a sustainable livelihood framework approach to organize the complex concerns associated with rural-urban migration as a risk diversification technique in dealing with rural household poverty. The framework was chosen because it can be updated, adapted, and tailored to local circumstances and priorities (DFID, 2001).

The Sustainable Livelihoods Framework is depicted in Figure 2-1 as a schematic representation of rural-urban migration, its associated driving forces, direct repercussions and overall impact on livelihood and production efficiency of migrant-sending households. In this treatise, the term "rural-urban migration" means the movement of household members from rural to urban locations. The degree of vulnerability contexts, the status of livelihood asset possession, and the function of policies, institutions, and processes are summarized as significant determinants of rural-urban migration in this research. Finally, the impacts of rural-urban migration on rural livelihood outcomes are assessed and contrasted customizing the sustainable livelihood framework.

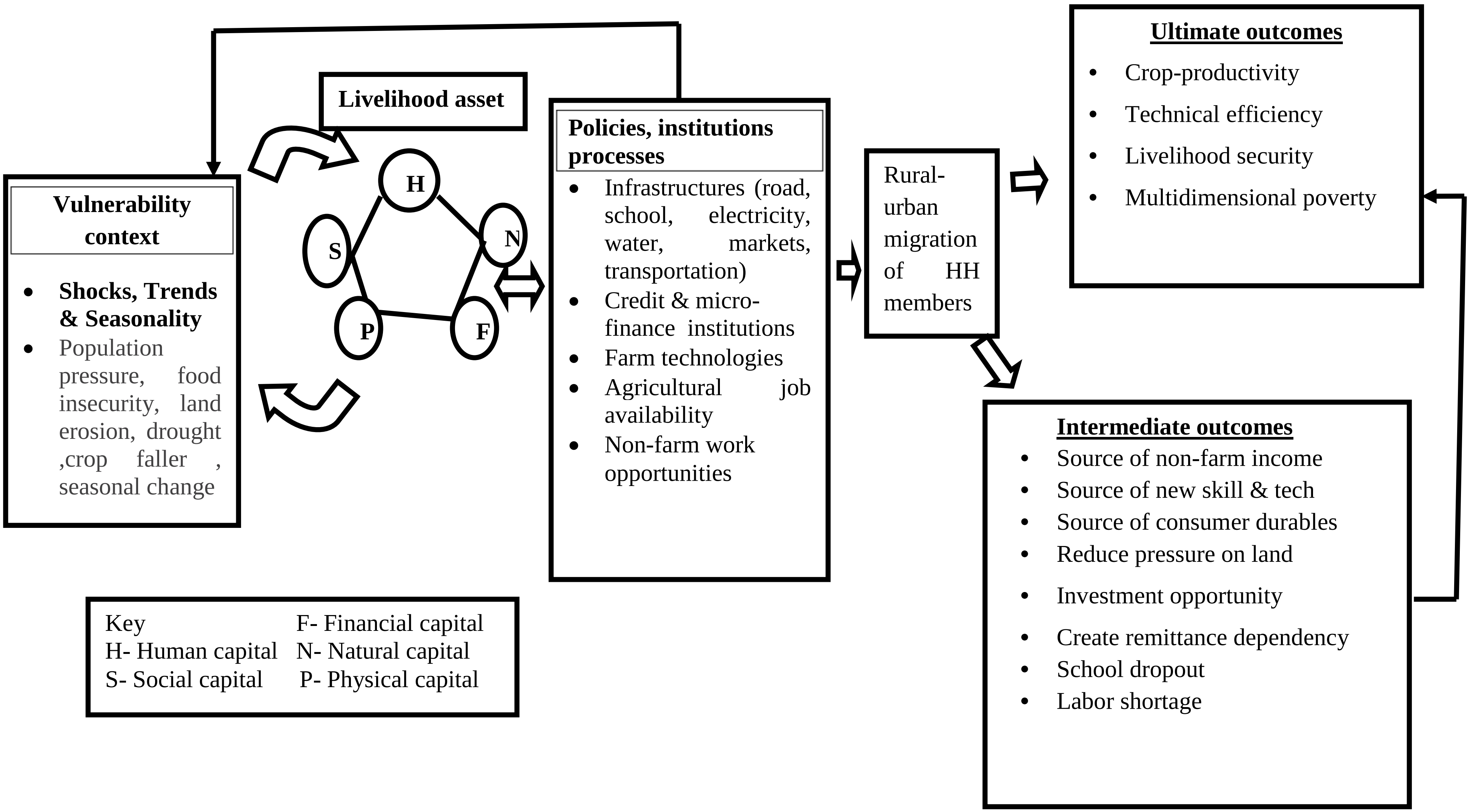

Figure 2-1: A sustainable livelihoods framework for conceptualizing the dissertation

Source: Adopted from DFID (2001)

3. CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Description of the Study Area

Gurage zone is one of the zonal administrations in the Southern Nations, Nationalities, and Peoples Regional State (SNNPR), located in the country's southwestern corner and on the region's northern edge between 7 ^{0} 40' to 8 ^{0} 30' North and 37 ^{0} 30' to 38 ^{0} 40' East (ArcGIS 10.3). It is bordered on the south and southwest by Hadiya zone and Yem special district, respectively, and on the north and east by Oromia regional state. The zone covers 5932 km2 (Belay, Bikila, Demel, Muluneh, & Mesfin, 2021) and is home to a diverse people who primarily speak Guragigna; there are a number of other ethnic groups, such as Amharic and Kembata speakers, as there are Gurage people in the neighboring districts and zones. The zone is organized into 15 districts and two town administrations. According to the Central Statistical Agency of Ethiopia (2007) census, the zone's total population and households were estimated to be 1,280483 and 286, 328, respectively, with an average person in a household of 4.7. Males make up 622,254 (48.6%) of the zone's total population, while females make up 658, 229 (51.4%). As reported in the same source, 95 percent of the population lives in rural areas, and agriculture is their primary source of income and livelihood. Most of the land area of the zone, particularly non-homestead farm fields have been extensively eroded, although the people have the culture of conserving homestead areas with stone and soil hedges supported by biological conservation measures. The Zone is located at an elevation ranging from 1,000 to 3,638 meters (Belay, Bikila, Demel, Muluneh, & Mesfin, 2021). The zone's topographic character is classified into three types (Wondwossen, Zewde, Tesfaye, & Habtamnesh, 2018): The plateau flat-lands, the mountainous high (represented by the Gurage Mountain chain, which separates the zone east to west), and the low widening area (the western border of the rift valley and the Wabe-Gibe valley).

The zone's agro-ecology is mainly divided into three categories: "Dega" or highland, "Woina-Dega" or midland, and "Kola" or lowland. However, Belay, Bikila, Demel, Muluneh, and Mesfin (2021) identified four agro-ecological categories in the study area: Wurch (Afro-Alpine), Dega (Temperate), Woina-Dega (Sub-tropicaland), and Kolla (Tropical). Majority of the area of the zone is covered by the mid-highland climate, accounting for 65.3 percent of the total area, while the highland and lowland agro-ecological zones cover 31.6 percent and 3.1 percent of the total area, respectively (Wondwossen, Zewde, Tesfaye, & Habtamnesh, 2018). The annual average rainfall ranges from 600 to 1,900 mm, with average temperatures ranging from 3 °C in the Gurage high mountains to 28 °C in the Ghibe Valley (Belay, Bikila, Demel, Muluneh, & Mesfin, 2021). In most areas, small showers occur in March and April, with the main rainy season occurring between June and September. About 30-40% of the rainfall occurs during the "Belg" season (i.e., February to May). The primary growing season lasts 90-180 days, while the "Belg" lasts 60-90 days, and the major dry season lasts from October to February. Moreover, frost occurs in areas with altitudes of above 2000 masl. These agro-ecological ranges have allowed the Zone to grow a variety of crops and livestock. Agriculture, particularly mixed farming system that includes crop production and livestock husbandry is the primary source of income for rural households in the study area. Farmers grow Enset, teff, wheat, maize, barely, sorghum, potato, chat, coffee, paper, tree, banana, avocado, papaya, avocado, and other crops in the different areas of the zone. Among the list of crops, Enset crop is deeply embedded in every element of the people's daily social and ritual lives in the area. Beef and dairy cattle, small ruminants (sheep and goats), horse, mule, and donkey; and poultry are operated in conventional manner in the study area.

The contribution of agriculture sector to household income varies by agro-ecological zone, and is decreasing, especially in the zone's midlands, which account for 65.3 percent of the total land area. Many households are looking for additional sustainable livelihood options, such as rural-urban migration, associated to the fact that the traditional agriculture sector in the study area is no providing enough employment and income for the people. Internal labor mobility, particularly rural-urban migration, has long been a hallmark of the people, occurring in permanent or seasonal patterns, and benefiting both individuals and communities (Worku, 1995). With these push and pull factors in place, as well as hints from the local indigenous people, rural-urban migration could increase in the future, potentially forcing many people to abandon their families, homes, land, and other assets.

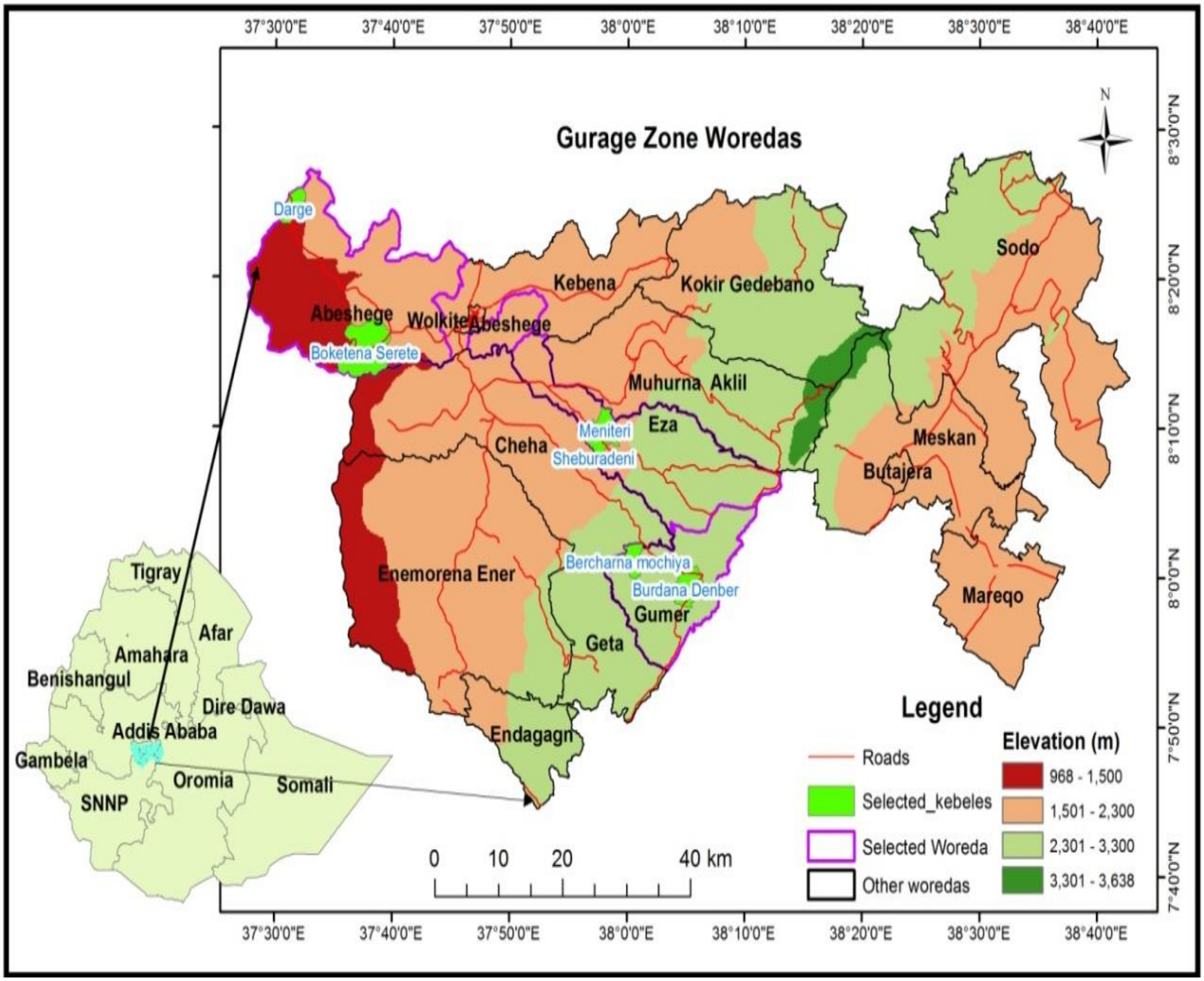

Figure 3-1: Location map of the study area

Source: Arc GIS 10.3

3.2 Research Design

In a nutshell, the dissertation sought to investigate the relationship between rural-urban migration, crop productivity, and rural household poverty in the Gurage zone. A mixed research design (a combination of quantitative and qualitative features) is used to address the above-mentioned issues. The study focuses on the pragmatism knowledge claim from a philosophical standpoint. The concurrent embedding technique is used among the different mixed methods of inquiry, with a special focus on quantitative features. The required data were gathered from 384 randomly selected rural households. Because random assignment to treatment was impossible, we conducted a quasi-experimental quantitative inquiry. Closed and open-ended questions, focused group discussion, key informant interviews, and field observations were utilized to collect the cross-sectional data. Various appropriate quantitative tools were used to examine the acquired data. The dissertation ended with conclusions and recommendations once the acquired results were completely disclosed.

3.3 Sample and Sampling Techniques

In theory, the only way to get accurate data about a population is to conduct a census survey. Due to cost and time constraints, however, the total coverage of the population is not always attainable, making sampling obligatory. However, selecting representative samples from the population is not a straightforward task; rather, it necessitates extra effort in order to select samples that are fairly representative (Berg & Lune, 2004; McKenzie & Mistiaen, 2009).

The dissertation used a multistage sampling technique to accomplish this. The Gurage zone is purposely chosen for the first stage of sampling since it is renowned for significant migration of individuals from rural portions of the zone to different cities and towns. Following that, the districts of Gurage zone were classified as lowland, midland, and highland based on agro-ecological characteristics. Then, from the categorized strata, three districts are chosen using a simple random selection procedure (one district from each stratum) with the assumption of homogeneity within the agro-ecology. Following that, six rural Kebele administrations were chosen at random from the three districts (2 Kebele in each district). Finally, the dissertation used a proportionate sample size random sampling approach to represent the sample households from the total rural homes in the sampling sites.

Because we do not know the proportion of households who regard rural-urban migration as a livelihood strategy, the sample size was determined using the Cochran (1963) formula. It assumed a proportional value of 0.5 for maximum variability (p), i.e., q or 1-p equals 0.5; with 95 % confidence level, 5% error, with 1.96 Z-value derived from statistical tables. Consequently, the sample size is projected as:

$$n = \frac{(z^2 * p * q)}{e^2} = \frac{1.96^2 * 0.5 * 0.5}{0.05^2} = 384 \text{ Households} \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Accordingly, Table 3-1 below shows the distribution of sample households by agro-ecological zone (study district).

Table 3-1: Proportional sample size distribution

Agro-ecological zones			Rural Kebeles			Migration status	
Agro-ecological zones	Total HHs (No)	Sample HHs (No)	Name of Kebele	Total HHs (No)	Sample HHs (No)	Non-migrant HHs (No)	Migrant-sending HHs (No)
All zones	286328	384	All kebeles	286328	384	170	214
Highland (Gumer Woreda)	13368	127	Denber	912	81	28	53
			Mochiya	518	46	11	35
Midland (Ezha Woreda)	14660	139	Shebraden	531	55	6	49
			Menter	820	84	30	54
Lowland (Abeshige)	12400	118	Bewuketa	421	69	53	16
			Darge	300	49	42	7

Source: Own survey result, 2021

3.4 Sources of Data and Methods of Collection

Both quantitative and qualitative data types were used in order to complete the study's objective of examining the connections between rural-urban migration, crop productivity, technical efficiency, and rural household poverty. Closed-ended and open-ended inquiries were employed to collect cross-sectional data from sample rural households, key informants, and focused group discussants on variables including demographics, resource ownership, production, marketing, services, perceptions, sociocultural factors, and others. Secondary sources were also carefully used while developing primary data collection tools.

3.5 Methods of data analysis

To examine the collected data, we used descriptive statistics, inferential statistics, and econometric models. The data were analyzed in order to identify the determinants of rural-urban migration, assess the impact of remittances on livelihood security, forecast technical efficiency, measure crop productivity, identify sources of technical inefficiency, calculate the prevalence of rural household poverty, identify the determinants of multidimensional poverty, and assess the impact of migration on multidimensional poverty. The endogenous ivprobit model was used to identify the determinants of rural-urban migration; the dose response model was used to quantify the impact of remittance on livelihood security; the stochastic frontier model was used to determine technical efficiency and its determinants; the multidimensional poverty index was used to examine the measures of multidimensional poverty; and propensity score matching was used to evaluate the impact of rural-urban migration on poverty. The specifications of these econometric models are briefly discussed in each respective chapter.

3.6 Operational definition of variables

- **Rural to urban migration**: Is an outcome variable defined as the migration of household members from rural parts of the Gurage zone to various municipalities throughout the country in search of employment in any time duration. A rural household is referred to as a migrant-sending household in this study if at least one of its members migrated to urban areas due to various reasons; otherwise it is referred to as a non-migrant household.
- **Livelihood Security Index:** The Livelihood Security Index is a composite index that examines households' social and economic well-being in relation to the Sustainable Livelihood Approach (Lindenberg, 2002; Sanzidur & Shaheen, 2010). The index, which is used to assess the impact of remittances on it, is regarded as continuous in the range of 0 to 1, and a direct association is anticipated. From the data set, seven important indicators of education, health, and living standard are chosen to develop the index. These include children's education (all school-aged children attending school), the ability to address medical needs, access to drinking water, access to electricity, access to multiple rooms, multiple communication/media assets, and access to household level bathrooms. As the indicators have a similar scale (dichotomous), we created the index without standardizing them (Hahn, Riederer, & Foster, 2009; Roslina & Shamzaeffa, 2014). Then, for each household, a livelihood security index is calculated by averaging all of the selected indicators with equal weight (because they are all dummy) as follows:

$$HLSI = \frac{\sum_{j=1}^{j} indicator}{n} \tag{7}$$

Where n is the number of indicators utilized to create the index and j is the total of the indicators' successes.

- **Crop output:** This variable contains all sales, consumption, gifts, and losses for each crop (Qi) generated by the sample households in 2018/2019. The value approach was used to aggregate total production into output value by multiplying the gross product by the current market output price (in Birr) (Bozoglu & Ceyhan, 2007; Tsobo, Omotesho, Salau, & Adewumi, 2012; Julie, Engwali, & Claude, 2017). The variable was considered as a continuous variable with the total price of crop outputs as the unit of measurement and it is predicted to have an inverse association with rural-urban migration.

- **Production input variables**: Four categories make up the production input variables in this study: land in hectares, labour in working hours, fertilizer in quintals, and chemical (pesticides and herbicides) usage in liters. Technical efficiency and total factor productivity were examined based on the estimated frontiers on the crop output once the input variables were configured as physical quantities for stochastic frontier estimation.

- **Technical efficiency**: Technical efficiency describes how well a particular set of inputs is utilized to generate a maximum output. Achieving a higher amount of output using a small amount of resources, such as land, labour, and capital, reaches the highest level of technical efficiency. The value, which was determined using the stochastic frontier model's post estimation command, falls within the range of 0 to 1. The relationship between the variable and rural-urban migration is predicted to be negative.

- **Total factor productivity:** Total factor productivity is the share of output that cannot be explained by the quantity of inputs utilized in crop production. It is the variation in output made possible by a period of time while maintaining a constant level of input (Comin, 2010). The variable was regarded as continuous, and a negative relationship between it and rural-urban migration was anticipated.

- **Remittance:** In this study, remittance is defined as all monetary and non-monetary transfers of cash and other materials by migrants to the left-behind households in rural areas. Consequently, remittance is treated as a continuous variable, and it is expected to have a positive impact on migrant sending households' livelihood security index. Similarly, Tesfaye (2018), Redehegn, Sun, & Eshete (2019) in Ethiopia, Sey (2019) in Ghana, and Chowdhury and Radicic (2019) in Bangladesh discovered that remittance receipts significantly increase household livelihood security.

- **Agro-ecological zone (AEZ):** This is a variable that indicates whether a household is located in the highland, midland, or lowland agro-ecological zones. Different climatic conditions, sizes of landholdings, types of animals, and sources of revenue are assumed to be explained by agro-ecological variation, which regulates the rate of rural-urban migration. The variable is treated as categorical in the descriptive analysis but as a dummy in the econometric model analysis, with a value of 1 if the household is situated in a lowland area and a value of 0 otherwise. The variable is used as an instrumental variable for livestock ownership and determines rural-urban migration. Therefore, it is expected to have a negative relationship with rural-urban migration but a positive relationship with livestock ownership. Similarly, according to IOM (2020), agro-ecology plays an important role in reducing the likelihood of human migration in West Africa by improving resilience, climate change adaptation, and agricultural production. In order to compare and contrast the outcome variables of this dissertation, such as technical efficiency, TFP, livelihood security index, and multidimensional poverty index, agro-ecology has been customized as categorical (highland, midland, and lowland).
- **Age of the Household Head (AGEHH):** This is a continuous variable that has been predicted to have a positive impact on the magnitude of household member migration. The older the head of the household is the more likely he or she is to have more children, which increases the likelihood of household members migrating to urban areas (Herrera & Sahn, 2013; Akher & Bauer, 2014; Ferrone & Giannelli, 2015).
- **Sex of the Household Head (SEXHH):** It is a dummy variable that has two possible values: 1 for male heads and 0 for female heads. Male-headed households are thought to send members as migrants than female-headed households. Several studies, however, have found that female-headed households are more likely than male-headed households to participate in migration (Ackah & Medvedev, 2010; Gray & Mueller, 2012; Kusuma, 2012; Herrera & Sahn, 2013).
- **The household head's educational level (EDUHEAD):** The variable was treated as a continuous variable with years of schooling as the unit of measurement. The variable is

expected to have an inverse relationship with the migration of household members. Household heads with more years of education would be able to evaluate the value of migration critically, and the process would take time, reducing the likelihood of household members migrating. Similarly, Akher & Bauer (2014) and Ferrone & Giannelli (2015) found that more educated household heads were less likely to participate in migration. However, Ratha et al. (2011) found that an additional year of schooling for the household's head increases the likelihood of sending household members.

- **The head's religion (REHEAD):** This is a dummy variable that takes the value 1 if the head's religion is Christian and 0 otherwise. Christian household heads, it is thought, would be more likely to allow their family members to migrate. Similarly, Aleksynska & Chiswick (2011) studied the relationship between religion and migration and discovered a significant correlation.
- **Ethnicity of the household head (ETHHEAD):** It is a dummy variable with a value of 1 for Gurage ethnicity and a value of 0 otherwise. The variable is thought to have a positive effect on members' migration. Households with heads who belong to the Gurage ethnic group are thought to have more migrant members. Similarly, Mberu (2006) in Ethiopia and Herrera and Sahn (2013) in Senegal found a link between ethnicity and the risk of household member migration.
- **Family Size (FSIZE):** This is a continuous variable that is as the total number of household members in the family. Larger households, it is assumed, have a higher number of migrants. Similarly, Agesa and Kim (2001), Ratha et al. (2011) and Thorat, Dhekale, Patil, & Tilekar (2011) discovered that densely populated households were more likely to send migrants than their counterparts.
- **Access to Information (ACINFO):** Is a dummy variable that takes the value 1 if the household has access to multiple information asset (radio, TV, or cell phone), and 0 otherwise. Households with diverse information assets are expected to have more information about the benefit of migration and then are predicted to shift from rural to urban areas at a higher pace. FAO (2016), Duncan & Popp (2017), Stephen & Aarti (2018), and Sun (2019) all reported a direct relationship between access to information and household member migration, which is consistent with this hypothesis.

- **Landholding size in hectare (LSIZE):** Land is a measure of wealth and is expected to have a negative consequence on rural-urban migration. The higher the landholding size, the lesser the likelihood of household engagement in sending migrant member. Similarly, Waddington and Sabates-Wheeler (2003) discovered an inverse relationship between landholding size and household member migration, as did de Brauw, Mueller, and Tassew (2013).

- ***Soil infertility (SOILINFER): I***s a soil quality indicator that has been linked to household member mobility to urban areas. Food insecurity is exacerbated by the presence of soil infertility. The variable is a dummy variable that is set to 1 if a household perceives soil infertility on his farm and to 0 in all other cases. Warren, Batterbury, & Osbahr (2001), Henry, Boyle, & Lambin (2003), Carr (2008), and Massey, Axinn, & Ghimire (2010) all found this hypothesis to be true.

- ***Tropical Livestock Units (TLU)****:* This variable signifies livestock numbers converted into a common unit using a conversion factor of 1 for cows, 1.1 for oxen, 0.8 for heifers, 0.3 for a calf, 0.1 for sheep and goats, 1 for horse and mule, 0.7 for donkey, and 0.01 for chickens (Naseri & Kabul, 2005). Livestock is a measure of wealth, and it is thought that the larger the TLU of a household, the lesser its members' migration. Likewise, Ugo, Luca, Joachim, & Alberto Joachim & Alberto (2011), Otte et al. (2012), Yonas, Mathilde, & Katrin (2016), and Iritani (2018) discovered an indirect relationship between livestock ownership and rural-to-urban migration.

- **The distance to the nearest town (DNT):** This variable is continuous and is measured in kilometers between the sample households' homes and the nearest town. The greater the distance to the next town is predicted to result in a lack of information and reduce interest to send migrants. As a result, the variable is likely to negatively influence the choice to send a migrant.

- **The distance to the nearest secondary school in kilometers (DNSS)**: It is a continuous variable that is assumed to be the distance between a rural household's residence and the nearest available secondary school. Rural-urban migration is projected to have a direct link with the variable, as school dropout is expected to increase as the distance to the nearest secondary school increases.

- **The distance to the FTC in kilometers (DFTC):** Closeness to farmer training centers in terms of kilometers makes it easier for rural families to obtain a variety of agricultural advisory services such as knowledge of better farming methods, marking, and communication facilities to small scale farmers (Nigatu, 2010). So, the greater the distance to the FTC, the smaller the benefit to the household from the services, and therefore larger rural-urban mobility is projected.
- **The size of cultivated fields (SCF):** Is the size of cultivated fields within the agricultural lands of the rural households. The size of cultivated fields has a significant impact on job prospects and agricultural revenue streams. As a result, households with a greater size of cultivated fields are predicted to produce more agricultural output and, consequently, are less likely to send migrants to metropolitan regions. This hypothesis was developed in accordance with Adaku (2013) and Timmer (2014), who discovered an inverse relationship between the size of cultivated fields and the migration of household members.

4. CHAPTER FOUR: DRIVING FORCES OF RURAL-URBAN MIGRATION AND ITS IMPACT ON THE LIVELIHOOD SECURITY OF RURAL HOUSEHOLDS IN GURAGE ZONE, SNNPR, ETHIOPIA[1]

Abstract

Migration has been taken as one of development issues globally. Internal migration, despite its ubiquity and importance, has got less attention than cross-border migration. The key objectives of the study were to investigate the size of rural-urban migration, its determinant factors, and the impact of remittance on household livelihood security in the study area. In three agro-ecological sub-zones, quantitative and qualitative data were collected from 384 randomly picked sample households, and from key informants, and focus group discussants. Descriptive statistics, and ivprobit regression and the Dose Response Function were employed to evaluate the quantitative data. In the highland, midland, and lowland agro-ecological zones, migrant-sending households account for 69.3 %, 74.1 %, and 19.5 %, respectively. The results of ivprobit regression revealed that livestock ownership (negatively), family size (positively), access to information (positively), size of cultivated fields (negatively), soil infertility (positively), distance to the nearest town (negatively) and distance to the farmers' training center (positively) are all important determinants of rural-urban migration. The dose response model revealed that remittance has a positive effect on the household livelihood security. The dose response function is upwardly concave, with a local minimum dose of about 40%. It is critical to make efficient use of remittances and to manage the factors that drive rural-urban migration.

Keywords: Rural-urban migration, impact, ivprobit, DRF, Gurage zone, Ethiopia.

4.1 Introduction

Migration is one of the multidimensional topics that attract the attention of researchers and policymakers when thinking about development. The United Nations 2030 Agenda for the Sustainable Development Goals, particularly in SDG 10, for example, recognized the importance of migration, its costs, and the benefits it brings, including the reduction of inequities. Currently,

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a massive number of people are migrating either inside or abroad (Nori & Farinella, 2020; Ma, Chen, Che, & Fang, 2019). Internal migrants outweigh those migrating beyond their national boundaries by a large margin (Yonas, Mathilde, & Katrin, 2016; FAO, 2016; IOM, 2017; UNDESA, 2019). Rural to rural, rural to urban, urban to urban, and urban to rural migrations are the four types of internal migration streams. Rural-to-urban migration, among the aforementioned types of internal migration, has recently become more common in emerging countries (IOM, 2017; FAO, 2018). Higher migration rates, both domestically and internationally, are typically attributed to three key fundamental issues (IOM, 2017; WB, 2016). The first attribute is the increase in the number of young people, particularly in rural areas. The second is the issue of a labour shortage in industrialized nations, and the third is related to the wage gap, which is a measure of poverty in different parts of the globe (Fei & Ranis, 1964; WB, 2008; Timmer, 2014; Nori & Farinella, 2020; Lewis, 1954). Many developing countries are also currently dealing with problems including expanding populations, rising food prices, and other livelihood instability, which is worse in rural areas (WB, 2015a; WB, 2016). This enforced a number of rural households have decreased poverty by sending migrants to cities within the country or abroad (WB, 2008). Population pressure and insufficient food access (Markos & G/Egziabher, 2001; FAO, 2016), household poverty (Gebrehiwot & Fekadu, 2012), insufficient income and fragmented land holding (Sosina & Holden, 2014), ecological degradation and drought (Betemariyam & Michael, 2000; Gray & Mueller, 2012), government resettlement policies (Belay K. , 2004; Hammond, 2008), and other employment opportunities (Girma, Woldie, Gete, & Scott, 2008) (Belay K. , 2004; Hammond, 2008) are the major triggering factors of rural-urban migration in Ethiopia. Furthermore, access to social media and social networks have contributed for the increased rural-urban migration in Ethiopian (de Brauw, Mue, & Lee, 2014; Kelemework, Zenawi, Tsehaye, Awet, & Kelil, 2017; IOM, 2017) as these play an important role in disseminating success stories of migrants.

The ex-ante and ex-post conditions of rural-urban migration, as a household livelihood strategy, are fundamentally linked everywhere. The key ex-ante circumstances for migrants are obviously linked to specific infrastructure, economic, environmental, institutional, and social patterns. The lost-labor effect and the remittance effect are the two most common ex post effects of migration on migrant sending households. Optimist thinkers on migration often believed that migration is the most effective way to reduce household poverty and reclaim labor lost through remittance. Households with remittances, according to the optimists, are always in a better condition and have higher income levels than non-migrant households (Taylor & Mora, 2006; Airola, 2007; Schmook & Radel, 2008; Wouterse & Taylor, 2008; Kumar, The Impact of International Remittances on Poverty Alleviation in Bangladesh, 2019; Seyfe & Marangu, 2019; Redehegn M. , Sun, Eshete, & Gichuk, 2019). In terms of consumption patterns, a number of studies have also found that migrant sending households with remittance are more likely spend on durable goods and productive assets than non-migrant households (Zarate-Hoyos, 2004; Taylor & Mora, 2006; Acosta, 2006; Airola, 2007; Abdelmoneim & Litchfield, 2016; Tesfaye, 2018; Seyfe & Marangu, 2019). Adams, R. (1998), Entwisle & Tong (2005) , Ford, Jampaklay, & Chamratrithirong (2007) , and Garip (2007)explored a positive mean difference in household livelihood asset accumulation between migrant sending and non-migrant rural households. Pessimists, on the other hand, claim that rural-urban migration results in a loss of family labor force and hence has a negative impact on the farming ability of sending households. According to them, no amount of remittance flow from migrants to the households can compensate for the value of lost labor. Mazambani (1990) , Rozelle, Taylor, & de Brauw (1999), Schmook & Radel (2008), and Gunjan & B.V Chinnappa (2015) all found evidence to support pessimistic view points by demonstrating the negative impact of rural-urban migration on crop production and efficiency. According to Worku (1995), migration of the Gurage people are visible in a number of urban locations in the country, and he acknowledged the fact by saying, "… There is no place in Ethiopia where you cannot observe Land Rover and the Gurage migrants…" The majority of rural households in the research area are eager to send out migrants to different cities around the country as a means of reducing their vulnerability to food insecurity and the high danger of food shortages (Feleke, Pankhurst, Bevan, & Lavers, 2006; Worku, 1995). As a result, for many rural individuals seeking work, rural to urban migration is becoming a practical choice. Due to the desire for short-term gains from migration, a number of rural households refrain from sending their children to higher or technical education. Rural to urban migration is regarded as a vital economic lifeline for youngsters, particularly those who completed grade ten, but were unable to enroll in preparatory schools. According to information gathered from the local indigenous people, rural to urban migration is common, and a number of youngsters are encouraged to drop out of school and migrate either early in their education or at the end of grade ten schools.

In the study area, previous researchers such as Worku (1995), Feleke, Pankhurst, Bevan, & Lavers (2006), Ferework, (2007), and Feleke (n.d) did not discern the ex-ante and ex post conditions of rural-urban migration quantitatively. Despite the fact that a number of quantitative studies have been conducted to assess the impact of remittances on household poverty (Acosta, 2006; Nigussie, Ataklti, Girmay, Maxwell, & Vaitla, 2017; Kumar, 2019; Seyfe & Marangu, 2019), the studies have assumed that the effect is uniformly distributed across all households with migrants. Literature in the area of examining the effect of such continuous treatment that employs rigorous methodological approach is scarce. Hence, this study is expected to contribute to the existing studies in Ethiopia. Two main research questions were identified with the aim of completing the intended objectives: What are the major factors influencing rural-urban migration? And, is there any evidence that the dose of remittance is helping to lift households out of poverty in the study area?

4.2. Conceptual Framework

The conceptual framework is a modified version of the framework for sustainable livelihoods. The framework for sustainable livelihoods is an important tool for conceptualizing various livelihood alternatives as a means out of poverty (Carney, 1998; DFID, 2001; Elizondo., 2015). The decision of rural households to send migrants as a means of escaping poverty is linked to a variety of socioeconomic factors derived from the above-mentioned migration theories and empirical literature. These days, intellectuals recognize that the process of rural-to-urban migration is extremely complicated and necessitates the use of a variety of ideas to understand it (Ma, Chen, Che, & Fang, 2019). This study focused on the New Economics of Labor Migration theory for determining the primary drivers of rural-urban migration in the study area among the different theories of migration (by assuming the decision to migrate is a risk spreading strategy). The suggested conceptual framework connects the drivers of rural-urban migration gleaned from several migration theories. The potential drivers of rural-urban migration are illustrated as push-pull factors such as wage differentials between rural and urban areas, urban job opportunities, social networks, family size, land size, access to social services, and etc. These drivers are articulated as a household strategy for poverty reduction through income diversification and risk aversion in the ‘New Economics of Labor Migration' theory. Rather than focusing on labor markets, the study devised a livelihood security index to analyze the impact of remittance on the living conditions of migrant-sending households. The conceptual framework of the drivers of rural-urban migration and the effect of remittance are outlined in Figure 4-1.

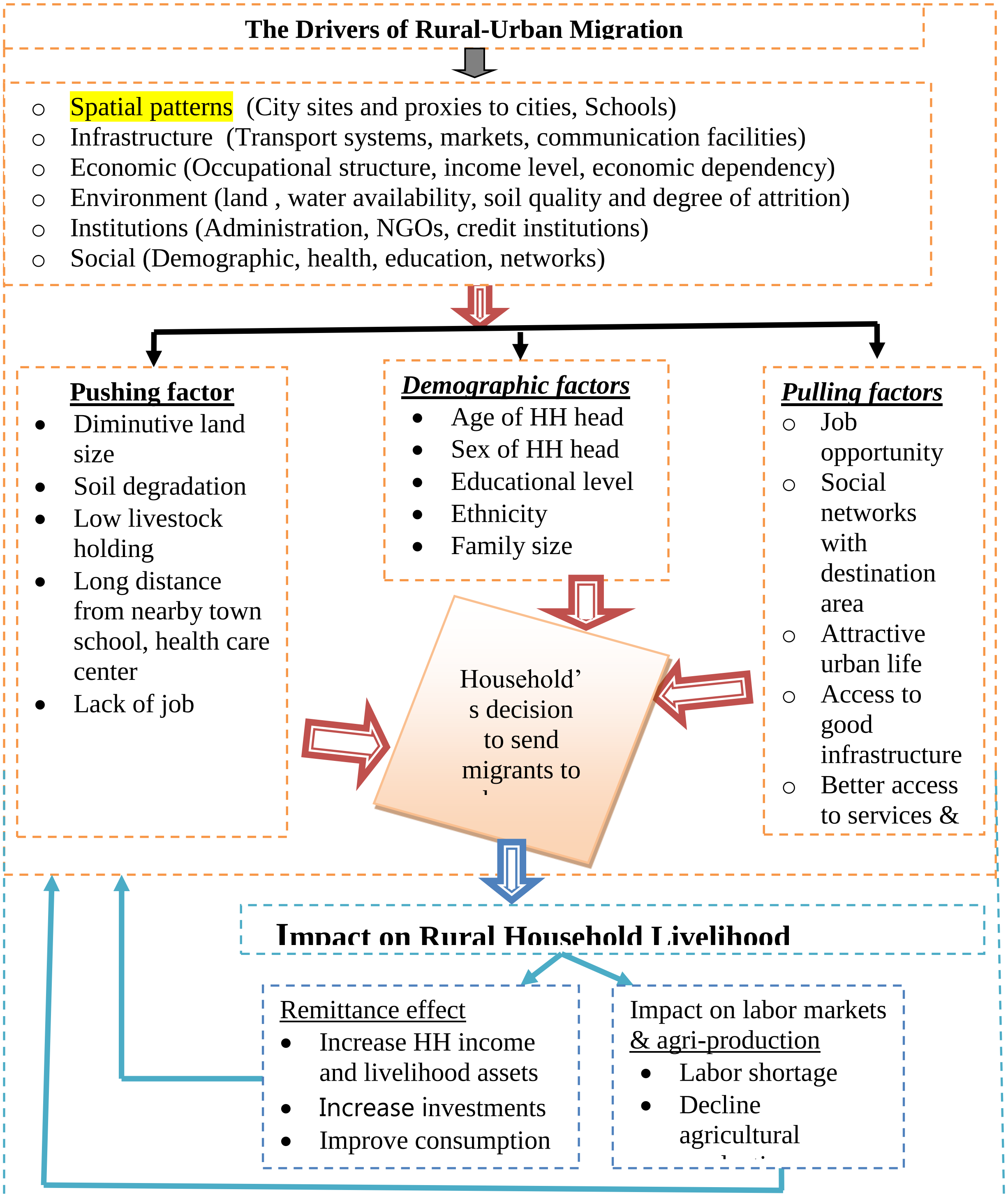

Figure 4-1: Conceptual framework of the study

Source: Generated based on the Livelihood Framework (DFID, 2001).

4.3 Methodology

4.3.1 Model Specification for Identifying Rural-Urban Migration Drivers

The study employed the basic Todaro migration model and the New Economics of Labor Migration theory (NELM) to specify the dynamics of rural-urban migration. The Todaro migration model relates migration drivers as push-pull factors (such as wage disparities between rural and urban areas, urban job opportunities, social networks, family size, land size, access to social services, and so on), while the NELM model specifies migration drivers as a strategy to reduce household poverty through income diversification (Stark & Bloom, 1985; Birhanu & Dr.Kavitha, 2017; Carolina, Andrew, Alessia, Michele, & Robert, 2018). This study used binary choice models to quantify the key causes of rural-urban migration through categorizing families based on their migration status as households with migrants or households without migrants. The binary choice model is a nonlinear regression model where the output (predicted values) is either 0 or 1 (Gujarati, 2004; Soderbom, 2009). The study's dependent variable is dichotomous with 1 and 0 values for the attribute of being migrant-sending and non-migrant households, respectively. To estimate the factors that explain the probability of sending migrant family member over the alternative, Logit, Probit, or ivprobit regression models can be employed. By assuming a dichotomous dependent variable without endogenous regressors, the Logit and probit models are statistically similar and produce comparable results.

When there are omitted variables, measurement error in the independent variables, and reverse causation, and presence of endogeneity with regressors the ivprobit model is an ideal option (Statacorp, 2013; Yonas, Mathilde, & Katrin, 2016). As endogenous regressors are found in the analysis, ivprobit model is employed to determine the determinant factors behind rural-urban migration, utilizing the maximum likelihood estimator. The ivprobit post estimate command is employed to predict the average marginal effects of the explanatory variables [(dydx (*) predict (pr)] to interpret the coefficients. The endogenous ivprobit model is defined as follows, according to Stata Corp (2013):

$$y_{1i}^{*} = y_{2i}\beta + x_{1i}\gamma + \upsilon_i \quad (2.1)$$

$$y_{2i} = x_{1i}\prod_1 + x_{2i}\prod_2 + \nu_i \quad (2.2)$$

Where: i=1… N, y_{1i}^{*} is the treatment variable, which has a value of 1 for migrant-sending households and 0 for non-migrant households. The endogenous variable, y_{2i} which measures livestock ownership in TLU, has a different value for households that send migrants to town compared to those that do not. A vector of exogenous variables (such as, Age of the HH head, year of schooling, family size, land size access to information, number of cultivated fields, soil infertility, distance to the nearest town, distance to the nearby secondary school and distance to the FTC) denoted by x_{1i}. x_{2i} is a vector of independent variables potentially explaining y_{2i} is the first ivprobit regression result and its equation is written in the reduced-form. By assumption, (υ_i, v_i) ~ N (0, ∑), where $\delta 11$ is standardized to one recognize the model. β *and* γ are vectors of structural parameters, and $\prod_1$ *and* $\prod_2$ are matrices of decreased-form parameters. This is a recursive model: y_{2i} appears in the equation for y_{1i}^{*} is not shown in the equation for y_{2i}. We do not observe y_{1i}^{*} (the second stage ivprobit regression); instead, we observe,

$$y_{1i} \begin{cases} 0 & y_{1i}^{*} < 0 \\ 1 & y_{1i}^{*} \geq 0 \end{cases} \qquad (2.3)$$

The criteria for detecting structural parameter requires $\kappa_2 \geq$ p appears not to be blocked diagonally between υ_i and ∑; otherwise, y_{2i} would be exogenous.

4.3.2 Specification of the Dose Response Model for Measuring the Impact of Remittance

The central idea is to assess the impact of remittance (in the form of money) doses on rural household livelihood. We used remittance in Birr as a treatment variable and the livelihood security index as an outcome variable in this study. We considered several levels of treatment (or dose) to be treated in the analysis, ranging from 0 (no treatment) to 100 (highest treatment level) (Cerulli, 2012; 2015; Arapi-Gjini, Möllers, & Herzf, 2020). Thus, a continuous treatment analysis model is used to assess the effect of these varying degrees of treatment (dose) on the household livelihood security index. To define the model, consider two distinct outcomes: y_1, which represents the outcomes of treated data, and y_0, which represents the outcomes of untreated observations. We define w_i as the treatment indicator, with 1 indicating treated data and 0 indicating untreated observations, and x = ($x1i$, $x2i$, $x3i$... $x_k i$) as a row vector of K observable variables for the unit I = 1... k. Assume that the unit responses to the vector of a factor x are g1 (x) and g0 (x), respectively, when the unit is treated and untreated. Assume that 1 and 0 are two scalars, and that *e*1 and *e*0 are two random variables with a constant variance and a zero unconditional mean. Lastly, assume *t* as values within the continuous range (0; 100] for the continuous-treatment indicator and *h* (*t*) is the response function to the level of treatment *t*. So, according to Cerulli (2012; 2015), the model specified as follows:

Initially, the model looks like this: $$\begin{cases} w = 1 => y_1 = \mu_1 + g_1(x) + h(t) + e_1 \\ w = 0 => y_1 = \mu_0 + g_0(x) + e_0 \end{cases} \quad (3)$$

In which: $$\begin{cases} h(t) = 0 \; if \; w = 0 \\ h(t) \neq 0 \; it \; w = 1 \end{cases}$$

Using a parametric form of: $g_1(x) = x\delta_1$ and $g_0(x) = x\delta_0$

The Average Treatment Effect (ATE) conditional on x defined as;

$$ATE(x, t) = E(y_1 - y_0 | x, t) = \begin{cases} \left(\mu_1 - \mu_0\right) + x\left(\delta_1 - \delta_0\right) + h(t) if \; t > 0 \\ \left(\mu_1 - \mu_0\right) + x\left(\delta_1 - \delta_0\right) \; if \; t = 0 \end{cases}$$

$$= \begin{cases} \mu + x\delta + h(t) if \; t > 0 \\ \mu + x\delta \; if \; t = 0 \end{cases} \quad (3.1)$$

In so doing: $$ATE(x, t, w) = \begin{cases} (ATE(x, t > 0) \; if \; w = 1 \\ (ATE(x, t = 1) \; if \; w = 0 \end{cases}$$

$$= I(t>0)[\mu + x\delta + h(t)] + I(t = 0)[\mu + x\delta]$$

$$= w[\mu + x\delta + h(t)] + (1 - w)[\mu + x\delta] \quad (3.2)$$

By averaging on (x, t, w), the preceding formula becomes:

$$ATE = N_T | N(\mu + \bar{x}_{t>0}\delta + \bar{h}_{t>0}) + N_{NT} | N(\mu + \bar{x}_{t=0}\delta \quad (3.3)$$

By definition ATE = *p* (*w*=1) · ATET + *p* (*w*=0) · ATENT, we can get from the end row of the previous formula that:

$$\begin{cases} ATE = p(w=1)(\mu + \bar{x}_{t>0}\,\delta + \bar{h}_{t>0}) + p(w=0)(\mu + \bar{x}_{t=0}\,\delta) \\ ATET = \mu + \bar{x}_{t>0} + \bar{h}_{t>0} \\ ATENT = \bar{x}_{t=0}\,\delta \end{cases} \quad (3.4)$$

In simple algebra, the formula written as:

$$ATE(x, t, w) = w\left[ATET + (X_{t>0} - \bar{x}_{t>0})\delta + (h(t) - \bar{h}_{t>0})\right] + (1\text{-}w)\left[ATENT + (x_{t=0} - \bar{x}_{t=0})\delta\right]$$

It means that:

$$\begin{cases} ATET(X,t) = ATE\ (x,t,w=1) = ATET + (x_{t>0} - \bar{x}_{t>0})\delta + (h(t) - \bar{h}_{t>0}) \\ ATE(x,t) = ATE(x,t,w=0) = ATENT + (x_{t=0} - \bar{x}_{t=0})\delta \end{cases} \quad (3.5)$$

$$\text{Where: } \begin{cases} ATET = \mu + \bar{x}_{t>0}\,\delta + \bar{h}_{t>0} \\ ATENT = \mu + \bar{x}_{t>0} \end{cases} \quad (3.6)$$

The dose response function (DRF) is predicted simply by averaging ATE (**x**, *t*) on the x:

$$ATE(W,t) = E_x\{ATE(x,t,w)\} = w.\left[ATET + (h(t) - \bar{h}_{t>0})\right] + (1-w).ATENT$$

$$\text{That is: } \begin{cases} ATET + (h(t) - \bar{h}_{t>0}) & if\ t > 0 \\ ATENT\ if\ t = & if\ t = 0 \end{cases} \quad (3.7)$$

Finally, to obtain accurate estimates of all the above parameters, we used a regression approach based on the Ordinary Least Squares method with the assumption of unconfoundedness or CMI (Conditional Mean Independence). The regression line of the outcome variable y has been obtained as follows: using the supplied observable exogenous confounders x, treatment indicator w, and treatment intensity t, the regression line of the outcome variable y has been obtained as follows:

$$\boldsymbol{E}\left(\boldsymbol{y}_i \middle| \boldsymbol{w}_i, \boldsymbol{t}_i, \boldsymbol{x}_i\right) = \boldsymbol{\mu}_0 + \boldsymbol{w}_i.\boldsymbol{ATE} + \boldsymbol{x}_i\boldsymbol{\delta}_i + \boldsymbol{w}_i.\left(\boldsymbol{x}_i - \bar{x}\right)\boldsymbol{\delta} + \boldsymbol{w}_i.\left(\boldsymbol{h}\left(\boldsymbol{t}_i\right) - \bar{h}\right) + \eta_i \quad \textbf{(3.8)}$$

Where, $\eta_i = e_{0i} + w_i \cdot (e_{1i} - e_{oi})$

4.4 Results and Discussion

This part presented quantitative and qualitative analytical results to answer to the research questions. The quantitative results are explained with different descriptive statistics (such as frequency, mean, percentage, and figures), inferential statistics and various econometric models. Inferential statistics such as the t-test and the Chi-square test were employed to predict the relationships between continuous and dummy independent variables and migration. The meso level factors of rural-urban migration in the research area were explained using the ivprobit regression model. Furthermore, a dose response function was used to investigate the impact of remittance on the livelihood security index of migrant sending households. Finally, the qualitative data were analyzed in the form of distinct language and voices.

4.4.1 Description of Sample Households

According to Table 4-1, respondents were divided into two groups based on their migration status: migrant-sending households and non-migrant sending households. Migrant-sending households account for 55.7 percent, while non-migrant sending households account for 44.3 percent. With a statistical significance level of 1%, the age of the migrant-sending household's head was 4.6 years older than the age of the non-migrant household head. This study's findings are consistent with prior research, which found that the head of migrant sending households is often older and more educated than the head of a household without migrants (Herrera & Sahn, 2013; Akher & Bauer, 2014; Laura & Elisenda, 2016).

At a 1% significance level, a statistical mean difference was identified between migrant-sending and non-migrant households in terms of household size. The mean average family size was higher in migrant-sending households than non-migrant sending households. Migrant-sending households, on the other hand, were lower in size after migration or the exclusion of migrants from the home. Migrants make up 27.7 percent of the population in total sample households and 46.6 percent of the population in migrant-sending households. The size of the landholding and the amount of cattle held in TLU were also used as indicators of respondents' wealth. At the 1% significance level, there was a higher mean difference in landholding size between the two groups. The mean difference in livestock keeping between the two household groups, however, was insignificant. Non-migrant households fared better in terms of land and animal ownership, with a higher proportion in the lowland agro-ecological zone. The findings support the economic theory of migration, which anticipated that the ownership of productive assets such as land, cattle, machinery, and equipment would be a determining factor in household migration (Waddington & Sabates-Wheeler, 2003; de Brauw, Mueller, & Tassew, 2013).

To compare migrant-sending and non-sending households, the study developed a household livelihood security indicator based on the Sustainable Livelihood Approach with an equal weighted average. To develop the index from the data collection, seven relevant indicators with respect to education, health, and living standards were chosen. At 1% significance level, the obtained livelihood security index revealed a higher mean difference between the two groups. The analysis found that migrant-sending households have larger average livelihood security index, ranging from 0.43 to 1, with a mean of 0.85 and a standard deviation of 0.148. Non-migrant households, on the other hand, have a livelihood security index that ranges from 0.143 to 1, with a mean of 0.69 and a standard deviation of 0.177.

The average livelihood security index for all of the households studied was 0.782, with a standard deviation of 0.18. As a result, household livelihood security is often linked to presence of migrant family member, as family members' mobility is justified to help alleviate poverty and hunger by raising household knowledge of future threats (de Haas H. , 2007; FAO, IFAD, IOM, & WFP, 2018; FAO, 2019). Finally, Table 4-1 shows the relationship between rural households' migration status and the locations of key services in the research area. At 1% and 5% significance level, respectively, the t-tests reveal a significant mean difference between the two household groups in terms of distance to the nearest town and secondary school. In terms of distance to a neighboring FTC, however, there is no significant difference between the household groups.

Table 4-1: The association of continuous variables with rural-urban labor migration

Characteristics	NMHH (170)	MSHH (214)	Pooled (384)	Mean diff	T-value	Significance level
Mean age of HH heads	48.39	53.02	50.97	-4.63	-4.48	0. 000***
Average years of schooling (head)	4.42	4.68	4.565	-0.254	-0.59	0.5
Average HH size (with migrants)	6.165	7.23	6.76	-1.069	-6.84	0. 000***
Average HH size (without migrants)	6.165	3.86	4.89	2.30	14.88	0.000***
Average number of migrants	0	3.37	1.88	-3.37	-30.2	0. 000***
Average land holding in hectare	1.69	0.99	1.30	0.70	6.76	0. 000***
Average livestock holding in TLU	3.02	2.78	2.885	0.24	1.316	0.1889
Mean livelihood security index	0.69	0.85	0.78	- 0.16	-9.64	0. 000***
Average number of cultivated fields	3.72	3.66	3.69	0.054	0.504	0.6143
Distance to nearest town (km)	12.83	11.40	12.04	1.43	3.20	0. 001***
Distance to nearest 2nd school (km)	6.19	5.64	5.88	0.55	1.95	0. 05**
Distance to the nearest FTC (km)	3.73	3.86	3.80	-0.12	-0.68	0.496

Note: *** p < 0.01, **p < 0.05, NMHH=Non-migrant HHs, MSHH=migrant-sending HHs

Source: Own survey result, 2021

Table 4-2 uses the expected value of the Chi-square test to confirm the correlations of dummy/categorized variables with household migration. Along with the demographic characteristics, the gender of the household head had no bearing on household migration. However, Sun (2019) discovered a strong relationship between migration and gender in China, revealing that female-headed households are less likely to migrate to the countryside and prefer to stay at home doing domestic chores than male-headed households. The other major link was also discovered in Ethiopia (Gray & Mueller, 2012), Senegal (Kusuma, 2012), and Ghana (Ackah & Medvedev, 2010), which demonstrated that female-headed households have poorer earning capacity than male-headed households, causing them to migrate. However, at 1% and 5% levels of significance, household heads' religion and ethnicity were statistically associated with rural household migration, respectively. Orthodox Christian and other households made up 70.56 % and 29.44% of migrant-sending households, respectively. Orthodox Christian households are more likely to send migrant than other households in the study, in absolute terms. At 1% significance level, Gurage people were more likely to migrate than others in terms of ethnicity. Table 4-2 further summarizes the comparisons of respondents based on their households' access to key indices of livelihood security. Schooling for children, ability to fulfill household medical needs, access to drinking water, electricity, more than two rooms, more than one communication/media asset, and access to a household level toilet are all examples. The evaluated factors were strongly connected to the migration status of the household groups at 1% significance level. As a result, with the exception of children's schooling, all the selected livelihood security indicators showed that migrant-sending households own more valued material assets than non-migrant sending households.

The characteristic of agro-ecological zone, i.e., highland, midland, and lowland is related to the attribute of rural-urban migration. The study found that the intensity of household migration varied greatly across the three agro-ecological zones and it was statistically significant at 1%. The survey found that the midland area (Ezha Woreda) had a greater percentage of the migrant-sending households, with an average share of 74.1 percent among all midland rural households. There was also a higher concentration of rural household migration in highland areas (Gummer Woreda), accounting for 69.3 % highland rural household population. However, in the lowland agro-ecological zone (Abeshige Woreda), migrant-sending households account for just 19.5 % rural households in the Woreda. Table 4-2 also shows the respondents' characteristic of their soil fertility is strongly linked to the migratory status of rural households at 1% level of significance. According to the results of the survey, a great majority of the migrant-sending households were prone to soil infertility, where 72.8 % of them engaged in sending migrant family member(s). Similar findings have been found by Warren, Batterbury, & Osbahr, (2001); Henry, Boyle, & Lambin (2003); de Haas H. (2007); Zhang & Zhuang (2019); and Call & Gray (2020).

Table 4-2: Correlation between rural-urban migration and categorical variables

Variables		NMHHs (170)	MSHHs (214)	All HHs (384)	Sig. Level
Household head's gender	Female	17%	20.6%	19%	0.385
	Male	83%	79.4%	81%	
Household head's ethnicity	Gurage	88.2%	98%	93.8%	0. 000***
	Other	11.8%	2%	6.2%	
Household head's religion	Orthodox	59%	70.6%	74.5%	0. 035**
	Other	41%	29.4%	25.5%	
Every child of school age is enrolled.	Yes	95.9%	82.2%	88.3%	0. 000***
	No	4.1%	17.8%	11.7%	
Capability to meet the household's medical needs	Yes	69.4%	93%	82.5%	0. 000***
	No	30.6%	7%	17.5%	
There is a water supply within a 15-minute walk.	Yes	65.3%	80%	73.4%	0.001***
	No	34.7%	20%	26.6%	
Electricity supply	Yes	45.3%	59.4%	53.1%	0.006***
	No	54.7%	40.6%	46.9%	
Being able to acquire more than two rooms	Yes	74.7%	97.2%	87.2%	0.000***
	No	25.3%	2.8%	12.8%	
Access to a variety of communication/media assets	Yes	59.4%	90.6%	76.8%	0.000***
	No	40.6%	9.4%	23.2%	
Access to household level toilet	Yes	74.7%	94.4%	85.7%	0.000***
	No	25.3%	5.6%	14.3%	
Agro-ecology	Lowland	45.9%	10.7%	26.3	0.000***
	Other	54.1%	89.3%	73.7%	
Soil infertility problem	Yes	27.6%	58.9%	45%	0.000***
	No	72.4%	41.1%	55%	

Note: *** p < 0.01, **p < 0.05.

Source: Own survey result, 2021

4. 4.2. The Drivers of Rural-Urban Migration in the Study Area

4.4.2.1 Quantitative analysis

The relationship between the outcome variable and the explanatory variables was investigated using random effect probit regression after a multicollinearity test. The model was applied by customizing migration occurrence as a dependent variable and treating all the independent variables as exogenous. The coefficients and marginal effects of the exogenous probit regression for the household model of migration are shown in Table 4-3 Rural-urban migration is influenced positively by the age of household heads, family size, access to multiple information assets; number of plots, soil infertility, and distance to FTC. Land size, distance to the next town, and distance to the secondary school, on the other hand, are inversely related to rural-urban migration and reduce the likelihood of sending migrants. Key variables such as livestock ownership, household head education, number of plots, and distances to the nearest town, on the other hand, have no significant effect on rural-urban migration. As a result, the endogenous ivprobit model is used to uncover the hidden effect in the variables.

Table 4-3: Drivers of rural-urban migration (Random Effect Probit Regression Results)

	Random effect probit			Marginal effect		
	Coef.	Std.	P-value	Coef.	Std.	P-value
Livestock holding in TLU	0.0004	0.046	0.993	0.0001	0.013	0.993
Age of the HH head	0.027	0.007	0. 000***	0.007	0.002	0. 000***
Year of schooling (head)	0.012	0.018	0.526	0.003	0.005	0.525
Family size	0.364	0.054	0. 000***	0.101	0.012	0. 000**
Land size	-0.414	0.079	0. 000***	-0.115	0.020	0. 000***
Access to information (dummy)	0.453	0.165	0.006***	0.125	0.044	0.005***
Size of cultivated fields	-0.034	0.076	0.655	-0.009	0.021	0.655
Soil infertility (dummy)	0.697	0.161	0. 000***	0.193	0.041	0. 000***
Distance to the nearest town	-0.027	0.020	0.177	-0.008	0.006	0.173
Distance to adjacent 2nd school	0.052	0.031	0. 087*	0.014	0.008	0. 084*
Distance to the FTC	0.141	0.052	0. 006***	0.039	0.014	0. 005***
Intercept	-3.7849	0.648	0. 000***			
Obs=384, Log-likelihood = -187.1, LR chi2 (11) = 153.15; Prob>chi2=0.00, Pseudo R2 = 0.29						

Notes: ***p < 0.01, *p < 0.1

Source: Own survey result, 2021

Because the ivprobit model is stronger than the random effect probit regression (Statacorp, 2013), it is used to determine the potential driving factors of rural-urban migration in the research area. We focus on the endogeneity of livestock holding in TLU among the four identified endogenous variables in the random effect probit regression. The variable is highly insignificant compared to the other variables, and has a theoretically unexpected sign. Agro-ecology was regarded as an instrumental variable and used as a dummy (1 = lowland and 0 =

otherwise) to explain the endogeneity of livestock holding in rural-urban migration. Agro-ecology variable was found important as it influences breed types, altitude, and land availability (Njonge, 2017), all of which are helpful for maintaining intensive livestock production in rural settings. Thus, the chance of sending migrants from rural to urban areas would be determined by livestock output and remuneration. A Wald test of the exogeneity of the instrumental variables is presented at the bottom of Table 4-4. There is enough information in the sample to reject the null premise of no endogeneity because the test statistic is significant (p-value = 0.0000). There are a range of factors that influence rural-to-urban migration in the study area. The key drivers of rural-urban migration in this study are presented below.

The impact of adjusting for endogeneity of livestock holding in the migration and parameter estimations is presented in Table 4-4. Livestock holding in TLU has statistical significance impact at 1%, and shows its theoretically expected sign. The coefficients of livestock ownership, household head education, landholding size, number of plots, and distance to nearest town are all negative and have an inverse influence on driving rural-urban migration, as shown in the second stage regression model result. Rural-urban migration is positively related to the age of the household head, family size, the access to information, soil infertility problem, distance to adjacent secondary school, and distance to farmer training facilities. Agro-ecology has little impact. The following variables are finally recognized as key determinants that influence rural-urban migration in the study area.

Livestock holding in TLU: Farming is the main source of income for rural communities, and livestock is one of the most important assets in the countryside. The number and value of livestock held is a crucial condition for rural people to preserve their livelihoods, as well as a significant component in labor migration. Because livestock is a measure of wealth, the size of a livestock holding has a bearing on the degree of household migration status. Households with more livestock and other productive assets are less likely to send migrant member. Livestock ownership in TLU was examined as an endogenous variable in this study, and it was found to have a negative impact on rural household migration at 1% significance level. However, due to an inability to obtain previous data on livestock holding for different time frames, the study is based purely on actual period data. As a result, the study's finding may be limited in its ability to compare the two household groups and generalize the results. If the data is correct prior to the migration decision, the findings indicate that households with better livestock holding are less likely to choose migration as a livelihood strategy. According to the study, holding all other factors constant, a TLU increase in livestock holding reduces the likelihood of rural household migration by 14.9 percentage points. This is due to the fact that as the number/value of livestock holding increases, nutritional and economic diversification improves, and households' desire to send a migrant decrease. Livestock contributes to the overall food production by increasing crop productivity through the application of manure. In other words, the positive effect of livestock management encourages rural households to stay in their communities and engage in a variety of agricultural activities rather than sending members to migrate for the purpose of their livelihood requirements. Similarly, several studies (Martin, 2004; Otte & Upton, 2005; Ugo, Luca, Joachim, & Alberto, 2011; Otte, et al., 2012; Yonas, Mathilde, & Katrin, 2016; Iritani, 2018) have revealed a negative relationship between livestock ownership and rural-to-urban migration. Larger livestock holdings have been proven in these studies to be a tool for overcoming poverty by ensuring food and job stability. According to Beneberu and Mesfin (2017), a unit increase in TLU reduces rural to urban migration by a factor of 0.415. The authors utilized TLU as a proxy for wealth, and they discovered that rural households with higher TLU are less sensitive to migrate because they have a better ability to get various food and nonfood products required for household livelihood stability. Migration, on the other hand, has an ex post positive effect (i.e., after migration) on migrant-sending households by generating improved livestock holdings through remittances (Nancy, Gero, Benjamin, & Irini, 2006).

Family size: At 1% significance level, family size has a direct relationship with the movement of rural household members from their origin to metropolitan areas. According to the economic model, households with greater family size are more likely to participate in the migration. According to the study, adding one more person to a household increases the risk of rural to urban migration by 6.03 percentage points, assuming all other factors remain equal. The possible reason for this is that when family size grows, household per capita income decreases, forcing family members to migrate in search of work elsewhere. Beneberu and Mesfin (2017), Fassil and Mohammed (2017), Thorat, Dhekale, Patil & Tilkar (2011), Ratha et al (2011), and Agesa and Kim (2001) all agree with the study's findings and show that densely populated households are more likely to migrate in order to secure their household livelihood. Furthermore, the size of a family and the size of a land holding are inextricably related, influencing rural-urban migration.

Due to the inverse relationship between land size and family size, densely populated families would have overexploited agricultural land, which is a decisive factor in rural-urban migration (Castelli, 2018). Households would be unable to engage in labor-intensive farming if the land was divided into multiple portions. Moreover, the haphazard land holding scheme has an impact on planting patterns and intensities, reducing labor absorption in agriculture. As a result, migration is seen as a solution to address socioeconomic disparities through the benefits of agglomeration economies (FAO, IFAD, IOM, & WFP, 2018; Nori & Farinella, 2020). The deterioration of soil fertility, loss of agricultural yield, and a breakdown of household income are all putting pressure on the farmland, and as a result, such households turned to engage in sending members to mitigate (Lacroix, nd; Greiner & Sakdapolrak, 2013; Zhang & Zhuang, 2019). Inter-household conflicts may also be a factor in household members' decision to relocate from rural to urban settings. Conflicts among family members are more common in more densely populated households than in less densely populated households, resulting in relocation of household members to avoid a habitual deviation (F. Ivan, John, & Gerald, 1970; FAO, 2018).

Access to information: By assisting households or individual migrants in connecting with local people, access to information can help reduce the costs and uncertainties involved with migration (FAO, IFAD, IOM, & WFP, 2018). At 1% significance level, this study found a positive link between access to information and rural household’s decision of sending a member to migrate. However, because previous data on access to information for various time periods could not be obtained, the study is solely based on current period data. As a result, the study's finding may be limited in its ability to compare the two groups and generalize the results based solely on current period data. If the current obtained data is valid for all time periods, migrant-sending households are more likely than non-migrant households to have access to information. When all other variables are held constant, the study discovered that rural households with access to more than one information asset in the current period are 19.8 percentage points more likely to migrate. If the data is valid prior to household members’ migration, the findings suggest that households with better access to information are more likely to be actively involved in migration. This is because they are more likely to learn about suitable migration destinations as well as the culture, traditions, and customs of the destination areas (Stephen & Aarti, 2018). Migrant-sending households, on the other hand, are more likely to have access to information in the current period as a result of the migrant household members' aid. Thus, rural household migration and information access are two interconnected situations in which information is required for member migration and migrants serve as a foundation for the spread and utilization of information-supporting technology in the destination area (FAO, 2016; Duncan & Popp, 2017). This is also consistent with Sun's (2019) findings, which discovered that ICT use has a positive impact on rural household migration and that migrants play an important role in the development of ICT in rural areas.

Size of cultivated fields: At 5% significance level, there is an indirect relationship between the size of cultivated fields and rural household migration. The economic model anticipated that a household with additional number of farmed fields has a decrease in the likelihood of sending migrants by 3.6 percentage points, assuming all other factors remained equal. In other words, on average, migrant-sending households have fewer number of farm fields than non-migrant households. There are normally two main explanations for the lesser number of farmed fields as a result of rural-urban migration. First, rural-urban migration causes a labor shortage, and the loss in workforce undermines rural households' ability to respond to labor demand (Fei & Ranis, 1964; Timmer, 2014; Adaku, 2013; Zhang, Deng, Peng, Zhou, & Liu, 2020). As a result, the households leave their farmland uncultivated. The second argument might have something to do with the investment: Because of specialization, mechanization, and commercialization of agriculture, capital intensive investments made by rural migrants have an impact on the lesser number of cultivated fields, but the land may not be left uncultivated (Ajaero & Onokala, 2013; Ge, Long, Qiao, Wang, Sun, & Yang, 2020).

Soil infertility: Sending migrants out is one option for households with soil infertility problems, a decision that can generate more revenue, reduce consumption, and broaden livelihood alternatives while reducing the chance of agricultural failure in the origin households (Stark & Bloom, 1985; Clark, 2011; FAO, 2016). In this research, a positive relationship between soil infertility and rural household migration was observed at less than 5 percent significant level. The ivprobit regression model predicted that households with soil infertility problem are more likely to have migrant member than households with no problem of soil fertility, by 9 percent. The findings imply that as soil fertility deteriorates, arable land shrinks and the internal ability of land to produce the required agricultural output eventually diminishes. As a result, rural households with soil infertility problem are unable to earn adequate agricultural output, and they tend to send migrants as a means of supplementing household’s income or livelihood requirements. Warren, Batterbury, and Osbahr (2001) in southwest Niger, Henry, Boyle, and Lambin (2003) in Burkina Faso, Carr (2008) in Guatemala, and Massey, Axinn, and Ghimire (2010) in lowland Nepal are all in agreement with the same results found in this study. A similar study was also conducted in Kenya, where rural households are involved in internal labor movement to address agricultural risks induced by poor soil quality. Households with poor-quality soil were 67 percent more likely to contemplate migration as a household livelihood strategy than those with high-quality soils (Clark, 2011). Land degradation and migration are directly linked, according to Robert (2017), Zhang & Zhuang (2019), and Nori & Farinella (2020).

Distance to the nearest town in kilometers: Examining the relationship between the distance to the nearest town and the desire to migrate aids a wide conceptualization of migration. The distance to the next town, according to this study, has a negative impact on the decision to send a migrant. With all other explanatory variables held constant, the higher distance to the next town reduces the likelihood of sending a migrant by 1.1 percentage points. This is because of the possible reason that being close to a town makes migration easier for households since they can readily obtain information about the potential benefits and costs of migration. Due to the close proximity of the nearest town, rural families benefit from the free flow of people, commodities, and services. Similar findings were found by Zhang & Zhao (2013) in China and Fassil & Mohammed (2017) in Ethiopia. These two studies show that, the long the distance between a rural household's home and the nearest town, the higher the cost of migration and the lower the likelihood of rural-urban migration.

Distances to farmer training centers in kilometer: Farmer training centers are knowledge hubs staffed with agricultural professionals who supply small-scale farmers with a variety of advisory services (such as providing information on better farming methods, marking, and communication capabilities) (Nigatu, 2010) . At 5% significance level, distance to the farmer training center is positively associated with rural household migration in this study. The study found that a one-kilometer increase in the distance between rural households and the FTC would raise the likelihood of rural-urban migration by 2.6 percent, assuming that other factors remained constant. The most likely reason is that as rural households' access to FTC services supports agricultural production, and the nearer the distance the likelihood of sending member decreases. Farmers that live farther away may gain less from the FTC services provided, resulting in lower agricultural income, then tend to send migrant member.

Table 4-4: Ivprobit model result for the driving forces of rural-urban migration

Rural-urban migration	Ivprobit			Marginal effect		
	Coef.	Std.	P-value	Coef.	Std.	P-value
Livestock holding in TLU	-0.519	.049	0.000***	-0.149	0.015	0.000***
Age of the HH head	0.008	.007	0.216	0.002	0.002	0.209
Year of schooling (head)	-0.007	.015	0.638	-0.002	0.004	0.639
Family size	0.219	.053	0.000***	0.063	0.014	0.000***
Land size	-0.035	.083	0.670	-0.010	0.024	0.668
Access to information (dummy)	0.689	.130	0.000***	0.198	0.036	0.000***
Size of cultivated fields	-0.125	.061	0.042**	-0.036	0.018	0.041**
Soil infertility (dummy)	0.329	.148	0.026**	0.095	0.041	0.022**
Distance to the nearest town	-0.038	.016	0.019**	-0.011	0.005	0.018**
Distance to secondary school	0.024	.026	0.351	0.007	0.007	0.353
Distance to the FTC	0.094	.043	0.028**	0.027	0.012	0.025**
Intercept	-1.34	.654	0. 040**			
Athrho	1.302	0.222	0. 000***			
Lnsigma	0.419	0.036	0. 000***			
Log-likelihood= -875.02, Obs = 384; Wald chi2 (11) = 318.8; Prob>chi2 =0.0000***						

Wald test of exogeneity (/athrho = 0): chi2 (1) = 34.35 Prob > chi2 = 0.0000***

Notes: ***p < 0.01, **p < 0.05

Source: Own survey result, 2021

4.4.2.2 Qualitative investigation

A qualitative investigation was carried out to supplement the quantitative analysis on identifying the drivers of rural-urban migration. FGD (focused group discussions) and key informant interviews were conducted. The results indicate that there are a variety of reasons that contribute to rural-urban labor movement, but that they are all linked to poverty and economic concerns. The majority of FGD participants and key informants interview linked issues of land holding area and quality to the drivers of rural-urban mobility. A male FGD participant in a Mochiya Kebele of Gummer Woreda said, "*Our agricultural land is very small; its size becomes less and less as it is divided to family members; additionally, over time, its quality became poorer and poorer as it was continuously plowed and degraded. Consequently, many families are forced to send their members to migrate to urban areas as a principal source of income*." However, another male participant in the same focus group disagreed, claiming that the land is not a major factor in household relocation. "*Access to enough land is not a guarantee for stopping migrants from being sent to cities*," he stated. *Many rural households in our neighborhood are too preoccupied with migration, yet they have a lot of fertile farmland that needs to be cultivated. Migration in this community, in my opinion, is simply an addiction*."

Moreover, several FGD participants stated that migration is an effective way to alleviate rural household poverty. "*Whenever we can, we give our children milk or milk products... When there is a shortage, though, we give them coffee or simply water if there is any. Youths are becoming dissatisfied with the situation and have opted to migrate,"* a female FGD participant in the Gurage zone's Shebraden Kebele of Ezha Woreda said. Another female participant in the FGD commented, *"My husband and I are poor, and we work hard to buy exercise books for our six children." One day, we told our two older children, "We are really poor." Only a tenth-grade education is available to you... As a result, you must be ready to relocate."* Some of the participants attempted to associate rural-urban migration to rural livelihood challenges. "*Life in rural areas is full of challenges; you can't get infrastructure services nearby, and there aren't enough job opportunities to secure financial stability; as a result, the majority of rural households are sending migrants to urban areas to avoid these difficulties*," a key informant in Edzha Woreda said. Others associated the motivations for migrating with success tales. "*There are rural households that are capable of doing everything and have gained recognition in society* *as a result of the remuneration received through migration; hence, other households are enthusiastic to send migrants to potential towns*," remarked one key informant during the interview session. Some FGD participants also reflected the link of migration with ethnicity to rural-urban migration. One male FGD participant in Menter Kebele of Ezha Woreda said, "*Gurage civilization by nature is gifted to the business rather than farming. Farming is insufficient and ineffective as a source of revenue unless it is supported with remittance. Thus, in Gurage civilization, rural-urban migration is not just a choice, but also a necessity and a culture*."

In general, the qualitative data obtained supported the quantitative data and demonstrated that rural-urban labor migration is common. Many rural families are unable to send their children to college or vocational school. Many children are dropping out of school because they want to migrate or are forced to drop out by their families in order to support the household's livelihood. These children, the majority of whom are boys, migrate from rural to urban areas and send remittances to supplement the income of their families.

4.4.3 The impact of remittances on the livelihood security of rural households

A dose response model was employed to examine the impact of remittance on household livelihood in this section. The dose response model meets the three requirements: the treatment variable being continuous, individual observations react heterogeneously to exogenous confounders and treatment selection being endogenous (Cerulli & Potì, 2014; Cerulli, 2015). Remittance flows from migrants to the family back home is often a continuous variable expressed in Birr value. Remittance offers a variety of treatments "levels" ranging from 0 (no treatment) to 100 (maximum treatment level). The highest score was considered the maximum level of treatment among the various ranges of the remittance, which was then converted to 100 by dividing the value by itself and multiplying by 100 percent. Thus, two types of families emerge: (1) untreated (non-migrant households), with no treatment (or dose), and (2) treated (migrant-sending households), with treatment (or dose) larger than zero.

Before employing the regression model for treatment effect estimation, the multicollinearity problem among the predicting variables was investigated. As shown in table 4-5, all predictors were free of multicollinearity because their VIF values were less than 4 and their tolerance was greater than 0.25 (O'brien, 2007). The mean Value of VIF is 1.21, which is far less than 4, indicating that the regression model will be stable and free of overestimation (Daoud, 2017). The regression model estimation of the effect of remittance on household livelihood security is shown in Table 4-6. The unconditional Average Treatment (remittance) Effect (ATE), Average Treatment Effect on Treated (ATET), Average Treatment Effect on Non-Treated (ATENT), household livelihood security predictors, heterogeneous variables (landholding size and livestock holding), and the polynomial factor of the Dose-Response-Function (Tw 1) are all shown in the Table. Landholding size in hectare, family size in number, and livestock holding in TLU are also important determinants of rural livelihood security. The size of landholding and the value of livestock holdings had a direct and positive relationship with the household livelihood security index. The positive sign could indicate that owning more agricultural land and having a higher value of livestock aids in the achievement of a household's livelihood and stability. The negative sign of family size can indicate that an increase in family size leads to a decrease in saving and asset formation, making rural households vulnerable in their daily lives. Because the heterogeneous variables were insignificant and had a similar sign to their origin, the model is stable, and the predicted average treatments are consistent (Cerulli, 2015).

Remittance has a positive influence on household livelihood security, accordingly, at 1% significance level. The economic model anticipated that remittance has an average effect of 15.94 percentage units on the livelihood security index of the sample households (ATE). The average effect of remittance on the migrant-sending households' livelihood security index (ATET) is 16.71 percent, which is higher than the average treatment effect over the whole sample. On the other hand, the average effect of remittance on the livelihood security of non-migrant sending households (ATENT) is around a modal value of 11.66 percentage units. The ATENT is the average treatment effect on the outcome of control units, and it acts as a counterfactual for the treatment units' average outcome (Holland, 1986; Sekhon, 2007).

Table 4-5: Variance inflation factor

Variable	VIF	Tolerance (1/VIF)
Treatment	1.54	0.649446
Landholding size	1.28	0.783567
Agro-ecology (dummy lowland=1)	1.25	0.800875
Family size	1.18	0.845297
Soil infertility problem	1.18	0.847125
Livestock holding in TLU	1.15	0.866920
Age of the HH head	1.07	0.931473
Gender of household head	1.02	0.975894
Mean VIF	1.21	

Source: Own survey result, 2021

Table 4-6: Regression results for the effect of remittance on households' livelihood security

Livelihood security index	Coef. Std.	Err.	T	P>t
Treatment	.1594371	.0208233	7.66	0.000***
Age of the HH head	-.0000473	.0008058	-0.06	0.953
Landholding size	.0235479	.0109675	2.15	0.032**
Family size	-.0167086	.0055588	-3.01	0.003***
Gender of household head	-.0091335	.0205952	-0.44	0.658
Livestock holding in TLU	.0156565	.0070662	2.22	0.027**
Soil infertility problem	.0149906	.0175206	0.86	0.393
Agro-ecology (dummy lowland=1)	-.002866	.0117529	-0.24	0.807
ws_ Landholding size (heterogeneous)	.0015374	.0096863	0.16	0.874
ws_ Livestock in TLU (heterogeneous)	.001864	.016847	0.11	0.912
Tw_1(polynomial factor of the DRF)	.0020163	.0005668	3.56	0.000***
Intercept	.7202377	.0622007	11.58	0.000***
Number of observations = 384	R-squared = 0.2748, Root MSE = .15549			
F(11,372)=12.82; Adjusted R-squared=0.2534; Prob>=0.0000; ATET= 0.1671				

Note: *p < 0.1, ** P < 0.05 and * ** p < 0.01, respectively.
Source: Own survey result, 2021

The estimation of the dose-response function is the section's most appealing aim. The dose response function resembles that of binary treatment instances like ATE, ATET, and ATENT. However, the estimated value of DRF is dependent on confounders and treatment level, and is designated as ATE (x, t), ATET (x, t), and ATENT (x, t) (x, t). As a result, the DRF is used to evaluate the impact of various remittance intensities (levels or doses) on the household livelihood security index. Graphical presentation is made to show the predicted dose response function in a more understandable and appealing manner. Figure 4-2 shows the kernel density estimation and dose-response function with 95 percent confidence intervals for the distributions of ATE (x, t), ATET (x, t), and ATENT (x, t). The ATET (x) and ATE (x, t) are significantly more concentrated in the middle value of the livelihood security index with a peak modal value of 0.167 and 0.159, respectively. Furthermore, whereas both are more evenly distributed than ATENT (x, t), ATET (x, t) is more uniform than ATET (x, t) (x, t). Thus, remittances have a much bigger impact on migrant-sending households than on non-migrant households. The ATENT (x) distribution, on the other hand, is more concentrated in the lower values, with the greatest modal value in the livelihood security index being approximately 0.116. The dose response function predicts that if remittances are not frequently transferred to the household, the livelihood security index will fall.

Figure 4 shows the contour of the dose-response functions. The dose-response function for remittance has a positive slope with substantial confidence intervals between (0; 100]. This shows that all of the migrants-sending families are responsible for the positive effect of remittance (ATE) for household livelihood security reported in the preceding regression result (Appendix Table 4). Households who get a higher share of remittance, on the other hand, contribute more. When used at 100%, remittance has a 32% impact on a household's livelihood security index. Therefore, the bigger effect appears for higher remittance shares, as the dose-response curves continue to climb with larger confidence intervals. This finding is similar to several other researches that showed a compassionate outcome to the optimistic theoretical perspective that remittances flowing to migrant sending households lessen poverty (Richard & Cuecuecha, 2013; Makram & Montassar, 2014; Nilsen, 2014; Kerime & Degefa, 2016; Joseph, Rachel, & Isaac, 2018; Tsaurai, 2018).

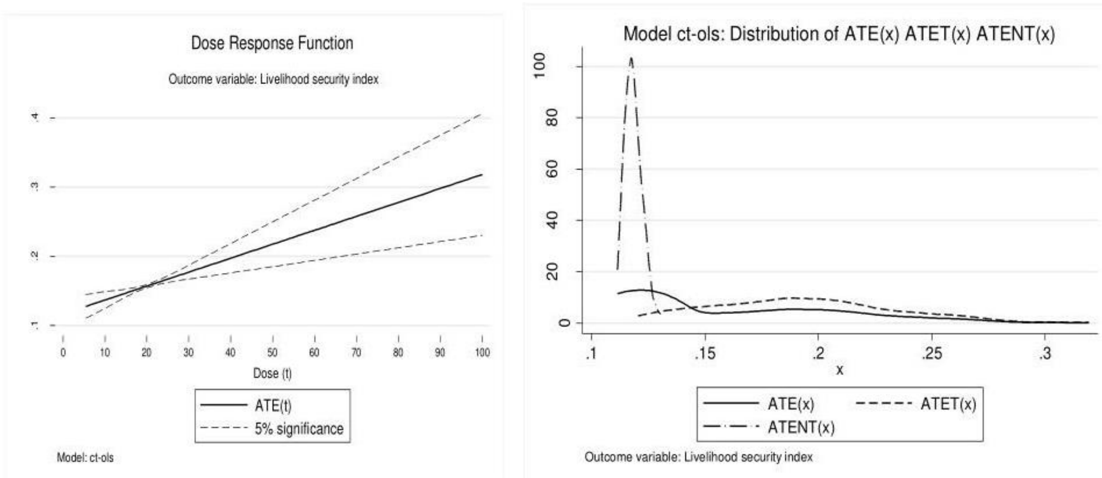

Figure 4-2: Distribution of ATE (x, t), ATET (x, t) and ATENT (x, t) and the DRF

Source: Own survey result, 2021

Figure 4-3 depicts the average Dose Response Function's instantaneous rate of change in relation to the average change in remittance level. The graph depicts the rate at which a dose response function changes in order to achieve a better livelihood security index in percentage units. The dose response function is concave upwards (the graph curves higher), has a positive slope (it is an increasing function), and a local minimum at 40 percent dose, as shown in the diagram (the point at which the dose response function switches from decreasing to increasing).

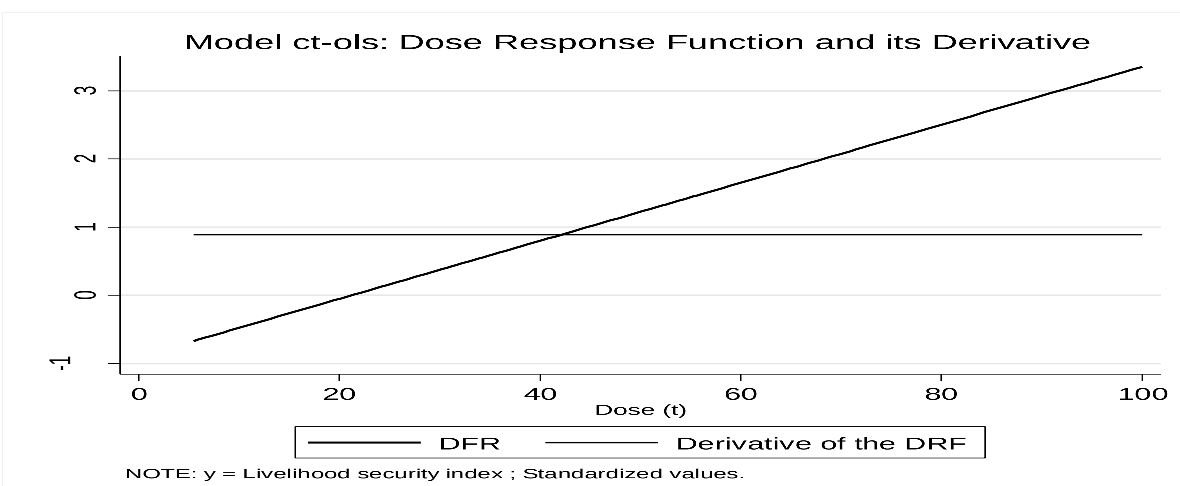

Figure 4-3: The DRF and its derivatives; exogenous treatment case

Source: Own survey result, 2021

Finally, this section includes bootstrapped standard errors for evaluating ctreatreg's correctness from a computational standpoint and checking whether it meets the terms with uniformity of the DRF estimations. Fortunately, the analytical standard errors and the estimated DRF with bootstrapped standard errors with 20 replications exhibit a fairly similar trend (see Figure 4-4 and Appendix Table 4). As the level of dose increased, so did the impact of remittance on the household livelihood index.

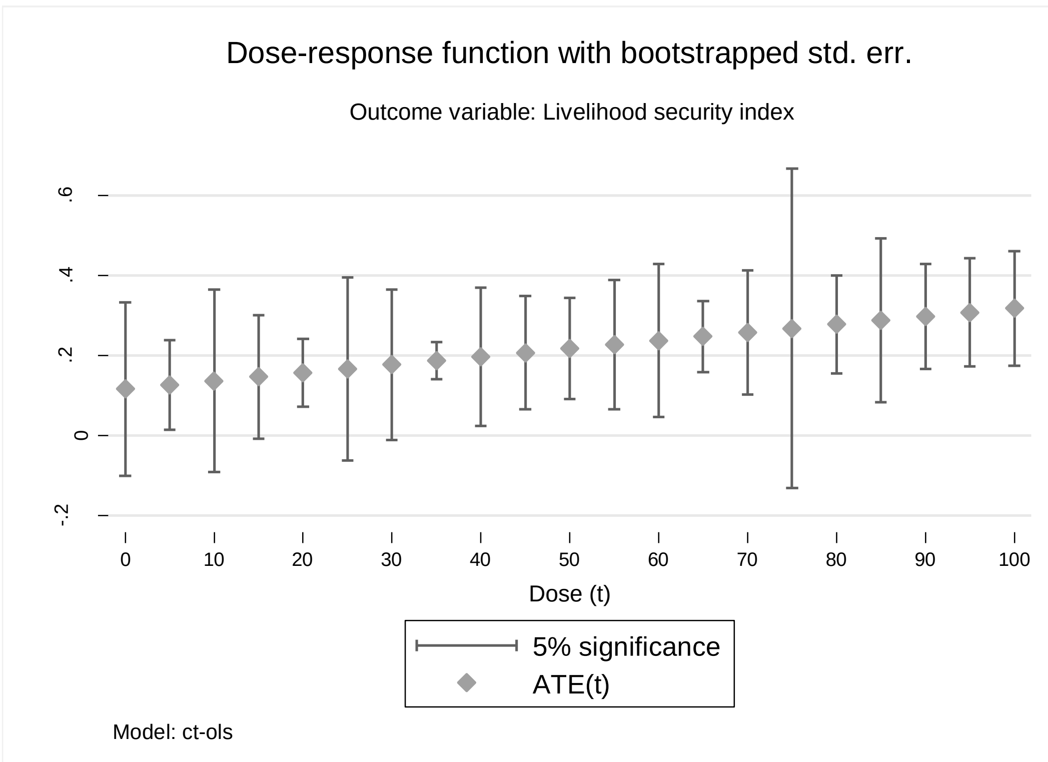

Figure 4-4 : Dose-response function with bootstrapped std.err

Source: Own survey result, 2021

4.4.4 Migration rate and livelihood security index in agro-ecological zones

The average number of migrants and the mean score of the livelihood security index across agro-ecological zones are shown in Table 4-7. In a combined sample, the average size of migrant household members is 1.88, with a mean variation of 1.99. Households in the lowland agro-ecological zone had fewer migrant household members than households in the other agro-ecological zone. The average migrant household member in the lowland agro-ecological zone is less than one, and the number is even significantly lower than the pooled sample mean. The midland agro-ecological zone, on the other hand, experienced a higher rate of migration. Every household in the midland agro-ecological zone has at least two migrants, with an average deviation of 1.92. The rate of migration in the highland agro-ecological zone is also large, with the average value being closer to the midland agro-ecological zone than the lowland agro-ecological zone.

Furthermore, Table 4-7 shows that households in the midland agro-ecological zone have a higher livelihood security index than households in the highland and lowland agro-ecological zones, and the variation in the mean value is more identical than the mean variation in the other agro-ecological zones. Overall, lowland households had a lower livelihood security index than households in other agro-ecological zones, and the mean value is likewise lower than the pooled sample mean. According to this study, the migration rate of households is fairly high in midland agro-ecology and very low in lowland agro-ecology. As a result, an increase in the number of migrants may help to secure livelihoods by increasing the requirements of rural households in their place of origin. Because migration is a source of cash and kind remittances, which are required to meet the needs of household livelihood, households in the midland agro-ecological zone have a higher value of the livelihood security index than households in other agro-ecological zones.

Table 4-7: Migration rates and livelihood security in the agro-ecological zones

Variables	Agro-ecology						Pooled sample	
	Highland		Midland		Lowland			
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Number of migrants	2.27	1.96	2.51	1.92	0.712	1.6	1.88	1.996
Livelihood security	0.793	0.182	0.822	0.162	0.722	0.184	0.782	0.180

Source: Own survey result, 2021

A one-way anova test was used to determine where there is a mean difference in the number of migrants and the value of the livelihood security index across the three agro-ecological zones. To interpret the results, the F value was obtained by dividing the mean square of the independent variables by the mean square of the residuals. As demonstrated in Table 2-8, the number of migrants and the livelihood security index differ significantly between the three agro-ecologies, while there is no variance within agro-ecologies. We found a statistically significant difference in the number of migrants and the livelihood security index in the agro-ecological zones (F (2) = 34.77, p 0.0000) and (F (2) = 10.90, p 0.0000), respectively. Because the p-values for the F test statistic are less than a significance level of 0.01, we reject the null hypotheses and accept the alternative hypotheses. The higher the F values, the more likely it is that the variance related with the number of migrants and the livelihood security index in three agro-ecological zones is real and not random (Bevans, 2022). Overall, there is no significant mean difference in the number of migrants or the livelihood security index within the same agro-ecological zones, but there is a significant mean difference between agro-ecological zones. Agro-ecological variation is the main factor contributing to the high levels of disparity in resource endowment, and thus a higher disparity in migration rate to be occurred.

Table 4-8: Migration rates and households' livelihood security index in agro-ecology.

Variation in the number of migrants in agro-ecology					
Source	SS	Df	MS	F	Prob > F
Between agro-ecologies	235.4	2	117.78	34.77	0.0000***
Within agro-ecologies	1289.8	381	3.39		
Total	1525.2	383	3.98		
Variation in the livelihood security index in agro-ecology					
Source	SS	Df	MS	F	Prob > F
Between groups	.671	2	0.336	10.90	0.0000***
Within groups	11.73	381	0.031		
Total	12.40	383	0.032		

Note: * ** p < 0.01.
Source: Own survey result, 2021

4.5. Conclusion and Recommendations

According to this study, rural-urban migration as a way of escaping from poverty is common in the study area, whose importance varies in different agro-ecologic zones. The effect of migration and remittance on livelihood security is fueled by a variety of demographic, economic, social, and institutional pressures. It is employed as an option to get out of poverty by more than 55.73 percent of rural households in the area. In the midland, highland, and lowland agro-ecological zones, however, the share of migrant-sending households was 74.1 percent, 69.3 percent, and

19.5 percent, respectively. We discovered that livestock ownership, family size, access to a variety of information assets, the number of cultivated fields, soil infertility problem, distance to the next town, and proximity to farmer training centers all have a significant influence on the growth of rural-urban migration. With the exception of livestock ownership, the number of cultivated fields, and proximity to the town positively influenced the rural-urban migration. Establishment of proper livestock management system would contribute to maximize the benefit of migration by enhancing household livelihood resources and income. Furthermore, the study results show that migrant-sending households had fewer cultivated fields than non-migrant households. Therefore, suitable methods and policies that assist farmers, especially migrant-sending households, in modernizing their methods of cultivation are required to boost crop production. The government would also take practical steps to improving soil quality through integrated soil management practice and fertilizer application. Besides, this study discovered that remittances have positive impact on the livelihood security of rural households, and that this trend is predicted to continue with a broad confidence interval. Expanding non-farming activities in rural areas would also help to enhance the positive effect of remittance on livelihood security. The study's conclusions imply that rural-urban migration is widespread in the study area and advantageous for the security of household livelihoods. To reap the advantages of migration, it is essential to put supportive policies and initiatives into place. For instance, encouraging the transmission of material remittances is preferable to monetary remittances in order to reduce the unnecessary waste associated with monetary remittances.

5. CHAPTER FIVE: THE EFFECT OF RURAL-URBAN MIGRATION ON THE TECHNICAL EFFICIENCY AND TOTAL FACTOR PRODUCTIVITY OF CROP PRODUCTION IN GURAGE ZONE, ETHIOPIA[2]

Abstract

This study analyzed the technical efficiency of crops production, and explained the determining factors, analyzed the impact of rural-urban migration on it, and the total factor productivity of crop-production in the Gurage Zone of Ethiopia. The data were collected from 384 randomly selected rural households and analyzed using stochastic frontier and propensity score matching models. Non-migrant households, migrant-sending households, and total samples had mean technical efficiency of 45.5 %, 72.3 %, and 57.4 %, respectively. The household head's age and distance from a neighboring town have a detrimental effect on technical efficiency, whereas schooling, soil fertility, migratory experience, and distance to a nearby market have a beneficial impact. The average impact of rural-urban migration on technical efficiency is 19.4 % loss in the crop output of migrant-sending households'. The mean total factor productivity of migrant-sending, non-migrant, and pooled samples, respectively, was 9.87, 10.23, and 10.03. The study recommends that the government body focus on making the best use of available agricultural inputs, enhancing soil fertility, and regulating the sources of technical inefficiency, based on the diverse and specific solutions provided.

Keywords: TE, TFP, Treatment Effect, PSM, Gurage zone, Ethiopia

5.1 Introduction

The smallholder farmers make for 96% of the agriculture sector in Ethiopia (Taffesse, Dorosh, & Asrat, 2012), and it is the most essential economic sector, accounting for 80% of jobs and 41% of GDP, respectively (Taffesse, Dorosh, & Asrat, 2012; Eyasu, 2018). According to the official statistics survey, crop production in the country increased by 8% between 2010 and 2016 (Eyasu, 2018). Despite appearing to increase crop production over time, market demand for crops is extremely high, and the current food shortage cannot be alleviated. Several factors have been

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[2] One article was published in cogent social sciences journal with the title "Crop Producers' Technical Efficiency and Its Determinants in Gurage Zone, Ethiopia: A Comparative Analysis Using Rural-Urban Migration as a Parameter." DOI: 10.1080/23311886.2021.1995996. Taylor and Francis.

identified as driving factors for scarcity of agricultural output. The most important of the factors include households' ability to efficiently use their limited resources (Julie, Engwali, & Claude, 2017; Yimenu, 2017; Makombe, Namara, Awulachew, Hagos, Ayana, & Kanjere, 2017; Anbes, 2020). Optimization of agricultural production would consider innovations and efficient alternatives, such as selection of more marginal value product of alternative crops (Binam, Tonye, & Wandji, 2005), comparing or combining specialization and diversification (Julie, Engwali, & Claude, 2017),combining rain-fed with irrigation (Gebrehaweria, Namara, & Holden, 2012), and determining and managing rural –urban migration as a strategy of reducing poverty (Black, 1993; Adaku, 2013).

Empirical research findings on the relationship between rural-urban migration and crop output have been based on two contradicting hypotheses. The first assumption is that rural-urban migration stimulates economic growth in the departing area through remittances and technological advancements gained by migrants (Black, 1993; Simelane, 1995; McCarthy, Carletto, Davis, & Maltsoglou, 2006; Hull, 2007; Thomas, Migrants as Transnational Development Agents: An Inquiry into the Newest Round of the Migration–Development Nexus, 2008; Mendola, 2008; Gray, Rural out-migration and smallholder agriculture in the Southern Ecuadorian Andes, 2009; Richard & Cuecuecha, The Impact of Remittances on Investment and Poverty in Ghana:, 2013; Redehegn M. , Sun, Eshete, & Gichuk, 2019). Consequently, migrant-sending households are supposed to have better capacity and agricultural output. The other opposing hypothesis holds that rural-migration causes labor shortages, fallow farmland, and decrease in agricultural production (García-Barrio & García-Barrios, 1990; Schmook & Radel, 2008; Gunjan & B.V Chinnappa, 2015; Qin, 2010).

Several studies that were conducted in Ethiopia (Solomon, 2014; Yimenu, 2017; Yimer, 2017; Dessale, 2019; Anbes, 2020; Tsion, Anbes, & Zerhun, 2020) have estimated the level of technical efficiency in the agricultural sector and examined its determinants (Fantu, 2012; Makombe, Namara, Awulachew, Hagos, Ayana, & Kanjere, 2017). Among others, few studies (Gebrehaweria, Namara, & Holden, 2012) have compared the efficiency of different crops or techniques of production. However, comparative study on the effect of rural-urban migration on the technical efficiency of crop production is scanty. The study concentrates on three main research questions: (1) How efficient are migrant-sending households in crop production compared to others in the study area? (2) What are the root causes of failures in the level of technical efficiency? (3) Does rural-to-urban migration improve the technical efficiency and total factor productivity in the study area? The study results would be input for agricultural policymakers, in general, and rural households, in particular, in terms of shaping the efficient allocation of the limited resources. The second chapter presents the conceptual framework, the third chapter describes the analytical methods, the fourth presents the findings, and the last chapter concludes with key recommendations.

5.2. Conceptual Framework

Rural-urban migration and remittances are inextricably intertwined, as previously noted, and their consequences may be observed in the economies of sending communities, notably in agriculture. In order to comprehend the relationship between rural-urban migration and its impact on crop output in the researched area, the study built an analytical framework within the context of theoretical frameworks. A number of migration theories are considered to develop the analytical framework. The New Economics of Labour Migration theory, for example, claimed that the causes and consequences of migration are intricately linked. If lack of funds to invest in agriculture is a cause for migration, remittances obtained from the migrants can provide liquidity while simultaneously promoting technological advancement (Stark & Bloom, 1985). Such remittances are essentially an income transfer in the basic neoclassical migration model. It has an impact on consumption because it shifts the budget limit outside (De Haas, 2012; De Haas, 2010).

The flow chart below depicts the relationship between rural-urban migration and crop output. Figure 5.1 shows how rural-urban migration, as a household livelihood strategy, affects the technical efficiency and crop productivity of migrant-sending households via remittance and labor loss. The effects of labor loss and remittance on crop-production, technical efficiency and total factor productivity of migrant-sending households are shown. The remittance and labor loss consequences of rural-urban migration are depicted in the flow chart by black and red arrows, respectively. The yellow arrows, on the other hand, represent the impact of technical efficiency of physical inputs to crop productivity.

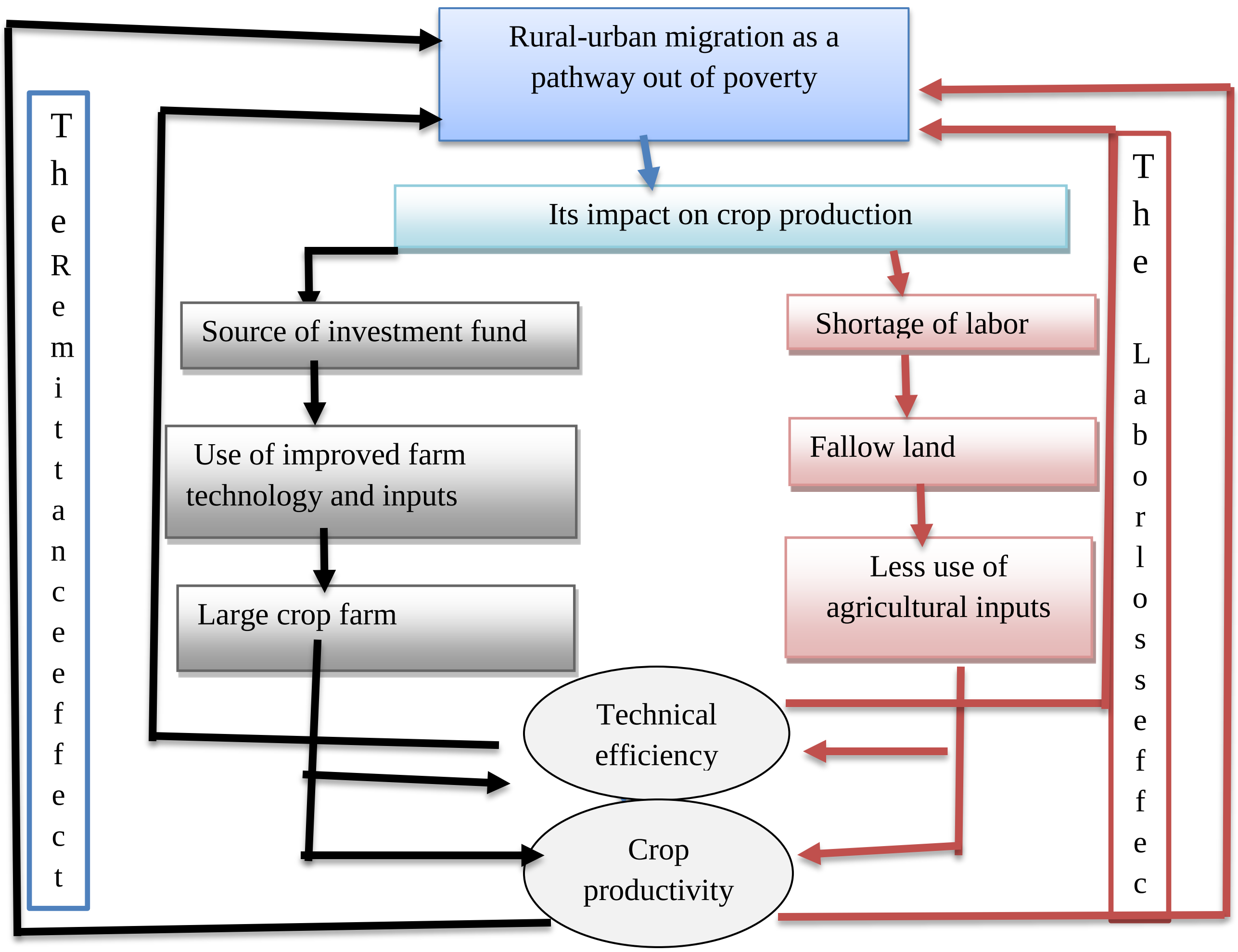

Figure 5 1: The conceptual framework of paper

Source: Generated based on migration theories

5.3 Methodology

5.3.1. Sources of data and study variables

This study uses crop output and production inputs data that are collected from the farm households in three agro-ecological zones of Gurage zone. The required data were collected in the academic year 2018/2019 from the 384 randomly selected farm-households. The dependent variable of the study was the output of all crops (Qi) produced by the sample households. To achieve consistency in measurement, the value approach was employed to aggregate the total production into output value by multiplying the gross product by the current market price (in Birr) (Bozoglu & Ceyhan, 2007; Tsobo, Omotesho, Salau, & Adewumi, 2012; Julie, Engwali, & Claude, 2017). The gross production was calculated as sales + consumption+ gift + losses and the output price information was obtained from the survey households and it was confirmed by the local market officers. The input variables consist of four categories such as land in hectare, labor in working hours, fertilizer in quintal, and chemical (pesticides/herbicides) used in liter. The input variables were customized as a physical quantity form for stochastic frontier estimation and then the technical efficiency and the total factor productivity of crops were analyzed from the estimated frontiers.

5.3.2. Specification of stochastic frontier model to measure technical efficiency

In literature, frontiers are estimated by employing various methods. Among others, stochastic and Data Envelopment Analysis frontiers are repeatedly used, which involve parametric and non-parametric (deterministic) approaches, respectively (Coelli, 1996a; Coelli, Rao, & Battese, 1998). In this study, stochastic frontier model was handled following Cobb Douglas production frontier using cross-sectional data. The model provides maximum likelihood estimates of parameters of a number of stochastic frontier functions. Thus, from the estimated stochastic production frontier, technical efficiency of the farm units was determined. The stochastic frontier production was separately originated by Aigner, Lovell, & Schmidt (1977) and Meeuse and van den Broeck (1977). The original specification involved a production function specified for cross sectional data with two error term components; the one explains random effects and the other account for technical inefficiency (Farrell, 1957; Charnes, William.W, & EL, 1978; Färe, Grosskopf, Norris, & Zhang, 1994; Coelli, Rao, & Battese, 1998). Thus, the stochastic production frontier model is expressed in the following form;

(1) $$Y_i = X_i \beta + (V_i - U_i)$$ ………i=1….N,

Where Y_i is the production of (or the logarithm of the production) of the i[th] household;

X_i is a Kx1 vector of (transformations of the) input quantities of the i[th] household;

β Is a vector of unknown parameters;

V_i Are random variables which explain random effects and

U_i Are technical inefficiency effects that cause the firm to operate below the stochastic frontier.

As far as the efficiency prediction is concerned, the study determines the technical efficiency relative to stochastic production frontier (Färe, Grosskopf, Norris, & Zhang, 1994; Coelli, 1996a). Thus, model has the form; $\mathrm{EEF}_i = E(Y_i^* \mid U_i, X_i) / E(Y_i^* \mid U_i = 0, X_i)$ Where Y_i^* is the production of the i[th] household, which is equal to Y_i when the dependent variable is in original units as well as equal to exp (Y_i) when the dependent variable is in its log form. In the case of stochastic production frontier, EEF_i takes a value between 0 and 1.

5.4. Results and discussion

5.4.1 Description of respondents

Table 5-1 demonstrates the comparison of respondents based on the mean aggregated crop output and the mean quantity of inputs used. Results of the study shows, on average, migrant-sending households produced 59.4 percent less output, and incurring 27.97 percent less input costs than non-migrant households. The surveyed households were smallholder farmers as the mean land size for crop production to 1.29 hectare. The mean land size of non-migrant households was found to be about 1.696 which is somewhat bigger than migrant-sending households (0.97 hectare) indicating that land availability is a determinant factor of household livelihood strategy choice. Migrant-sending households were associated with a lower land productivity which is less than the land productivity of non-migrant households by 29 percentage points.

The findings of the study also revealed that the mean level of labor that is necessary for crop production per annual is 831.4 human working hours. The mean available labor with migrant-sending and non-migrant households, respectively, is 855.85 and 800.85 man hours. This finding revealed that the amount of agricultural labor used for crop production varied as a result of rural-urban migration. Moreover, the labor productivity of migrant-sending households is 62 percent lesser than the labor productivity of non-migrant households. The probable reason for this may be associated with the utilization of old labor or the hired labor that is employed more by migrant-sending households may not perform efficiently. The intermediate inputs such as fertilizer and chemicals are applied on crop farms irrespective of the migration status of rural-households. Lastly, the profitability ratio of the farm households was calculated by dividing the output price by the total input cost. The study result revealed that the profitability ratio of the migrant-sending households was 48.73 percent smaller than that of non-migrant households.

Table 5-1: Description of the respondents based on the crop output and production inputs

Variable	Migrant-sending HHs (N=214)		Non-migrant HHs (N=170)		Pooled (N=384)	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Output price in birr	16252.78	15634.1	40020.5	31634.9	26774.94	26781.7
Land holding in hectare	0.970	0.834	1.696	1.160	1.29	1.05
Labor in working hours	855.85	290.59	800.64	294.15	831.41	293.07
Fertilizer used in quintal	0.326 .	0.660	1.272	1.653	0.744	1.292
Chemical used in liter	0.162	0.566	0.635	1.278	0.372	0 .976
Total input cost in birr	5532.8	2059.6	7681.74	4551.83	6484.2	3555.8
Profitability ratio (π)	2.856	2.162	5.570	4.303	4.058	3.548

Source: Own survey result, 2021

5.4.2 Stochastic production frontier estimation

The results of the estimation of the stochastic frontier analysis are presented in Table 5.2. The parameters are estimated using one step stochastic approach based on Cobb Douglas production function with truncated normal distribution for the (in) efficiency term and they are in line with theoretical predictions. The sfcross command was employed by regress the log output on the log of the physical quantities inputs (Battese & Coelli, 1995; Iheke, Nwaru, & Onyenweaku, 2013; Julie, Engwali, & Claude, 2017). From the estimated stochastic production frontier, the level of technical efficiency and the sources of technical inefficiency of the households were predicted. The goodness of the fit of the model was realized as the estimated lambda (λ= 0.526) is different from zero at 1% significance level. According to the predicted Sigma_u value (0.256), technical inefficiency accounts for 25.4 percent of the total disparity in crop output.

Table 5-2: Estimates of the stochastic production frontier and drivers of technical inefficiency

Variables	Units	Parameters	Coefficients	Std. Err.
Lnoutput				
Production frontier				
Inputs constant		β_0	9.83***	0.690
Ln (land)	Hectare	β_1	0.502***	0.051
Ln (labor)	Hours	β_2	0.131	0.089
Ln (fertilizer)	Quintal	β_3	0.054***	0.010
Ln (chemical)	Liter	β_4	0.008	0.009
Technical inefficiency model (MU)				
Intercept		δ_0	0.6055	0.39747
Age (household head)	Years	δ_1	-0.0059*	0.0033
Education status (head)	Dummy	δ_2	0.1656*	0.0971
Agro-ecology	Dummy	δ_3	-0.0737	0.0569
Soil infertility problem	Dummy	δ_4	0.200**	0.0809
Migration participation	Dummy	δ_5	0.446***	0.1559
Distance to the close town	Km	δ_6	-0.0198**	0.0098
Distance to the close market	Km	δ_7	0.0194*	0.0114
Diagnostic statistics				
Log likelihood			-307.29	
Sigma_u (σ_u)			0.256*	0. 139
Sigma_v (σ_v)			0. 487***	0. 057
Lambda (λ)			0.526***	0.192

Note: * and *** are level of significances at 10% and 1%, respectively.

Source: Own survey result, 2021

5.4.2.1 The technical efficiency of respondents

The results of the maximum likelihood estimation reveal that the surveyed households in the study area show a substantial amount of technical inefficiency. The modal efficiency score value is found within the range of 0.41-0.50 which accounts for 42.97% of the pooled sample households, and followed by 0.71-0.80, which consists of 21.61% (Table 5.3). However, only 7.29% the sampled households have efficiency scores greater than 0.80. The estimated technical efficiency of the pooled sample was found between 0.295 and 0.894, with a mean of 0.574. The mean predicted TE of 57.4% suggests that there is a chance to boost crop production in the study area by 42.6% with the same level of inputs to be used. That is, there is a possibility to reduce the input use by 42.6% to attain the same output level. The value can also be interpreted as, on average, 42.6% of the crop production is lost because of technical inefficiency. The average households in the pooled sample could attain the TE of the most efficient frontier (0.894) either by reducing the cost or increasing the output by 35.79% (1-(0.574/0.894). The predicted TE scores of migrant-sanding households ranges from 0.295 to 0.728, with a mean of 0.455; whereas that of the non-migrant households ranges from 0.371 to 0.894, with a mean of 0.723. These results imply that the non-migrant households are more technically efficient than the migrant-sending households. The average households in the migrant-sending and non-migrant sample households are supposed to reduce the cost or increase the crop output by 49.1 % and 19.13%, respectively, to realize their most efficient status.

Table 5-3: Technical efficiency of the respondents from production frontier

Efficiency score	Migrant- sending		Non-migrant		Pooled	
	N	%	N	%	N	%
≤ 0.5	163	76.17	2	1.18	165	42.97
0.51-0.60	40	18.69	12	7.06	52	13.54
0.61-0.70	8	3.74	48	28.24	56	14.58
0.71-0.80	3	1.40	80	47.06	83	21.61
0.81-0.90	0	0	28	16.47	28	7.29
0.91-1.0	0	0	0	0.00	0	0.00
Total	214	100	170	100	384	100
Mean	0. 455 (0.0855)		0. 723 (0.088)		0.574 (0.159)	
Minimum	0.295		0.371		0.295	
Maximum	0. 728		0. 894		0.894	

Note: values in the parentheses are denoting standard errors.

Source: Own survey result, 2021

The result of a two-sample independent t-test, which is shown in Table 5-4, also presents the significant variation in the mean TE of the migrant-sending and the non-migrant households. The significant mean difference in TE scores confirmed that TE is correlated with migration. The rural-urban migration is found to have a household technical efficiency lessening effect in the study area. This finding verified the results of (Iheke, Nwaru, & Onyenweaku, 2013; Defidelwina, Jamhari, Waluyati, & Widodo, 2019). Conversely, the study result is contrasting with the results of (Mochebelele, 2000; Nonthakot & Villano, 2008; Yang, Wang, Jin, Chen, Riedinger, & Peng, 2016; Liu, Zhang, Hu, Zhu, & Cai, 2019) who found that migration affects positively on technical efficiency of crop production.

Table 5-4: Two- sample t-test with equal variances on technical efficiency

Household group	Observation	Mean	Std. Err.
Non-migrant	170	0.7234	0. 0067
Migrant-sending	214	0.4547	0. 0058
Combined	384	0.5737	0. 0081
Difference		0.2687	0.0082
Null hypothesis	Pr (T>t)	t-statistics	Conclusion
Ho: diff = 0	0.000***	30.256	Reject Ho

Source: Own survey result, 2021

5.4.2.2 Determinants of technical inefficiency

Scientific recommendations are essential for agricultural policy makers in order to make appropriate decisions for an efficient utilization of the limited resources. In this case, the inefficiency effects model was employed to classify the determinants of technical inefficiency following the one-step approach. Among the 7 explanatory variables that are included in the inefficiency effects model (see Table 5-2 above), 6 variables were found to significantly affecting the technical efficiency of crop-production in the study area. The predicted parameters showed that age of the household head, education status read and write, soil infertility problem, migration participation, distance to the closest town and distance to the closest market are the key factors that significantly determine the level of the technical inefficiency in crop production in the study area. The age of the household heads and distance to the nearest town are inversely correlated with the level of technical inefficiency, and thus have a positive contribution on the level of the technical efficiency. Education level, soil infertility problem, migration participation, and distance to a nearby market all reduce technical efficiency because they are positively correlated with the technical inefficiency term. The connotations of the important variables on the technical efficiency of crop producing households in the study area were argued below.

In this study, age of the household head was considered as a proxy to experience and it was indirectly associated with technical inefficiency at 1% significance level. The inefficiency effects model predicted that one additional year increase in the age of the household head would decrease the likelihood of technical inefficiency by 0.59%, holding other things constant. This means that technical efficiency increases with increased age. This hold ups the idea that farmers with higher age are more likely to build up farming experience which enables them to understand farm challenges and utilizes production inputs in a better way. These results are consistent with the findings of (Julie, Engwali, & Claude, 2017; Ogundari, 2013; Mkhabela, 2005; Dessale, 2019; Wudineh & Endrias, 2015; Tadie, Abebe, & Taye, 2019; Getachew & Bamlak, 2014). The findings of (Tolga, Nural, Mehmet, & Bahattin, 2009; Gul, Koc, Dagistan, Akpinar, & Parlakay, 2009; Liu, Zhang, Hu, Zhu, & Cai, 2019) however, reported the converse.

The coefficients of education status of the household heads confirmed a positive and significant association with technical inefficiency, which revealed that with increased education rural-households' technical inefficiency level increased. The possible explanation for this can be, household heads with a higher level of education may be less motivated to pursue crop production as a livelihood strategy and prefer to devote their time to non-agricultural activities. In this regard, rural household heads with lower levels of education may actively devote more time to crop cultivation, gaining farming experience and becoming more efficient than their counterparts. Another reason could be that more educated farmers are less likely to engage in agriculture but are more active in seeking non-farm income. This result suggests that rural households that are actively involved in only crop cultivation as permanent workers are more efficient than counterparts because they devote more time to crop cultivation. The study result is consistent with the findings of Mkhabela (2005). The study results of (Igbekele, Adebiyi, & Abiodun, 2006; Gul, Koc, Dagistan, Akpinar, & Parlakay, 2009; Beyan, Jema, & Endrias, 2013; Getachew & Bamlak, 2014; Wudineh & Endrias, 2015; Tadie, Abebe, & Taye, 2019) were reported in the different line.

The migration experience of rural households showed expected signs and found to have an inefficiency increasing effect at 1% significance level. This suggests that, in the study area, the migrant-sending crop producing households are technically less efficient than households without migrants. A possible justification for this could be because of improper utilization of the available labor and remittance. In the study area, many of the migrant-sending rural households are remittance dependent and withdraw themselves from tedious activities related to crop cultivation & wrongly use their leisure time by doing unnecessary things like drinking alcohol (Worku, 1995; Feleke, Pankhurst, Bevan, & Lavers, 2006). Thus, wrong utilization of leisure time, an acute remittance dependency and sluggishness are more likely to increase farm technical inefficiency. Similar results were met by (Sauer, Gorton, & Davidova, 2015; Liu, Zhang, Hu, Zhu, & Cai, 2019) who reported a positive significant effect of migration on technical inefficiency. Analogous connotations were obtained during the FGD session in the study area and stated as: "*In this community, every household is eager to send children to towns. Because of this you could hardly find labor for crop cultivation and thus you are forced to pay more for hired labour even if they are feeble"* said by a female FGD participant in Shebraden Kebele of Ezha Woreda.

Results of this study also showed a positive relationship between soil infertility and technical inefficiency, at the 5% significance level. This positive association implies that as the soil infertility problem enhances the technical efficiency of crop producing households would be declined due to the increased inefficiency. An allusion to this is that households with soil infertility problems are technically more inefficient than their counterparts who haven't faced soil infertility problems. This can be attributed to the fact that in the study area the technical inefficiency of crop producing households is likely to augment as the soil infertility problem enhances. This finding verified the outcome of (Al-Amin, Rahman, Hossain, & Sayem, 2016; Raimi, Adeleke, & Roopnarai, 2017; Assefa, Meded, Alemayehu, Mulubrhan, Ibrahim, & Abduselam, 2020). Related results were also confirmed by Rapsomanikis (2015) who reported a direct significant effect of soil quality on productivity across nine countries.

The coefficient of distance to the nearest town is negatively correlated with farm technical inefficiency and statistically significant at 5% level. The study result showed that an increase in the distance to the nearest town by one kilometer leads to reduce the technical inefficiency of crop producing households by 1.98%, other variables constant. This hints that crop producing farm households who are located far-away from the close towns are more technically efficient and optimize their farm activity more than their counterparts who are located at nearby towns. A possible reason for this might be the fact that farther from the town to the farm household home would increase transport and opportunity costs. This is an opportunity for effective allocation of working population; reduce unnecessary town vacation and minimization of occasional costs which are the basis for achieving superior farm technical efficiency. This result is consistent with the findings of Wudineh & Endrias (2015) who stated that wheat producing farmers who are living in the nearest town and engaged in off-farm & non-farm works have realized a reduced amount of technical efficiency in Ethiopia. However, Bhatt & Bhat (2014) in Bangladesh reported contrary results to this study.

One of the results of this study showed that distance to the nearby market had a positive and significant relationship with technical inefficiency. The inefficiency effect model predicted that one kilometer increase in market distance increases the technical inefficiency of farm households by 1.9%, holding other variables constant. A possible reason for this might be linked to the accessibility of non-farm and off-farm jobs in the nearest market that leads farm households to spend fewer times in their farm and therefore harvest a higher technical inefficiency. Another possible clarification for this could be linked with higher costs as the opportunity costs of production and marketing are increased with the increased market distance then the technical efficiency of farm households is likely to be less. Moreover, the accessibility and choice of farm inputs are determined by market access which reduces farmers' susceptibility to shocks and widens economic opportunities. As a result of this households are more likely to be negatively affected with the increased market distance. A comparable result was found by One of the results of this study showed that distance to the nearby market had a positive and significant relationship with technical inefficiency. The inefficiency effect model predicted that one kilometer increase in market distance increases the technical inefficiency of farm households by 1.9%, holding other variables constant. A possible reason for this might be linked to the accessibility of non-farm and off-farm jobs in the nearest market that leads farm households to spend fewer times in their farm and therefore harvest a higher technical inefficiency. Another possible clarification for this could be linked with higher costs as the opportunity costs of production and marketing are increased with the increased market distance then the technical efficiency of farm households is likely to be less. Moreover, the accessibility and choice of farm inputs are determined by market access which reduces farmers' susceptibility to shocks and widens economic opportunities. As a result of this households are more likely to be negatively affected with the increased market distance. A comparable result was found by Agerie, Tigabu, & Abebe (2019) investigating the effect of market distance on the technical efficiency of potato producing farmers in Ethiopia. The findings of Tamirat, Wondaferahu, & Tesfaye (2020), Rapsomanikis (2015), Hagos (2014),and Getachew & Bamlak (2014) were also reported in the same line as the finding of the study.

5.4.3. The impact of rural-urban migration on crop producers' technical efficiency

This section presents the estimation of the effect of rural-urban migration on the technical efficiency of crop-producing households in the study area. To execute this, a propensity score matching method was employed by looking at the mean score differences between treated and control groups. In this study, the predetermined technical efficiencies of each farm household and the migration status of households were considered as outcome and treatment variables, respectively.

5.4.3.1 Covariates selection and propensity score estimation

Continuous as well as categorical covariates that are significantly correlated with the treatment and outcome variables were chosen for estimating the propensity scores using the probit model. The selected covariates were current household size (without migrants), age of household head in years, agro-ecology (dummy; 1=lowland, 0= otherwise), landholding size in hectare, fertilizer use in quintal, access to irrigation (dummy; 0= no and 1=yes), soil infertility (dummy; 0= no and 1=yes) and livestock holding in TLU. The propensity score model result shows that current household size, agro-ecology, landholding size, quantity of fertilizer use and access to irrigation are negatively correlated with the treatment variable; but, positively associated with farm technical efficiency. However, age of household head, soil infertility and livestock holdings were covariates that are positively associated with the treatment variable but negatively related with the outcome variable (See Table 5-5 below).

Table 5-5: The association between treatment variable and covariates from pscore model

Treatment	Coef.	Std. Err.	P>z
Current household size	-.4969445	.059953	0.000***
Age of household head	.0212917	.0085535	0.013**
Agro ecology (dummy)	-.0936647	.1178254	0.427
Landholding size	-.1203751	.1074585	0.263
Quantity of fertilizer	-.1870229	.0976392	0.055*
Access to irrigation	-1.138879	.3691122	0.002***
Soil infertility	.9188149	.1733904	0.000***
Livestock holding	.0429433	.0472871	0.364
Intercept	1.501255	.5493284	0.006***
N = 384, LR chi2(8) = 235.70,		Prob > chi2 = 0.0000***	
Log likelihood = -145.79,		Pseudo R2 = 0.4470	

Where: ***, ** and * are significant levels at 1%, 5% and 10%, respectively.

Source: Own survey result, 2021

Table 5-6: Estimated ATET from propensity score model

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
TE	Unmatched	0.45475	0.72343	-0.26868	0.00888	-30.26***
	ATT	0.4627	0.6819	-0.2191	0. 021	-10.44***

Source: Own survey result, 2021

5.4.3.2 Examination of match quality

A covariate balance diagnosis was made to analyze the true effect of treatment by ensuring sufficient overlap (region of common support) between the two groups before trusting on the estimated value of ATET from the propensity score estimation model. Consequently, sufficient overlap (79.69%) was achieved between the two groups, which is greater than the minimum satisfactory level of overlap (75%) for conducting PSM (Greg & Heath, 2018). Among the 214 treatment observations, 78 of them were outside the range of common support and they are discarded in treatment effect analysis. The distribution of the propensity scores across the region of common support is displayed in Figure 5-1 below.

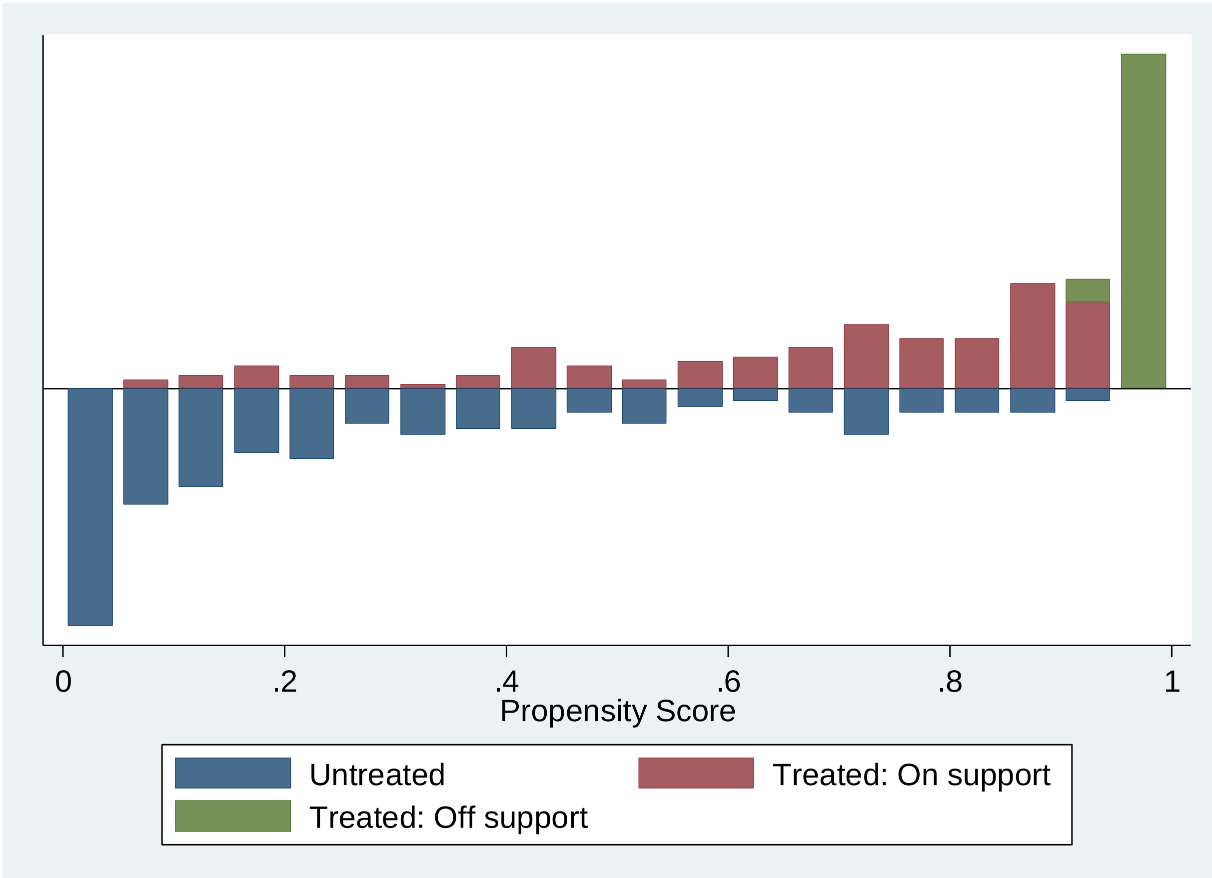

Figure 5-1: Distribution of propensity scores at the region of common support (OV=TE)

Source: Own survey result, 2021

To ensure whether or the mean propensity score is equivalent in the matched samples a covariate balancing t-test was performed. The t-test result showed that all the covariates were likely balanced after matching as there was no significance mean difference (p=0.878) in the matched samples. Thus, the matching significantly decreased the unbalance in the samples. The mean (69.4) and median (68.2) biases in the unmatched samples were reduced to 7.0 and 6.3, respectively, after matching (Table 5-7). The ratio of variances in the propensity (0.81) score and covariates was balanced (1.86) between the treated and a control group as found between "0.5 and 2 extreme values" (Rubin, 2001; Imbens, 2004).

Table 5-7: Balanced sample tests within blocks of the propensity score

Covariates	Samples	Mean		t-test
		Treated	Control	
Current household size	Unmatched	3.8645	6.1647	0.000***
	Matched	4.5735	4.6912	0.459
Age of household head	U	52.491	49.741	0.009***
	M	50.993	52.191	0.330
Agro-ecology (dummy)	U	1.6963	2.1824	0.000***
	M	1.8309	1.8824	0.552
Landholding size in hectare	U	0.96998	1.6965	0.000***
	M	1.106	1.0474	0.566
Fertilizer in quintal	U	0.32576	1.2716	0.000***
	M	0.39565	0.4536	0.572
Access to irrigation (dummy)	U	0.03271	0.0941	0.012**
	M	0.05147	0.0588	0.791
Livestock holding in TLU	U	2.5722	3.1674	0.002***
	M	2.6413	2.7186	0.713
Soil infertility (dummy)	U	0.71495	0.2471	0.000***
	M	0.57353	0.625	0.388

Diagnosis results

Sample	Ps R2	LR chi2	p>chi2	Bias		B	R	%
				Mean	Median			Var
Unmatched	0.447	235.70	0.000***	69.4	68.2	190.7	0.81	50
Matched	0.010	3.76	0.878	7.0	6.3	23.4	1.86	33

Where: *** and ** are significant levels at 1% and 5%, respectively

Source: Own survey result, 2021

5.4.3.3 Estimated average treatment effects

After ensuring the quality of matches between the two groups the key aspect is disclosing the effect of treatment on the outcomes of treated groups and the population. ATET is the estimated average effect of the treatment (rural-urban migration) on treated observations (migrant-sending households) which is a difference between the mean outcome of the treated and control groups in the matched samples. Alternatively, ATE is the average effect of the treatment on the population, and it predicts the probability of the expected effect of the treatment if observations in the population are randomly assigned to treatment. However, ATENT is the counterfactual effect of treatment which answers two questions: What happens to the outcomes of the treatment groups if they were not received treatment and what will happen to the outcomes of the control groups if they were received treatment? Therefore, ATENT is estimated by subtracting the outcome of treatment groups if they were not treated from the outcome of the control groups if they were treated (Abadie & Imbens, 2012; Melissa, et al., 2014). Standard errors were estimated following Abadie-Imbens Robust method for interpreting ATEs and ATETs because AI standard error makes available a consistent estimate in match data (Abadie & Imbens, 2008; Austin, 2009; Abadie & Imbens, 2012; Melissa, et al., 2014).

This study depicted that rural-urban migration has a significant destructive effect on farm technical efficiency in the study area. The study result reveals the average technical efficiency loss due to rural-urban migration is estimated 19.4% for the migrant-sending households. The estimated counterfactual effect (0.191) indicated that the technical efficiency migrant-sending households would be increased by 19.1% if they were not engaged in the migration, another thing remained constant. The value also suggested that the technical efficiency of the average non-migrant households will decrease by 19.1% if they participated in rural-urban migration (Table 5-8). This advocates that due to migration migrant-sending households are more affected than their counterparts in farm technical efficiency loss. A possible clarification for this might be associated with the labour loss effects that are indicated in terms of productive labour deterioration or and the inability of remittance to substitute the missing labor which can be a cause for improper land use in the study area. This supports the findings of migration studies that hypothesizes the loss of labour force in the origin has a downbeat impact on farm production and technical efficiency. The findings of (Adaku, 2013; Drissi, 2014; Sauer, Gorton, & Davidova, 2015; McCarthy, Carletto, Davis, & Maltsoglou, 2006) were reported in the same line to the study result. However, (Huy & Nonneman, 2016; Yin & Wang, 2017) revealed the positive effects of migration on crop outputs and technical efficiency in the rural economy.

Table 5-8: Estimates of the average treatment effects

Treatment (Migration (1vs.0))		Coef.	Std. Err	P-value
Current household size		-0.4969	0.0599	0.000***
Age of household head		0.0213	0.0086	0.013**
Agro ecology		-0.0937	0.1178	0.427
Landholding size		-0.1204	0.1075	0.263
Quantity of fertilizer		-0.1870	0.0976	0.055**
Access to irrigation		-1.1389	0.3691	0.002***
Livestock holding		0.0429	0.0473	0.364
Soil infertility		0.9188	0.1734	0.000***
Intercept		1.5013	0.5493	0.006***
Estimated treatment effects				
Variable	Sample	Treated	Controls	Difference
TE	Unmatched	0.4547	0.7234	-0.267***
	ATET	0.4547	0.6485	-0.194***
	ATENT	0.7234	0.5326	-0.191
	ATE			-0.192
Diagnostic statistics				
Observations	Prob > chi^2	LR chi2(8)	Log likelihood	Pseudo R^2
384	0.000***	235.70	-145.79	0.4470

Note: *** and ** indicate significance level at 1% and 5%, respectively.

Source: Own survey result, 2021

5.4.3.4 Sensitivity analysis test

This test was performed before interpreting the baseline estimate as indication of a factual treatment effect through examining the hidden bias as a result of uncontrolled confounders on the estimated treatment effects. For this simulated treatment effects (with an unobservable confounder U) and baseline treatment effects (without unobservable confounder U) were computed and evaluated how resistant the baseline treatment effects were to deviations from the conditional independence premise. The analysis was executed by following the command: sensatt TE Treatment Agecology Land Fertilizer Agehead Irrigation TLU soilinfer hhsize, p (Accinfo) r (100) comsup to make sure whether there is large mean effective difference between the baseline and simulated estimates. The stimulated confounder (Accinfo) is chosen because it has a positive effect on the outcome (161.673>1) and the treatment variables (2.146>1) (Nannicini, 2006). The computed average treatment effect with the existence of access to information (Accinfo) as an unobservable confounder (0.195) is very similar to the baseline average treatment effect (0.194) (see Table 5-9). Consequently, as the hidden bias is very small and there is no selection bias in the estimated average treatment effects and thus the baseline estimate can be interpreted as a true value (Joo & LaLonde, 2014; Shenyang & Mark, 2015).

Table 5-9: Estimates of sensitivity analysis test

Estimates	ATT	Std. Err.	Outcome effect	Selection effect
Baseline	- 0.194	0.043		
Simulated (with Accinfo)	-0.195	0.044	161.673	2.146

Note: The outcome and the selection effects are odds ratios from Logit estimations.

Source: Own survey result, 2021

5.4.4 The total factor productivity of the respondents

In this section the total factor productivity of the respondents was estimated using input coefficients (the ratio of aggregated output index to aggregated input index) to point out how efficiently the households utilize the available resources in turning production inputs into outputs (the share of output not clarified by the quantity of inputs utilized in the production). For this, the elasticity of the production inputs were estimated following Cobb-Douglas production functions. The inputs used in the production were landholding size in hectare, human labor in working hour, fertilizer in quintal and chemical in liter. In line with the theoretical predictions, a direct elasticity of quantity of crops output with all production inputs was observed but landholding size and fertilizers are the only significant inputs. The greatest elasticity achieved was that of landholding size which would help boost the quantity of crops output and the total factor productivity at the l% level of significance. Keeping all other factors stable, the model predicted that a unit increase in the landholding size would result in 36.1%, 70.6% and 59.8% increase in the quantity of crops output in migrant-sending households, non-migrant households and pooled samples, respectively (Table 5-10). This suggested that the powerful association that existed between crops output and landholding size would contribute more for total factor productivity, ceteris paribus.

Labor utilization reveals the second major elasticity confirming the importance of available human labor to increase the volume of crop production in the study area. This study showed that a 1% increase in human working hour will boost the quantity of crops output of migrant-sending households, non-migrant households and pooled sample by 0.234%, 0.006% and 0.024%, respectively. The study result showed that labor has a remarkable effect on the quantity of crops output and total factor productivity of migrant-sending households than other households at a significance level of 5%. This advocated that labor input is more important for migrant-sending households than their counterparts for achieving a higher crops output in the study area. A possible explanation for this might be attached with rural-urban migration which is a cause for labour scarcity and then improper land use in the departure. This maintains the results of migration studies that hypothesized the loss of productive labour in the origin would have a harmful effect on the volume and total factor productivity of crops. The end results of (Adaku, 2013; Sauer, Gorton, & Davidova, 2015; Imran, Bakhsh, & Hassan, 2016) were confirmed in the similar way to the study result. On the other hand, (Huy & Nonneman, 2016; Yin & Wang, 2017) reported the affirmative effects of labor shortage due to migration on the volume of crops output and the total factor productivity in the agricultural economy. In this study a positive and inferior elasticity of fertilizer and chemical use in relation to quantity of crops output also observed. Increasing the utilization of fertilizer and chemical inputs simultaneously by 1% would result in crops output rising by 0.082% and 0.007 %, respectively. Goldsmitha, Gunjalb, & Ndarishikanye (2004) and Chilimampunga (2006) reported in the same line to the study result.

According to this study result, crop cultivation is worse practiced by migrant-sending households in the study area as the estimated TFP values were considerably lower in migrant-sending households than non-migrant households. The total factor productivity of 59.81% of the migrant-sending households' was less than the pooled mean value (10.03), while 65.29% of the non-migrant households achieved a TFP more than the pooled mean value. The study result also confirms that the mean TFP of migrant-sending households is less than the mean TFP of non-migrant households by 3.52 percentage points. This result suggests that rural-urban migration contributed to a decline of the total factor productivity of crop cultivation in the study area. A plausible clarification could be that many of the migrant-sending households may have labour shortages, high costs of hired labor, or they slightly shift their demand from farming to non-farm works. A comparable result was found by (Idris, Bako, & Ayuba, 2011) who reported the downbeat effect of rural-urban migration on the crop output in Nigeria. However, this study result is contrary to the results of Beneberu (2015) revealed that migrant-sending households are associated with a higher farm income than non-migrant households in Ethiopia.

Table 5-10: Summary of the Cob-Douglas production function estimate

Lnoutput	Migrant-sending (N=214)		Non-migrant (N=170)		Pooled (N=384)	
	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Lnland	0.361***	0 .065	0.706***	0.065	0.598***	0 .048
Lnlabor	0.234**	0.116	0.006	0.129	0.024	0.090
Lnfertilizer	0.082***	0.011	0.031***	0.011	0.070***	0.008
Lnchemical	0.007	0.015	0.012	0.010	0.010	0.009
Constant	8.45***	0.802	10.23***	0.864	10.03***	0.613
Estimated TFP scores						
Mean	9.87	0. 584	10.23	0.532	10.03	0.589
Minimum	8.36		8.26		8.26	
Maximum	11.63		12.38		12.38	
% < 10.03	59.81		34.71		48.70	
% ≥10.03	40.19		65.29		51.30	
Diagnosis statistics						
Prob > F	0.000***		0.000***		0.000***	
R-squared	0.48		0.60		0.59	
Adj R-squared	0.47		0.59		0.58	
Root MSE	0.57		0.52		0.59	

Note: *** and ** indicate significance level at 1% and 5%, respectively.

Source: Own survey result, 2021

5.4.5 Technical efficiency and total factor productivity variation in agro-ecological zones

Table 5-11 demonstrates the technical efficiency and total factor productivity across agro-ecological zones. The average technical efficiency and total factor productivity of the household are higher in the lowland agro-ecological zone than they are in the other agro-ecological zones. As compared to the other agro-ecological zones, midland households have inferior technical efficiency and total factor productivity. Overall, in terms of technical efficiency and total factor productivity, midland households were less likely to be better off than lowland households. The most likely explanation for this is the impact of labour shortages. The migration rate of households is extremely high in midland agro-ecology and extremely low in lowland agro-ecology, as this dissertation confirmed. When the loss of labour is not compensated by remittances, the agriculture sector suffers' more.

Table 5-11: Technical efficiency and total factor productivity across agro-ecological zones

Variables	**Agro-ecology**						**Pooled sample**	
	Highland		**Midland**		**Lowland**			
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Technical efficiency	0.540	0.146	0.515	0.142	0.680	0.139	0.574	0.159
Total factor productivity	9.21	.557	9.05	.590	9.46	0.594	9.23	0.602

Source: Own survey result, 2021

A one-way anova test was performed to assess where there is a mean difference in the technical efficiency and the total factor productivity across the three agro-ecological zones. As shown in Table 5-11, the technical efficiency and the total factor productivity varied significantly among the three agro ecologies. We identified a statistically significant difference in the technical efficiency and the total factor productivity in the agro-ecological zones (F (2) = 48.23, p 0.0000) and (F (2) = 15.63, p 0.0000), respectively. Since the p-values for the statistic used for the F test are lower than the significance level of 0.01 we reject the null hypotheses and accept the alternative hypotheses. The likelihood that the variance associated with technical efficiency and total factor productivity in three agro-ecological zones is actual and not random increases with increasing F values.

Table 5-12: TE and TFP variation in agro-ecological zones

Variation in TE (technical efficiency) in agro-ecology					
Source	SS	Df	MS	F	Prob > F
Between groups	1.958	2	0.979	48.23	0.0000
Within groups	7.735	381	0.020		
Total	9.693	383	.0253		
Variation in total factor productivity in agro-ecology					
Source	SS	Df	MS	F	Prob > F
Between groups	10.538	2	5.269	15.63	0.0000
Within groups	128.461	381	0.337		
Total	138.999	383	0.363		

Source: Own survey result, 2021

5.5 Conclusions and the way forwards

This study examines the technical efficiency and the total factor productivity of rural households, including their determinants. The results are contrasted based on household migratory status. According to this analysis, the technical efficiency and total factor productivity of crop-production varies greatly depending on the household's migration status, with migrant-sending households having a lower value. Migrant-sending households, non-migrant households, and shared samples had 45.5%, 72.3%, and 57.4% technical efficiency, and 9.87, 10.23, and 10.03 value of total factor productivity, respectively. So, the consequence of rural-urban migration on technical efficiency and total factor productivity is dismal, as migrant-sending households are less efficient in utilizing their resources. The average impact of rural-urban migration on the level of technical efficiency in migrant-sending households and the total population is 19.4 percent and 19.2 percent crop output loss, respectively, with a 19.1 percent counterfactual outcome. The study also discovered that the age of the household head and distance to the closest town negatively associated to the technical inefficiency. While households are compounded by their education, soil infertility issues, their migration status and the distance to the nearest marketplace in their technical inefficient nature. As a result, the study recommends that the government agencies would develop appropriate farmland plans based on the level of technical efficiency, train farmers on efficient resource use, work on crop-producers' technical inefficiency drivers, and adjust to labor loss and the receipt of migrant remittances. This necessitates increasing the efficiency of production inputs by enhancing the input supply and distribution networks for key commodities; promoting the optimal use of agro-chemicals, improved seeds, and automation technology; implementing cluster and/or contract farming practices to fill the gap that existed in farmland, particularly in the fields of migrant-sending households; improving soil fertility through the use of integrated soil fertility management practices; strengthening monitoring and evaluation systems to make the full use of extension services; strengthening farmers' encouraging mechanisms, such as rewarding model farmers; and motivating potential migrants to participate in remittance-induced agricultural investments in order to compensate for negative lost-labor effects.

6. CHAPTER SIX: THE IMPACT OF RURAL-URBAN MIGRATION ON MULTIDIMENSIONAL POVERTY IN GURAGE ZONE, ETHIOPIA[3]

Abstract

In this study, the incidence and determinants of multidimensional poverty and the effect of rural-urban migration on multidimensional poverty is examined. Econometric models were used to analyze the data that were collected from 384 sample households. The adjusted headcount ratio of the non-migrant households and migrant-sending households was 19.8% and 10.5 %, respectively. Poverty was found in 43.5 percent of non-migrant households and 25.6 percent of migrant-sending households, respectively. Non-migrant households and migrant-sending households contributed 70.5 percent and 29.5 percent, respectively, to the adjusted headcount ratio of the total sample. According to the findings, household size, number of migrants per household, education level of the household head, and livestock ownership has significant effect on households' multidimensional poverty. The average poverty-reduction effect of rural-urban migration is 4.7 percent for migrant-sending households and 2.9 percent for the overall sample, with a 0.6 percent counterfactual outcome. The result shows that migration benefits in poverty reduction, and due attention shall be given to the management of migration and utilization of the remittances in order to help develop the productive capacity of households for a sustainable reduction of multidimensional poverty in the area.

Keywords: determinant, multidimensional poverty Index, remittance, PSM, Ethiopia.

6.1 Introduction

National and international development agenda have been putting efforts in poverty reduction and improvements in household livelihood security. Both of these topics are critical developmental concerns in today's environment. Poverty is defined as a lack of access to basic requirements of life and essential services, as well as lack of opportunities or resources for development (Alkire & Santos, 2014; Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015). Multidimensional poverty metrics reveals a spectrum of deprivations encompassing several aspects of well-being such as economic, social, and material (Alkire & Foster, 2011; Alkire &

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Santos, 2014; Santos & Alkire, 2015; Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015). Migration, on the other hand, is the movement of people from one geographical region to another for various reasons (Ekong, 2003; Zhang M. , 2003).

Multidimensional poverty and migration phenomena in rural areas of developing countries are theoretically interlinked each other, either positively or negatively. Because of the variability in managing rural-urban migration and its associated remittance, migration as a livelihood strategy can have either positive or negative impact on the lives of migrant-sending households. Rural-urban migration and poverty have existed for a long in the Gurage zone. Gurage zone is the most notable area with net out-migration in the country (Worku, 1995). Long-term rural-urban migration as a livelihood strategy has been well-cultured in the area, with remittances playing a considerable role in poverty reduction and community development (Worku, 1995; Feleke, Pankhurst, Bevan, & Lavers, 2006; Ferework, 2007). Despite the fact that there are a number of empirical researches on migration and household poverty as separate topics, only a few studies (Yousra & Julie, 2016; Kuschminder, Andersson, & Seigel, 2018) looked at the link between them by measuring the effect of migration on household wellbeing. Even so, because they are limited to welfare outcomes, these researches could not provide a comprehensive picture of multidimensional poverty. Furthermore, executing a multidimensional strategy to evaluate poverty is uncommon, with the exception of a few researches (Adams R. , 2010; Richard & Cuecuecha, The Impact of Remittances on Investment and Poverty in Ghana, 2013; Santos & Alkire, 2015). Specific information on the relationship between migration and non-economic factors (such as education, health, and living standards) as well as quantifying the effects of migration on multidimensional poverty in rural households in Ethiopia, in general, and the study area, in particular, are among development gaps to be investigated.

This paper investigates household deprivation, multidimensional poverty factors, and the impact of migration on multidimensional poverty in the study area. Investigation of the comparative multidimensional elements of deprivations in households who send and who don't send-out migrants helps in determining the impact of migration on the poverty. The research would contribute in developing strategy to reduce poverty in the area, and contributes to the few related studies in Ethiopia that can be utilized as a springboard for future comparable investigations.

This part of the study focuses on the question: is rural-urban migration a solution to poverty reduction in Gurage zone.

6.2. Materials and methods

6.2.1 Indicators and measurements

The study used three of the primary HDI dimensions, which are frequently used in other research studies, out of the 10 globally stated dimensions of the HDI. These are the dimensions of education, health, and living standards (Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015). According to the approach of multidimensional poverty analysis, relevant indicators with their normative thresholds or cutoffs were established for the identified dimensions. The poor households were identified using a two-cutoff procedure, i.e. the first set of cutoffs determines whether a person is deprived across all dimensions, but the second set (a single poverty line) identifies a person as poor, (Alkire & Foster, 2011; Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015). To distinguish the multidimensional impoverished households, a normative dimension cutoff (33 percent) was created by dividing 1 by the desired number of dimensions (1/3). Second, to determine the poor's deprivation score, the indicators' weights or indicator cutoffs (poverty line) were calculated by dividing 1/3 by the number of indicators in each dimension. Each deprivation score was calculated using a weighted sum of the number of deprivations, with the goal of keeping the overall deprivation score for each household between 0 and 1. The score increases as the household's deprivations increase, reaching a maximum of 1 when the household is deficient in all component indicators and 0 when the household is not deficient in any indicator (Alkire & Foster, 2011; Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015; Santos & Alkire, 2015). The MPI (multidimensional poverty index) is derived from the ten indicators, with a weighted vector of 1.67 for health and education indicators and 0.56 for the living standard indicators (Table 6.1). The indicator weight was calculated by dividing the dimension cutoff (33 percent) by the number of indicators in each dimension.

Table 6-1: Indicators and measurement

Dimensions	Indicators	The household is not deprived if…	Related to…	Weight of Indicators
Education	Literacy	No illiterate person (> 15 years)	SDG4	0.167
	Schooling	No child (7-16 age) out of school	SDG4	0.167
Health	Good health	No person with chronic illness	SDG3	0.167
	Medical	Able to meet medical needs	SDG3	0.167
Living Standard	Room	More than one room	SDG11	0.056
	Electricity	Access to electricity (at least solar)	SDG7	0.056
	Water	Access to improved water	SDG6	0.056
	Sanitation	Access to private toilet	SDG6	0.056
	Fuel	Energy source for cooking other than charcoal	SDG7	0.056
	Communication/asset	Access to more than one communication/media assets	SDG9	0.056

Source: Own survey result, 2021

Note that the third goal of SDG is about good health and wellbeing, the fourth goal deal with education, SDG6 is about clean water and sanitation, SDG7 is about affordable and clean energy, SDG9 is about industry, innovation, and infrastructure, and SDG11 is about sustainable cities and communities. A cutoff point of 33% of the weighted indicators is adopted for deprivation in all situations (Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015) .

6.2.2 Specification of multidimensional poverty index

The multidimensional poverty index takes a comprehensive approach to assessing poverty by considering aspects such as education, health, and social inclusion in addition to monetary factors (Alkire S. , 2002; 2005; Alkire & Santos, 2010; Santos & Alkire, 2015). The index uncovers the deprivations that the poor households face, as well as the links among the elements of deprivations. In the estimation process, the generalized version of Alkire and Foster (2011) index was used with the help of DASP software. The index is defined as follows, according to Alkire et al. (2015):

$$P(X,Z) = \frac{\sum_{i=1}^{n} w_i \, p(X_i, Z)}{\sum_{i=1}^{n} w_i} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.1$$

Where $p\left(X_i, Z\right)$ is the household poverty level (with the vector of indicators $X_i = (X_{i,1} \ldots X_{i,j})$ and the vector of poverty lines Z= (Z...... Z); and the contribution of indicators to total poverty is p = (X, Z). Furthermore, formula 1 and 2 are used to calculate the relative contribution of population subgroups and indicators to multidimensional poverty indices.

$$C_t^o = S^p \frac{M_O\left(X^t\right)}{M_o\left(X\right)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.2$$

Where C_t^0 is the subgroup's poverty contribution, S^P is the subgroup's sample population share, $M_o\left(X^t\right)$ is the subgroup's MPI, and $M_O\left(X\right)$ is the population's MPI. The following formula was used to calculate the contribution of indicators to overall poverty M_O:

$$\phi_i^0\left(k\right) = w_i \frac{h_i\left(k\right)}{M_O} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4.3$$

Where $\phi_i^o\left(k\right)$ is the contribution of an indicator at a dimension cutoff point k, W_i is the indicator's weight, $h_i\left(k\right)$ is the censored headcount ratio at an indicator I a cutoff point k, and M_O is the population's adjusted headcount poverty ratio.

6.2.3 Specification of probit model for identifying the determinants of MPI

By categorizing households as poor or non-poor based on their censored deprivation score Ci; the binary choice model was used to determine the key factors of multidimensional poverty in the research area. Households with a censored deprivation score (Ci) greater than the poverty criterion (33%) were classified as multidimensional poor. As a result, the outcome variable (y) is treated as a dummy variable, with values of 1 and 0 representing multidimensional poor and non-poor households, respectively, and a dimension cutoff point k. It is written as follows:

$$Y_i = \begin{cases} 1 \text{ if } Ci \geq k \\ 0 \text{ otherwise} \end{cases} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 5.1$$

After that, the maximum likelihood estimator was used to fit the probit regression model to estimate the chance of a household being multidimensional poor (y=1) (Hosmer & Lemeshow, 1989; Gujarati, 2004), and the findings were interpreted in terms of marginal effect (Eric, Luke, David, Julia, & Brendan, 2018). As a result, the model is defined as follows:

$$y_i = \begin{cases} 0 \; if \; y^* \leq 0 \\ 1 \; if \; y^* \geq 0 \end{cases} \quad \ldots\ldots\ldots\ldots 5.2$$

Where y_i is a dependent variable with a binary form that takes 1 for multidimensional poor households and 0 for non-poor a household as a base category, and y^* is a latent variable with $y^* = X\beta + \varepsilon$, Є~ N (0, δ^2). X and β are vectors of explanatory factors and unknown parameters, respectively, computed using maximum likelihood estimation methods. On the other hand, Є is a random disturbance phrase.

Non-indicator measurement variables were used as explanatory variables in the model. This comprises migration, which is a dummy variable with a value of 1 if at least one member of the household is a migrant and a value of 0 otherwise; household size; and household head's education level, which is defined as the number of years of schooling; sex of household heads, represented by a dummy variable with a value of 1 if the household head is a male and zero otherwise; livestock holding, defined as the number of livestock in TLU; and soil infertility, represented by a dummy variable with a value of 1 if the household experienced soil infertility and zero otherwise.

6.2.4 Specification of PSM as an impact measurement

The effect of rural-urban migration on the multidimensional poverty of rural households was estimated using a propensity score matching model. The model looks for a control group that is equivalent to the treated group in all essential pre-treatment characteristics. Individuals, treatment variable, confounders, and outcome variable were used as primary pillars in the analysis (Rubin, 2001; Imbens, 2004), and then the PSM model was used. Numerous iterations of steps were engaged in creating and estimating propensity scores. First, relevant covariates were selected following the modern empirical literature and then probit regression model was employed to estimate the probability of taking treatment, i.e., migration as a treatment variable, and deprivation score as an outcome variable, and the potential covariates as explanatory variables. Propensity scores, overlaps, weight of matched controls, and value of the outcome of matches are determined for each observation following the nearest neighbor matching algorithm. A weighted combination of control observations was used to create a match for each treated individual, where control individuals were weighted by their distance in propensity score from treated individuals within a range of the propensity score (Mingxiang, 2012). High level common support (similar propensity score distribution across the groups) was achieved and that the propensity score is properly specified (Imbens, 2004). Thus, observations outside the range of common support were discarded in the analysis. To ensure the quality of matches, a covariate balance diagnosis has been made across treatment and control groups. Afterwards, the potential outcome of the two groups within a range of the common support has been computed and the average effect of migration on the multidimensional poverty of migrant-sending households is estimated.

The binary model assumed that T =1 if the household is in the treated group (migrant-sending household) and T = 0 for the control group (non-migrant households). The potential outcomes were defined as *Yi* (*Ti*) for each individual *i*, in which the potential outcomes in the treated group denoted as Y (1) and the potential outcome of the control group as Y (0). So, the treatment effect is captured by estimating the average treatment effect on the population (ATE) and average treatment effect on the treated group (ATT). Then, the effect of the treatment on the population was determined as the difference between the two outcomes, and it is specified as:

$$T_i = \text{ATE} = \text{E}(\Delta Y) = Y_i(1) - Y_i(0) = \frac{1}{N}\sum_{i=1}^{N}(Y_i(1) - Y_j(0)) \quad \text{……….………….6.1}$$

Where $Y_i(1)$ is the average outcome for all treated group (migrant-sending households) matched with the average outcome of control group (non-migrant households) Y_i (0) and N is the number of treated cases (migrant and non-migrant households). Average treatment effect on the treated group (ATET) was estimated as:

$$ATET = E[Y(1) \mid T = 1] - E[Y(0) \mid T = 1]$$

$$= \Delta Y = \text{E}(Y(1) - \text{Y}(0) \mid \text{T=1}) = \text{E}(\text{Y}(1) \mid \text{T=1}) - \text{E}(\text{Y}(0) \mid \text{T=1}) \quad \text{…………..……6.2}$$

The counterfactual treatment effect was estimated by subtracting average treatment effect on treatment group if they were not treated (ATET) from the average effect on non-treatment group if they were treated (ATNT) and has been represented as:

Counterfactual effect = ($Y_i(0)$ | T=1) - $Y_i(1)$ | T=0) ……………………..………………..…6.3

Sensitivity analysis has been carried out, whether the unmeasured covariate would have changed the estimated treatment effects as sensitivity analysis takes a range of possible values attributed to any hidden bias. When the hidden bias is null or very small, it refers that there is no mean effective selection bias in the estimated average treatment effects (Joo & LaLonde, 2014). Assuming that there are two groups, *m* and *n*, and that the two groups have similar observed covariates **x** but perhaps varied the probability of receiving treatment; that is, **x** [m] = **x** [*n*], but T[*m*] ≠ T[n]. Thus, the two groups are harmonized to form a matched pair in the same subclass in an attempt to control evident bias due to **x** (Shenyang & Mark, 2015)**.** The likelihood that group m and *n* receive the treatment is T [m] / (1 − T [*m*]) and T [*n*] / (1 − T[*n*]), correspondingly. Thus, the probability is calculated as:

$$\frac{T(m)/(1-T[m])}{T(n)/(1-T[n])}=\frac{T[m](1-T[n])}{T[n](1-T[m])}$$ ……………………………………...……………6.4

The sensitivity analysis assumed that the odds ratio for groups with the similar **x** was at most some number of λ ≥ 1; that is:

$$\frac{1}{\lambda}\leq\frac{T[m](1-T[n])}{T[n](1-T[m])}\leq\lambda$$ For all m and n with **x** [m] = **x**[*n*]…………………………………… 6.5

Following the earlier explanations, if hidden bias (λ) equals 1, then T[*m*] = T[*n*], whenever **x**[*m*] = **x**[*n*]; thus the study would be free of hidden bias. Lastly, bootstrap r (att), reps (100): psmatch2 treatment, pscore (mypscore) out (deprivation) has been carried on the estimated samples to ensure whether the average treatment effects are accurately estimated.

6.3 Results and Discussion

This section presents the results of the household survey data analysis focusing on the impact of migration on multidimensional poverty. In the preliminary part, the various measures of multidimensional poverty are presented by disaggregating for the two household groups classified based on their migration status. The subsequent sections explain the determinants of multidimensional poverty and the impact of migration on MPI in the study area that are estimated using econometric models.

6.3.1 Raw headcount deprivations of the rural households in the study area

Contingency Table 6-2 demonstrates the measure of raw headcount deprivations in each indicator for the household groups. The table gives a picture of the proportion of households that are either well-off or deprived for each indicator. The deprivation of the whole sample households in child schooling and adult literacy was 11.5 and 49%, respectively. Migrant-sending households experienced more deprivations in education dimension. Of the deprivations of all households in education, 86.36% of deprived population in children's schooling and 58% in adult literacy were shared by migrant-sending households. The remaining 13.64% of the deprived population in children's schooling and 42% in adult literacy were non-migrant households. In the study area, the deprivation of rural-households in health dimension was relatively lower than the other two dimensions. Excluding the number of people in the household, 5.73 percent and 16.67 percent of the sample households were deprived of good health and medical needs, respectively. Regarding the deprivation of the two subgroups in good health and medical needs, the proportions for migrant-sending households are 18.2 percent and 23.4 percent, respectively, while the proportions for non-migrant households are 81.8 percent and 76.6 percent. This study found that the average deprivation of sample households in all indicators of living standard was very low, with the exception of indicators such as access to electricity (46.1 percent) and energy source for cooking other than solid fuel (76.56 percent). Households with migrant members were significantly more likely to be better off in all indicators of living standards except access to an energy source for cooking, regardless of the number of people in the household. In which they were subjected to 55.8 percent of the deprivation caused by a lack of cooking fuel. The number of rooms, access to more than one communication/media asset, and access to a household level toilet were found to be the most significant differences between migrant-sending households and non-migrant households. Non-migrant households had a much higher proportion of deprivation in these indicators than migrant-sending households; their deprivation share in the aforementioned indicators was significantly greater than 50%. Keep in mind that the described raw headcount deprivation in Table 6-2 was examined without taking into account the number of people in the household, so non-poor households were included in the analysis.

Table 6-2: The extent of multidimensional deprivations experienced by household groups

Dimensions	Indicators	Deprivation status	Household subgroups		
			Migrant-sending (214)	Non migrant (170)	Total (384)
Education	Child schooling	Non-deprived = 0	82.24%	96.47%	88.54%
		Deprived =1	17.76%	3.53%	11.46%
	Adult literacy	Non-deprived = 0	49.07%	53.53%	51.04%
		Deprived =1	50.93%	46.47%	48.96%
Health	Good health	Non-deprived = 0	98.13%	89.41%	94.27%
		Deprived =1	1.87%	10.59%	5.73%
	Meeting medical needs	Non-deprived = 0	92.99%	71.18%	83.33%
		Deprived =1	7.01%	28.82%	16.67%
Living standards	Access to above one room	Non-deprived = 0	97.20%	75.88%	87.76%
		Deprived =1	2.80%	24.12%	12.24%
	Access to electricity	Non-deprived = 0	58.41%	48.24%	53.91%
		Deprived =1	41.59%	51.76%	46.09%
	Access to drinking water	Non-deprived = 0	79.44%	68.24%	74.48%
		Deprived =1	20.56%	31.76%	25.52%
	Access to toilet	Non-deprived = 0	94.86%	81.76%	89.06%
		Deprived =1	5.14%	18.24%	10.94%
	Access to cooking fuel	Non-deprived = 0	23.36%	23.53%	23.44%
		Deprived =1	76.64%	76.47%	76.56%
	Communication asset	Non-deprived = 0	90.19%	61.76	77.60%
		Deprived =1	9.81%	38.24	22.40%

Source: Own survey result, 2021

6. 3.2 Relationships among the indicators

The focus of this part of the study is on multiple dimensions is that any single indicator does not entirely confine all determinants of multidimensional poverty (Anand, 1977; Ringen, 1995; Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015). Any single indicator is not an ideal predictor of poverty. Hence, we took a closer look at the relationship between the ten indicators before implementing multidimensional poverty measures. Such analysis is helpful to drop or reweight an indicator, to join some set of indicators into a sub-index, or to correct the classification of indicators into dimensions (Alkire & Santos, 2010; Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015). It can also notify the choice of indicators and their robustness tests, the situation of deprivation values, and the explanation of outcomes (Alkire & Foster, 2011; Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015). For this, Spearman pair-wise correlation (1904) was used to check the associations across indicators. The result (Table 6.3) shows that most correlation coefficients, except the relationship between electricity and fuel (r = 0.5), are much smaller than a half. Therefore, it is rational to take a multidimensional approach since all the indicators are poorly correlated.

Table 6-3: Spearman pairwise correlation matrix between indicators (observation = 384)

	Mig.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Mig	1.00										
(1)	-0.2***	1.00									
(2)	-0.044	-0.06	1.00								
(3)	0.19***	-0.02	-0.02	1.00							
(4)	0.29***	-0.05	-0.1*	0.07	1.00						
(5)	0.32***	-0.09*	0.016	0.15**	0.2***	1.00					
(6)	0.10*	0.061	-0.1*	0.11*	0.12*	0.021	1.00				
(7)	0.13**	0.033	0.002	0.2***	-0.04	0.02	0.3***	1.00			
(8)	0.21***	-0.074	0.024	-0.05	0.13**	0.12*	0.11	0.005	1.00		
(9)	-0.002	0.006	-0.07	0.057	0.049	0.04	0.5***	0.11*	0.095	1.00	
(10)	0.34***	-0.09*	-0.03	0.11*	0.25**	0.2**	0.2***	0.07	0.2***	0.1*	1.00

Source: Own survey result, 2021

Note: Mig is migration status, (1), (2), (3), (4), (5), (6), (7), (8), (9) and (10) are indicators which denote child schooling, adult literacy, good health, medical needs, room, electricity, water, sanitation, cooking fuel and communication/media asset, respectively.

Where ***, ** and * are levels of significance at 1%, 5% and 10%, respectively.

6.3.3 Multidimensional poverty analysis

Table 6-4 presents estimates of multidimensional poverty coverage of households at a poverty threshold *k*=33%. The share of the sample population in the analysis of MPI is 44.1% and 55.9 % in migrant-sending and non-migrant households, respectively. MPI is deeper than headcount deprivation as it provides information on the share of weighted deprivation experienced by the population. We use another category, poor and non-poor, because these two groups were present in both migrant-sending and non-migrant households, and we want to compare two poor categories in the sample. The MPI of the two subgroups was estimated by censoring the deprivations of the non-poor and calculated the proportion of people who have been recognized as multidimensional poor in the population. The value of MPI was broken-down into the incidence and intensity of poverty since it is a linear product of the two indices.

The multidimensional poverty index of subgroups is obtained by adding the censored deprivation scores weighted by the population share of each household group or by multiplying poverty headcount ratio by the intensity of poverty (0.367*0.428 = 0.157). Following poverty decomposability property, the entire multidimensional poverty index of the study area could be also obtained by adding the poverty level of subgroups after multiplying by each sample population shares', which is estimated as 0.559 * 0.198 + 0.441 * 0.105 = 0.157. As indicated in Table 6.4, the study satisfied dimensional monotonicity property (Alkire & Santos, 2010; Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015) as a poor person became deprived in extra indicators, then the intensity of poverty and MPI values were rising together.

As shown in Table 6.4, there is a greater disparity between the two subgroups in terms of population share, multidimensional poverty index, and poverty headcount. Non-migrant households' multidimensional poverty, for example, was nearly doubled, because the associated value of headcount and intensity is higher for them. The difference in the intensity of deprivation (the average deprivation share or the breadth of poverty) between the two subgroups, on the other hand, was not significant, in which the difference in weighted indicators between non-migrant and migrant-sending households was 2.5 percent (43.5 percent -41 percent).The contribution of non-migrant and migrant-sending households to the overall multidimensional poverty was 70.5% and 29.5 %, respectively. This suggests that there is an unequal distribution of multidimensional poverty (Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015; Kuschminder, Andersson, & Seigel, 2018) between the migrant-sending and non-migrant household groups. The results revealed that the poverty contributions of non-migrant household group in the overall MPI, poverty headcount and intensity of deprivation are higher by 41%, 38.6% and 13.6%, respectively than that of the migrant-sending household group.

Table 6-4: Multidimensional poverty indices of the respondents (observation 384)

Population subgroups	Pop. Share	MPI value	Poverty headcount	Intensity of deprivation	Contributions to…		
					MPI	Headcount	Intensity
NMHHHs	0.559	0.198	0.455	0.435	0.705	0.693	0.568
MSHHs	0.441	0.105	0.256	0.410	0.295	0.307	0.432
Whole sample	1.000	0.157	0.367	0.428	1.000	1.000	1.000
Difference	-0.118	-0.093	-0.199	-0.025	-0.41	-0.386	-0.136

Note: The difference is calculated between MSHHs and NMHHHs

Source: Own survey result, 2021

6.3.4 The relative contribution of different indicators to the overall MPI

Table 6-5 presents the multidimensional poverty index of the ten indicators that are grouped into three dimensions. The weights were computed such that each dimension receives an equal weight of 1/3 and the weight is equally divided by the number of indicators in each dimension. As a result, each education and health indicator received larger weights (0.167) than the standard of living indicator (0.056). The table also displays the relative contribution of indicators to the aggregate deprivations of poverty (censored headcount). The contribution of an indicator to poverty has a key message to the proportion of the population who are deprived in that indicator. Using the value of headcount ratio and the weight of each indicator, the contribution of each indicator is computed. Even though, the headcount ratio of an indicator can be computed from uncensored (raw) deprivation matrix (aggregate deprivation of poor and non- poor) and censored deprivation matrix (Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015), only the censored headcount ratio is used in the estimation process.

Table 6.5 shows that the proportion of poor people who are destitute in each indicator referring the multidimensional poverty index. We clarify that these are 'multidimensional' poor people as those people who are deprived in 33% and above. However, the rest were considered as non-poor since they have lower proportion of deprivations. Looking at the censored headcount rations, we can see that the poor people in the study area exhibit the higher deprivation levels with respect to access for energy source for cooking and literacy level, followed by the ability to meet medical needs, and access to electricity. When an indicator's percentage contribution to aggregate poverty exceeded its weight, a higher censored headcount ratio was observed Adult literacy, medical needs, access to electricity, access to drinkable water, and access to energy sources other than solid fuel have higher percentage contributions than their weight, and thus are associated with a higher censored headcount ratio (see Table 6-5 below). As a result, poor people are more likely to be deprived in these indicators, which are policy relevant variables for dealing with the composition of multidimensional poverty in the study area.

It was noticed that fuel and electricity have lower contribution to the overall multidimensional poverty, even though their censored headcount ratio is greater than any other indicators. This is because the weights assigned to these indicators are lower than those assigned to literacy and medical needs. In migrant-sending households, adult literacy, child schooling, access to energy source for cooking other than solid fuel, and the ability to meet medical needs were the top four indicators as they collectively contribute to 49.63% of the deprivations. However, for non-migrant household population, adult illiteracy, ability to meet medical needs, access to energy source for cooking other than solid fuel and access to electricity were the top four deprivations with 84.5% contribution to the overall multidimensional poverty. Comparing the two subgroups, except in child schooling, people in migrant-sending households were better off in all indicators which is consistent with the study result of Kuschminder, Andersson, & Seigel (2018). Generally, in the study area the contribution of education, health and living standard dimensions to the overall multidimensional poverty index is 34.8%, 24.3% and 40.9%, respectively.

Table 6-5: The proportion of poor peoples and experiencing deprivations in each indicator

Indicators	Weight	Censored *headcount ratio of indicators*			*Percent Contribution of indicators to MPI(Wi*HR/M0) = 0.157*		
		Non-migrant HHs	Migrant HHs	All HHs	Non-mig HHs	Migrant HHs	All HHs (0.157)
Schooling	0.167	0.043	0.101	0.0683	4.63	10.74	7.2
Literacy	0.167	0.2996	0.2104	0.2603	31.87	22.38	27.62
Good health	0.167	0.101	0.0193	0.0649	10.74	2.05	6.90
Medical	0.167	0.2385	0.0701	0.1638	25.37	7.46	17.43
Room	0.056	0.1574	0.0363	0.1031	5.61	1.30	3.70
Electricity	0.056	0.3378	0.1898	0.2739	12.91	6.77	9.77
Water	0.056	0.2328	0.1125	0.1791	8.30	3.98	6.39
Sanitation	0.056	0.1116	0.0302	0.0754	3.98	1.10	2.69
Fuel	0.056	0.4169	0.2455	0.3403	14.87	9.05	12.14
Media assets	0.056	0.2538	0.0677	0.1713	9.06	2.40	6.11
Total	1	2.1924	1.0828	1.7004			100

Source: Own survey result, 2021

6.3.5 The determinants of multidimensional poverty in the study area

The poverty level of rural-households is associated with various demographic and socioeconomic characteristics in the study area. Referring the households categorized as poor (1) and non-poor (0) based on the deprivation score *(Ci)* value, based on a poverty cutoff point (33%) where households with a censored deprivation score of 33% and above were poor and below are categorized as non-poor. Then, the study employed probit regression model as a tool to compute the determinants of household multidimensional poverty. Eleven explanatory (6 continuous and 5 discrete) variables were identified and tested for their significance of association with household multidimensional poverty status. Of which, six explanatory variables (such as household size, number of migrants, age and education of household head, livestock holding, and soil infertility) were found to be significantly associated with household multidimensional poverty, and chosen for the model specification. Table 6.6 presents the estimated results, i.e., the coefficients, marginal effect, and associated p-values of the coefficients of the regression model. The log likelihood -210.70697 with a p-value of 0.000 indicated that the model as a whole is statistically significant and fits better than a model with no predictors. As the probit regression model output revealed, the coefficients of the number of migrants and livestock holding in TLU was negative and has an inverse relationship with the household multidimensional poverty. The explanatory variables such as gender and education of the household head, household size and soil infertility problem have positive relationship with household multidimensional poverty. Except sex of the household head and soil infertility problem all the other explanatory variables were statistically significant and determine the poverty of rural households.

As the econometric model revealed, having a migrant household member decrease the possibility of rural household multidimensional poverty and the effect is statistically significant at 10%. The marginal effect of the number of migrants in the household indicated that additional number of migrants decrease the likelihoods of being multidimensional poor by 2.8%, holding other variables constant. The result is in line with various migration optimistic studies which argued remittance receiving households are better off and having more migrants in the household seems to reduce multidimensional poverty through smoothening household income and increasing access to capital (Richard, 1998; 2006; Kuschminder, Andersson, & Seigel, 2018). Besides, the neoclassical migration theory highlights migration as an investment where the benefits gained from migration has to exceed the costs associated for migration to take place. The gains obtained from migration are a flow of remittances, skills, knowledge, experience, and other household amenities that migrants acquired and are expected to be used in migrant-sending households (de Haas H. , 2006; Worku, 1995; Borjas, 1989). This finding is in contradiction with the structural migration theory that argued the multidimensional poverty of rural-households increased due to the effect of migration (Russell, 1992; Lipton, 1980).

The size of the household was also another liable factor for determining the level of multidimensional poverty in the study area. In this research, strong positive relationship was found between household size and multidimensional poverty. While the household size is increases, all the measures of multidimensional poverty levels also increase at 1% significance level. The result of the study shows that for each additional household member the likelihood of rural household multidimensional poverty increase by 5.42%, *ceteris paribus.* This is because household with larger family size are challenged to meet all the necessary requirements for life. It is obvious that larger household size has acutely rooted in the poverty circle since larger households are required with higher levels of income and other household amenities to live (Lekha, 2014; Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015).

The education of household head is significantly related to the multidimensional poverty of households at a significance level of 1% and shows unexpected sign. The study signified that, for a given household head a unit increase in the year of schooling would enlarge the probability multidimensional poverty by 1.67%. An allusion of this is that households with highly educated head have a higher possibility of being poorer than their counterparts. The possible reason for this may be household heads with higher year of education are in dilemma to engage in petty works and thus gain lower income. Consequently, they are more likely to be poor. In the study area, there are many jobs that are not suitable for the educated person, maybe for their risk or for the societal norms and values. This result is inconsistence with the study result of (Alkire, Foster, Seth, Santos, Roche, & Ballón, 2015; Muhammad, Derick, Mukesh, Wilson, Dipak, & Santosh, 2015) which reported that an increase in the year of education is a signal for the household to engage in different livelihood activities and it creates higher access to information that will help households to improve their way of life.

The correlation between livestock holding and multidimensional poverty of rural household is indirect and statistically significant at 5%. The marginal effect of TLU showed that a unit increase in TLU decreases the probability of a household to be multidimensional poor by 3.3%. This is because, households with a greater TLU have provided with a wide spectrum of benefits, such as cash income, food, manure, draft power and transportation services, savings and insurance, and social status and social capital (Upton M, 2004; Moll, 2005) which are basic for reducing household poverty. This finding is verified the outcome of (Birthal & Singh, 1995; Thornton, et al., 2002; Birthal & Ali, 2005; Minot, Epprecht M., Tram Anh, & Trung, 2006).

Table 6-6: Results of the probit model for the determinants of multidimensional poverty

Explanatory variable	Coefficients	Std. Err	Z-value	P-value	Marginal effect
Household size	.1738669	.08683	3.43	0.001 ***	.0541605
Number of migrants	-.0900571	.0841488	-1.84	0.065 *	-.0280533
Education of HH head	. 0534579	.0301489	2.98	0.003***	.0166524
Gender of HH head	.2911225	.357467	1.40	0.160	.0906862
Livestock holding	-.1064683	.0748192	-2.63	0.009**	-.0331654
Soil infertility	.0252202	.2538265	0.17	0.867	.0078562
Constant	-1.414831	.651115	-3.65	0.000***	
Number of Obs = 384; LR chi2(6) = 58.69; Prob > chi2 = 0.0000; Pseudo R^2 = 0.1222					

Where ***, ** and * are significant levels at 1%, 5% and 10%, respectively.

Source: Own survey result, 2021

6.3.6 The effects of rural-urban migration on multidimensional poverty

6.3.6.1 Covariates association and propensity score estimation

The major effort made in this section was measuring the effect of migration on migrant-sending rural households' multidimensional poverty. For this, propensity score matching model was utilized by seeking observed mean deprivation differences between treated and control groups. Deprivation score as an outcome variable was estimated based on the assigned weights of covariates and the size of people within the household. The covariates chosen for the estimation of propensity score were child schooling, adult literacy, good health, medical, access to more than one room, access to electricity, access to drinking water, access to private toilet, access to more than solid fuel for cooking, and access to more than one communication/media asset. The study result showed that, among the covariates; child schooling, adult literacy and cooking fuel were negatively associated with treatment variable and would increase the level of deprivation in migrant-sending households. The other covariates were positively associated with the treatment variable and trimming down the poverty of migrant-sending households. Except adult literacy and access to cooking fuel, all other covariates were significantly associated with treatment.

Table 6-7: The outcome of the propensity score estimation model

Migration	Coef.	Std. Err.	Z	P>|z|	[95% Conf. Interval]	
Schooling	-1.079205	0.2970223	-3.63	0.000***	-1.6614	-0.49705
Adult literacy	-0.151715	0.1462409	-1.04	0.300	-0.4383	0.13491
Good health	0.75940	0.3527909	2.15	0.031**	0 .0679	1.450858
Medical need	0.747982	0.21009	3.56	0.000***	0.3362	1.15975
More room	1.1688	0.2683968	4.35	0.000***	0.64275	1.69484
Electricity	0.064463	0.1829597	0.35	0.725	-0.29413	0.423057
Drinking water	0.4145292	0.1783421	2.32	0.020**	0.06498	0.764073
Sanitation	0.614142	0.2420465	2.54	0.011**	0.13974	1.088545
Cooking fuel	-0.333718	0.2015612	-1.66	0.098*	-0.72877	0.061335
Media assets	0.7984262	0.1852986	4.31	0.000***	0.43525	1.16160
Cons	-2.621009	0.560728	-4.67	0.000***	-3.720	-1.5220
Number of Obs = 384; LR chi2(10) = 131.32; Prob > chi2 = 0.0000; Pseudo R^2 = 0.2491						

Where ***, ** and * are significant levels at 1%, 5% and 10%, respectively.

Source: Own survey result, 2021

Besides, T-test was performed to measure the mean difference between migration and household deprivation score. From the analysis, a significant outcome difference was observed between the two groups at 1% level with higher deprivation score in non-migrant households before matching. With unmatched sample, the deprivation score of migrant-sending households was less than non-migrant households by 6.7%. After match the effect of treatment on the treated group was insignificant as the mean outcome of the two groups was almost the same (Table 6-8).

Table 6-8: Value of treatment effects from propensity score estimation model

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Deprivation	Unmatched	.217205609	.284047063	-.066841454	014491027	-4.61***
ATT	.217205609	.264060746	-.046855137	-.046999976	.046999976	-1.00
ATU	.284047063	.277811767	-.006235296	. -.006235296	.	
ATE				. -.028872395		

Where ATT, ATU, and ATE denote the average treatment effects on the treated, non-treated, and population, respectively, and *** denotes a 1% significant level.

Source: Own survey result, 2021

6.3.6.2 Examination of match quality

We have carried out further analysis in order to identify the true effect of treatment by ensuring sufficient overlap between the two groups and making a covariate balance diagnosis before trusting on the estimated value of ATET from the previous propensity score estimation model. From the estimated propensity score, we make sure adequate overlap in the range of propensity scores across treatment and comparison groups. We found a high level of overlap (91.4%) between the two groups which is greater than the minimum satisfactory level of overlap (75%) to conduct PSM (Greg & Heath, 2018). Only 33 treatment observations were outside the range of common support and they are discarded in treatment effect analysis. Thus, the overlap distribution of the propensity scores across treatment and comparison groups was ample and displayed in Figure 6.1

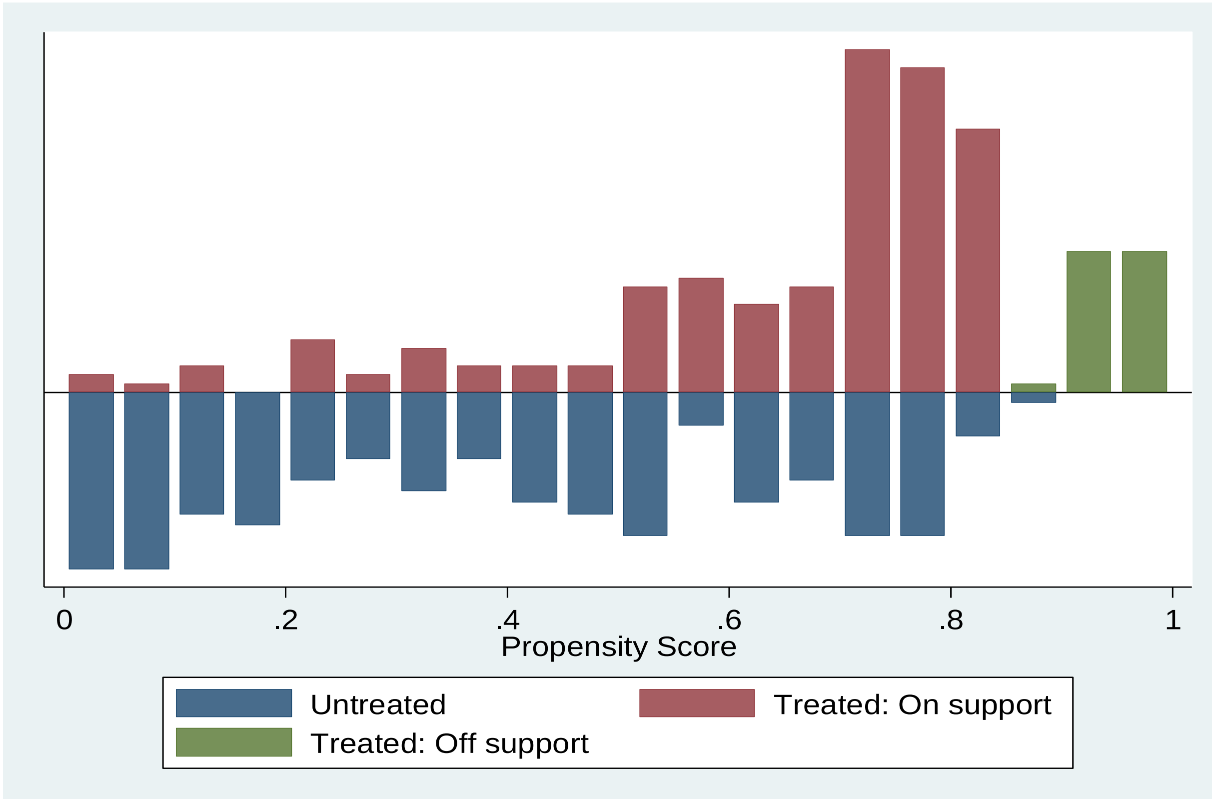

Figure 6-1: Distribution of propensity scores in the region of common support (OV=MPI)

Source: Own survey result, 2021

After the propensity score is balanced within common support, a covariate balance diagnosis test was performed across treatment and comparison groups. A starting test of covariate balance was to ensure that, the mean propensity score is equivalent in the treatment and comparison groups within each of the quintiles. From the analysis, we see that matching significantly decreased unbalance in the samples (See table 6-9 and 6-10). The ratio of variances in the propensity score between the treated and control groups changed from 0.54 in the unmatched sample to 2.00 in the matched sample. The two groups were balanced because the ratio of variances of the propensity score and covariates found between "1/2 and 2 extreme values" (Rubin, 2001; Imbens, 2004). All the covariates were likely balanced as there is no significance different between propensity scores and any of the covariates (Leonardo & Carla, 2011; Greg & Heath, 2018) after matching. Generally, the matching reduced unbalancing and it is satisfactory as the mean absolute bias (2.2) less than 5 and the standardized difference (20.2) is less than 25 (Grill & Rampichini, 2011) after matching.

Table 6-9: Balanced sample tests within blocks of the propensity score

Variable	Sample	Mean		% bias	% reduce	t-test	
		Treated	Control		|bias|	T	p>|t|
Schooling	Unmatched	0.82243	0.96471	-47.3		4.45	0.000***
	Matched	0.97238	0.98895	-5.5	88.4	-1.14	0.253
Literacy	Unmatched	0.49065	0.53529	-8.9		0.87	0.386
	Matched	0.47514	0.44751	5.5	38.1	0.53	0.599
Good health	Unmatched	0.98131	0.89412	36.6		3.71	0.000***
	Matched	0.9779	0.97238	2.3	93.7	0.34	0.737
Medical	Unmatched	0.92991	0.71176	59.2		5.94	0.000***
	Matched	0.91713	0.92818	-3.0	94.9	-0.39	0.695
More than 1	Unmatched	0.97196	0.75882	65.5		6.67	0.000***
room	Matched	0.96685	0.96685	0.0	100.0	-0.00	1.000
Electricity	Unmatched	0.58411	0.48235	20.4		1.99	0.047*
	Matched	0.58564	0.58564	0.0	100.0	-0.00	1.000
Water	Unmatched	0.79439	0.68235	25.6		2.52	0.012**
	Matched	0 .79006	0.77901	2.5	90.1	0.25	0.799
Sanitation	Unmatched	0.9486	0 .81765	41.5		4.16	0.000***
	Matched	0.94475	0.95028	-1.8	95.8	-0.24	0.814
Cooking fuel	Unmatched	0.23364	0.23529	-0.4		-0.04	0.970
	Matched	0.22099	0.22099	0.0	100.0	-0.00	1.000
Communication/	Unmatched	0.90187	0.61765	70.3		7.03	0.000***
media asset	Matched	0.88398	0.89503	-2.7	96.1	-0.33	0.738

Note: ***, ** and * are level of significances at 1%, 5%, and 10%, respectively.

Source: Own survey result, 2021

Table 6-10: Summary of covariates balance diagnosis result

Sample	Pseudo R2	LR chi2	p>chi2	Mean Bias	Median Bias	B	R
Unmatched	0.249	131.32	0.000	38.4	41.5	125.8*	0.54
Matched	0.004	2.05	0.996	2.2	2.3	14.8	2.00

Where: B denotes standardized differences and R stands for variance ratio
Source: Own survey result, 2021

6.3.6.3 Estimated treatment effects on multidimensional poverty

The goal of impact assessment is to figure out the effect of treatment on the outcomes of treated groups and the population after ensuring quality of matches between the two groups. The analysis depicted the potential poverty gains from migration in multidimensional poverty by estimating the average treatment effect on the entire sample and average treatment effect on the treated groups. The ATET is the estimated effect of the intervention among treated individuals and received the most attention in impact evaluation. The ATE combines the ATET with the estimated treatment effect for untreated individuals. The estimated value of ATE answered the question "What would be the expected effect of the treatment if individuals in the population are randomly assigned to treatment?" But estimating the individual treatment effect *is* not possible. Standard errors were calculated with Abadie-Imbens Robust method for the interpretation of ATEs and ATETs as AI standard error provides a reliable estimate in match data (Austin, 2009; Abadie & Imbens, 2012; Melissa, et al., 2014). As the ATET and ATE estimated value showed, migration has played a crucial role in reducing poverty in the study area by a move out of people from multiple deprivations. In the area, the average gain from the current labor migration is estimated at 4.7% and 2.6 % overlapping deprivation reduction in migrant-sending households and the entire population, respectively (Table 6-11). The counterfactual outcome was estimated by subtracting the outcome of treatment groups if they were not treated from the outcome of the control groups if they were treated. The resulting value was also negative and indicated that, the overlapping deprivations of non-migrant households would be decreased by 0.62% if they were participated in the migration, another thing remained constant.

Thus, the result is in line with the neoclassical migration theory which always noticed the migration as it has a positive effect on the socioeconomic conditions of households in the community of origin. In this perspective, the gains obtained from migration are a flow of remittances, skills, knowledge and experience that migrants acquired and which can be used as an intermediate tool in multidimensional poverty reduction strategy. Furthermore, the positive impacts of migration recognized in terms of price balancing in a condition wage differential. This means, where there is free migration, labor scarcity would be created in the community of origin, which would then result in higher wage rate and reduce multidimensional poverty (Kuschminder, Andersson, & Seigel, 2018; Todaro, 1969).

Table 6-11: The effect of rural-urban migration on rural household poverty

Treatment effect	Coefficients	AI Std. Err	P-value	(95% conf. Interval)	
ATE Migration (1 vs.0)	-0.02887	0.015034	0.055*	-0.05834	0.000594
ATET Migration (1 vs.0)	-0.046855	0.025038	0.061*	-0.09593	0.00222
ATENT Migration (1 vs.0)	-0.00624				
Estimator = PSM; Outcome model= Matching; Treatment Model= Probit regression					

Note: (*) is the level of significance at 10%.

Source: Own survey result, 2021

Qualitative information obtained from the focused group discussions and key informant interviews also exposed similar idea regarding the effect of migration on multidimensional poverty. Many of the voices were conveyed a concrete message on the power of migration in the reduction of rural households' poverty and its positive reward in every aspect of household needs. During focused group discussion an old woman in the study area stated the effect of migration as: "*Harvesting adequate crops and owning milking cows are not sufficient conditions for rural household livelihood unless there is a migrant household member and transferring remittance either in cash or kind form*." Another key informant in the study area said: "*Everyone can easily differentiate migrant-sending households from other households by their appearance. Households with migrant members are privileged; they look as if urban dwellers in every aspect of their life condition, and they are not dismayed at what to eat and where to live*."

6.4 Multidimensional poverty among households in agro-ecological zones

Table 6-12 demonstrates the degree of multidimensional poverty across agro-ecological zones. The average multidimensional poverty of the household in a combined sample is 27.7%. Households in the lowland agro-ecological zone had a higher mean of multidimensional poverty than households in the other agro-ecological zones. In the lowland agro-ecological zone the average multidimensional poverty of household is 28.1%, which is more than the population average in all agro-ecological zones. Furthermore, households who are living in the midland agro-ecological zone have achieved less multidimensional poverty index than households living in the highland agro-ecological zones and the variation in the mean value is more similar than the mean value of highland agro-ecological zone. Overall, the midland households were more likely to be better off and lowland households were more underprivileged. This dissertation demonstrated that the migration rate of households is extremely high in midland agro-ecology and extremely low in lowland agro-ecology. For this reason, migrants have the ability to contribute by offering durable goods and services that raise the standard of living for rural households and thereby contribute to the reduction of poverty.

Table 6-12: MPI in the three agro-ecological zones

Variable	Agro-ecology						Pooled sample	
	Highland		Midland		Lowland			
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
MPI	0.246	0.146	0.219	0.136	0.281	0.147	0.247	0.145

Source: Own survey result, 2021

The three agro-ecological zones were compared using a one-way anova test to determine where there is a mean difference in the rate of migration and the value of the livelihood security index. In the same agro-ecology, multidimensional poverty does not differ significantly from one agro-ecology to the next, but there is a considerable variance between agro-ecologies, as seen in Table 6.13. We found that there was a statistically significant difference between the agro-ecological zones in the multidimensional poverty index (F (2) = 6.04, p 0.0026). We reject the null hypothesis and accept the alternative hypothesis since the F test statistic's p-value is less than a significance level of 0.01. The difference between the three agro-ecological zones for the multidimensional poverty index is real, not arbitrary (Bevans, 2022).

Table 6-13: Analysis of variance in MPI between agro-ecological zones

Variation in multidimensional poverty based on agro-ecology					
Source	SS	Df	MS	F	Prob > F
Between agro-ecologies	0.247	2	0.123	6.04	0.0026
Within agro-ecology	7.776	381	0.020		
Total	8.023	383	0.0210		

Source: Own survey result, 2021

6.5. Conclusions and Recommendations

Poverty is the most serious threat to the economy and peoples of developing countries such as Ethiopia. A number of rural-households in the study area see rural-urban migration as a way out of poverty. The findings of this study indicate that rural-urban migration has a significant impact on reducing multidimensional poverty among rural households in the study area. The contribution of rural households to overall multidimensional poverty varies greatly depending on migration status and agro-ecological zones. Except for child education, migrant-sending households outperformed with all other indicators of multidimensional poverty. This study confirmed that the number of migrants, household size, household head's education level, and livestock ownership are the major determinants of multidimensional poverty in the study area. Development planners must mainstream rural-urban migration and focus on intensity rather than on the headcount ratio so as to reduce multidimensional poverty more effectively. It is critical for poverty alleviation strategies to encourage potential migrants to create appealing livelihood opportunities in rural areas and to suggest that they invest in overlapping deprivations. This study also encourages stakeholders to actively participate in societal training and awareness rising about the factors that contribute to multidimensional poverty in the study area.

CHAPTER SEVEN: SYNTHESIS

7.1 General discussion

This dissertation examined the relationships between rural-urban migration, crop productivity, and multidimensional poverty in three agro-ecological zones. It provided analytical data pertaining to four major research questions. (1) What drives the high rate of rural-to-urban migration in the study area? (2) Does rural-urban migration increase the technical efficiency and total factor productivity of migrant-sending households'? (3) Is the transferred remittance feasible to secure the livelihood of migrant-sending households? (4) Can rural-urban migration help reduce the multidimensional poverty of migrant-sending households? A mixed research design is used to address the above-mentioned research questions. 384 households are randomly selected in three agrological zones for the unit of analysis and the required cross-sectional data were gathered from them.

The factors that contributed to the higher rate of rural-urban migration were identified in the dissertation using the endogenous ivprobit regression model. The model's findings showed that factors such as family size, information access, the number of farmed fields, soil fertility problems, distance from the nearest town, and distance from the FTC all have a significant effect on rural-urban migration. Out of these, the size of the livestock holding, the number of cultivated fields, and the proximity to the neighboring town were negatively related to rural-urban migration, but the other pertinent variables were positively associated with it. Furthermore, the qualitative sessions identify rural disadvantages, success stories, social networks, and land values as the main forces behind rural-urban migration. The study examined the level of technical efficiency score, the variables that affect it, the impacts of rural-urban migration on technical efficiency, and the total factor productivity of rural households in response to the second research question using stochastic frontier, PSM, and OLS models. For estimating the frontiers and determinants of technical efficiency, a stochastic frontier model was used in a one-step technique. The estimated frontiers were being used to calculate the household's technical efficiency score. Non-migrant households were more technically efficient than migrant-sending households, according to the findings. The mean technical efficiency of non-migrant households, migrant-sending households, and aggregate samples is 45.5 percent, 72.3 percent, and 57.4 percent, respectively. In non-migrant households, migrant-sending households, and the pooled sample, respectively, there is a 54.5%, 27.5%, and 42.6% possibility of increasing crop output while utilizing the same inputs. The average household in the pooled data could reach the most efficient frontier's TE (0.894) by reducing input or raising output by 35.79 percent (1-(0.574/0.894)). To achieve their most efficient equivalents, average households in the migrant-sending and non-migrant sample households are expected to reduce input or improve crop output by 49.1 % and 19.13 %, respectively. Technical efficiency and TFP ratings varied throughout the three agro-ecological zones, with lower scores in the midland and greater values in the lowland. The mean households' technical efficiency in the lowland and midland agro-ecological zones was 68% and 51.5%, respectively. There is a likelihood of 38%, 48.5%, and 46%, respectively, of boosting crop output by utilizing the same inputs in the lowland, midland, and highland agro-ecological zones. The mean total factor productivity for migrant-sending households, non-migrant households, and pooled samples was 9.87, 10.23, and 10.03, respectively, and for highland, midland, and lowland households it was 9.21, 9.05, and 9.46, respectively, according to the OLS results. The results of the technical inefficiency model show that the age of the household head and distance to the nearest town have a negative impact on farm technical inefficiency, whereas education, soil fertility problem, migration experience, and distance to the nearest market have a positive impact. The average effect of rural-urban migration on the technical efficiency of migrant-sending households was 19.4 percent, according to the propensity score matching model.

By quantifying the depth of multidimensional poverty and drawing conclusions about the impact of rural-urban migration from it, the last study issue was resolved. In the investigation, a generalized version of the Alkire and Foster model was used to compute the multidimensional poverty index; a probit model was used to assess the determinants of multidimensional poverty; and a propensity score matching model was used for impact analysis. The indices of multidimensional poverty differed among categories of households and agro-ecological zones, supporting earlier findings from migration studies. The adjusted headcount ratio in non-migrant households, migrant-sending households, and the general population was 19.8%, 10.5%, and 15.7%, respectively, according to the multidimensional poverty index result. Poverty was found in 43.5 percent of non-migrant households and 25.6 percent of migrant-sending households. In the weighted measures, the average deprivation share of poor people in migrant-sending and non-migrant households was 41 percent and 43.5 percent, respectively. Non-migrant households and migrant-sending households contributed 70.5% and 29.5%, respectively, to the adjusted headcount ratio. The adjusted headcount ratio was 24.6%, 21.9%, and 28.1% for the highlands, midlands, and lowlands' agro-ecologies, respectively. Multidimensional poverty was higher in the lowland zone when compared to other agro-ecological zones. However, there was a reverse migration rate in the three agro-ecological zones. Midland agro-ecological zones had higher migration rates and lower rates of multidimensional poverty; whereas lowland agro-ecological zones had lower migration rates but higher rates of multidimensional poverty. The results of the probit regression model show that household size, number of migrants, the education of the household head, and livestock ownership all have a substantial impact on the multidimensional poverty of rural households in the research area. Multidimensional poverty has been greatly reduced as migrant numbers and livestock holdings have increased. At the 1% significance level, household size and education of the household head had a beneficial effect on the state of multidimensional poverty. Average multidimensional poverty reduction in households sending migrants was 4.3% as a result of rural-urban migration.

7.2 Conclusion

Ethiopia is a developing country where poverty is a major issue for both the economy and the people. Among the various forms of internal migration, many rural households across the country are considering rural-to-urban migration as a solution to the problem. Because it boosts rural household income and expenditure, which is the springboard for the expansion of many urban-based enterprises, a balanced rural development strategy involves good management of rural-urban migration and equitable sharing of its advantages among the rural population. Policies on human and natural resource development constantly require research findings to position rural livelihoods and the rural economy in the context of the greater area. This dissertation offers a thorough analysis of ex-ante and the ex-post circumstances of rural-urban migration in three agro-ecological zones in the Gurage zone of Ethiopia. According to the dissertation's findings, the rural-urban migration patterns that are now occurring in the research area are a result of a number of institutional, social, economic, and demographic factors. Livestock holding, family size, access to multiple information assets, the size of cultivated fields, soil quality, distance to the nearest town, and proximity to the farmer training centers are some of the significant drivers identified in this dissertation. This dissertation also asserts that rural-urban migration has a variety of implications for crop production and multidimensional poverty reduction. The investigation supports both the positive impacts of rural-urban migration on reducing poverty and securing household livelihoods, as well as the negative impact on technical efficiency and total factor productivity. Its average benefits on the livelihood security and multidimensional poverty reduction of households sending migrants were 4.7% and 13.64.7%, respectively. The technical efficiency and total factor productivity of households who send migrants are, nevertheless, reduced by, respectively, 26.8% and 38% when compared to those that do not send migrants. Besides, the average negative of rural-urban migration on the technical efficiency of migrant-sending households is 19.4%. The results of this dissertation generally imply that rural-urban migration in the Gurage zone of Ethiopia is influenced by a variety of factors and that it positively affects rural livelihood security and multidimensional poverty reduction while negatively affecting crop producers' technical efficiency and total factor productivity. Therefore, a number of policies and strategies based on the variables that were determined to have a significant impact on it must be implemented.

7.3 Recommendations

Based on the results of this empirical study, the following lists of suggestions are given to stakeholders in order to maximize the benefits of rural-urban migration and lessen its drawbacks.

- To alter the unfavorable conditions affecting rural-urban migration, all stakeholders in the study area, including migrants, must actively participate. This involves developing or implementing appropriate policies and strategies that help farmers, especially migrant-sending households. This may entail advising migrant-sending households to efficiently utilize the limited available resources, expand their crop fields, and making an effort to improve soil quality using integrated soil management techniques that increase soil productivity while also improving the household's economic, environmental, and social well-being.

- Crop-producers' technical efficiency and total factor productivity are projected to suffer as a result of rural-urban migration. Policies aiming at increasing crop output and technical efficiency should take into account issues like how to make up for lost labour and how to make the greatest use of limited and idle resources in the study area, particularly on farms owned by migrant-sending households. To do so, the relevant body must promote greater use of improved seeds and automation technologies in the study area, particularly in the cropland of migrant-sending households, in order to assure short and long-term crop production efficiency and total factor productivity. The actual action of the concerned body is also relevant in the areas of land resource management and agricultural-extension service provision. This could include; launching cluster or contract farming to make use of empty cropland; strengthening monitoring and evaluation systems to persuade farmers to use full extension services; improving input supply and distribution networks for major commodities; and opening up new investment areas to attract investors.

- Maximizing migrant remittances' productivity is essential since it helps to secure rural livelihoods and fight poverty. For this, appropriate remittance sending methods must be chosen, and recipients of remittances must be given management instructions. Encouraging and advising migrants to send kind remittances as compared to cash remittances to their families in order to boost productivity. A further priority in reducing excessive cash transfer waste is assisting households in turning their financial funds into physical assets. Given the benefits of physical assets, such as extending livelihoods, diversifying household risk, reducing multidimensional poverty, and allowing migrants to use the assets during future crises, they can also be used as collateral for borrowing money from financial institutions. It's also critical to make appropriate use of remittance investment as a mechanism for building rural-urban ties. If this is the case, it is more likely to benefit rural development since it expands a variety of income opportunities and market prospects in the sending areas. This is especially true since people and good flows frequently have a favorable impact on the growth of potential local markets at the receiving end. It may be possible to define policy and project objectives in the studied area by recognizing this potential and concentrating on rural-urban links.

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APPENDIX: DATA COLLECTION TOOLS

8.1 Survey questionnaire

8.1.1. Interview questions for sample households

This interview schedule is primarily intended to collect information on the state of labor migration from rural to urban areas, as well as its impact on crop productivity and household poverty in the Gurage zone. Your responses are critical to the study's success; therefore, you are kindly requested to be open and honest in answering the questions and expressing your opinions. You can be confident that your name or any other specific information you provide will be used for no other purpose than increasing knowledge about labor migration from rural to urban areas and its impact on crop productivity and household poverty, as well as providing relevant recommendations in accordance with each issue. We appreciate your cooperation ahead of time!

Site of Research: Region: SNNP, Zone: Gurage

District: ————————; Administration of Kebele: ——————

Full name of the interviewer: ——————; Date of Interview: ———

A. The demographics of the household head and the household members

1) Sex of the household head: ☐ Male ☐ Female

2) Age of the household head----------

3) Marital status of the household head: ☐ Single ☐ Married ☐ Other

4) Can the head read and write? ☐Yes ☐ No

5) If yes to question 4, indicate the highest grade level completed----------------------

6) Ethnicity of the head: ☐ Gurage ☐ Amhara ☐ Kebena ☐Marko ☐ Other

7) Religion of the head:- ☐ Orthodox ☐ Muslim ☐ Protestant ☐ Other----

8) Occupation of the household head?

- ☐ On farm work only
- ☐ Off-farm work only
- ☐ Non-form work only
- ☐ On farm and off-farm work
- ☐ On farm and non-farm work
- ☐ Off-farm and non-farm work
- ☐ On farm + off-farm + non-farm work

9) How much farming experience do you have? ------------------------

10) What was the source of household income in the previous year? Please double-check the source and amount.

Source	Amount (birr value)
Sale of crop and livestock	
Remittance	
Wage income	
Monthly salary	
Pension	
Other	
Total	

11) Total size of the household---------------

a) Children (under 15 years) Male:____, Female:___ total -------

b) Active members (15-64 years); Male:___, Female: ___ total------

c) Old members (+ 64 years old) Male:____, Female:____ total____

12) Number of children that died under the age of five in the household (if any):

Male: ____Female: ___; Total _____

13) Household members' educational level:

a) No formal education; Male____; Female: ___; Total____

b) Primary education; Male_____; Female____; Total_____

c) Lower secondary education; Male____; Female____; Total ____

d) Upper secondary education; Male____ Female____ Total _____

e) Tertiary education; Male____ Female___ Total ____

14) Employment status of the household members:

a) Employed; Male___; Female____; Total ___

b) Unemployed; Male____; Female___; Total ___

c) Self-employed; Male____; Female___; Total ___

d) Student; Male____; Female___; Total ___

e) Housewife; No _______

f) Laborer; Male___; Female___; Total ___

g) Inactive (retired and child); Male____; Female___; Total ___

B. Migration information (For migrant sending households only except Q15)

15) Is there a migrant member of the household? Yes ☐ No ☐

16) If you answered yes to question 15, how many of your household members have migrated?

Male-------Female-------Total----

17) Who is the primary decision-maker in the household for migration?

- ☐ The migrant him/her self
- ☐ Decided collectively
- ☐ Head of the household
- ☐ Other specify-----------------

18) What factors did the household consider when deciding on a migration destination area?

- ☐ The presence of known individuals
- ☐ Availability of employment
- ☐ Distance to family
- ☐ Costs of travel to family
- ☐ Prior knowledge of the location
- ☐ Other, please specify

19) What is/are the causes of migration? (More than one response is possible)

- ☐ Look for work.
- ☐ Land scarcity
- ☐ Soil infertility
- ☐ Credit/capital scarcity
- ☐ Poor crop yield
- ☐ Due to a lack of infrastructure
- ☐ Unemployment
- ☐ Inadequate educational services
- ☐ Drought/famine
- ☐ Concerns about health
- ☐ Other, please specify

20) Have the household faced difficulties as migrants were sent?

☐ Yes ☐ No

21) If you answered yes to question 20, what kind of difficulties did the family face? (More than one response is possible)

- ☐ Labor scarcity
- ☐ Migrant financing
- ☐ Activation burden
- ☐ Responsibility shifts
- ☐ Others, please specify-------------------------

22) How important do you believe remittances are in the household?

- ☐ Extremely important
- ☐ Very important
- ☐ Moderately important
- ☐ Less important

23) The majority of migrant remittances in the household are allocated to:

- ☐ Consumption
- ☐ Saving
- ☐ Investment

24) What type of consumption is primarily supported by remittances in the household?

- ☐ Food, clothing, and shelter
- ☐ Electricity
- ☐ Social safety net
- ☐ Time for recreation
- ☐ Others, please specify-------------------------

25) List all things and the benefits brought back to the household by the migrant.

----

26) Please provide the necessary information (profiles of migrant household members) in accordance with the table below.

No	Sex	Age	Marital status	Year of departure	Destination area	Season of migration	Migration pattern	Highest level of education		Employment status		Self-employment by sector	Frequency of return	Remittance		
								Before move	currently	Before move	currently			Type	Amount	Way of transfer
1																
2																
3																
4																
5																
6																
7																
8																
9																

Key:

Season of migration: - a) agricultural peak periods b) off-season and/or school vacation c) all season

Migration pattern: - a) Temporary b) Permanent

Level of education: - a) No formal education b) Primary c) Lower secondary d) Upper secondary e) Tertiary education

Employment status: - a) Employed b) Unemployed c) Self-employed d) Employer e) Student f) other-----------

Self-employment by sector: - a) transport b) shop/ boutique c) café/ bar/ restaurant d) Street Vender e) other -------------

Frequency of return: - a) Every four month b) twice a year c) once a year d) Occasionally e) other specify ----

Type of remittance: - a) Cash b) Consumable and/or farm supplies c) Both

Way of remittance transfer: a) Through bank b) through messenger c) The migrant brings him/her self d) other specify------------------------

C. Information on crop cultivations

27) How large is the overall amount of your land in hectare? ------------------------------

28) How much land have you grown on? (actual in hectare)______________

29) How many fields are you growing on average?

30) Do the household have irrigable land? yes ☐ no ☐

31) How many cycles do you have growing annually? ______________________

32) How long is each growth cycle going to last? ___________________________

33) What is the peak month/s for cultivation? ________________________________

34) What crops have you cultivated and how much revenue was generated in the last farming season? In the following table, give your reply

No	**Types of crops**	**Hectare used**	**Quantity harvested In Quintal**	**Quantity Sold in Quintal**		
				Amount	Unit price	Value
Cereal crops						
34.01	Teff					
34.02	Wheat					
34.03	Maize					
34.04	Barely					
34.05	Sorghum					
Oil and pulse						
34.06	Chickpea					
34.07	Bean					
34.08	Pea					
Fruit & vegetable						
34.09	Papaya					
34.10	Mango					
34.11	Avocado					
34.12	Orange					
34.13	Apple					
34.12	Cabbage					
34.15	Banana					
34.16	Tomato					
34.17	Pepper					
34.18	Coffee					
34.19	Onion					
34.20	Garlic					
Roots and tuber						
34.21	Enset					
34.22	Potato					

34.23	Sweet potato					
Nonfood crops						
34.24	Chat					
34.25	Eucalyptus					
Other crops						
34.26						
34.27						
34.28						
Total						

35) How do you meet the household's needs of the main food crops in the current situation?

☐ Only from my own harvest

☐ Only through marketing (buying)

☐ Proportionate (marketing and own harvest)

☐ The largest portion is derived from own produce, while the smaller portion is derived from marketing.

☐ The largest portion by marketing and the smallest portion from own produce

36) What were the most significant challenges you faced during crop production in previous years? Several responses are possible.

☐ Labor scarcity

☐ Inadequate credit

☐ Land scarcity

☐ A scarcity of improved seed and fertilizer

☐ Infrastructural problem (road & market)

☐ A scarcity of farm tools

D. Information on multidimensional poverty indicators

37) Indicators of the education dimension

37.1 Is the household head is literate? 1) yes 0) no

37.2 Do all school age children (7-15 ages) attend their education? (1) yes (0) no

37.3 Is there any adult household members (15 years and above) complete secondary education and access tertiary education? 1) yes 0) no

38) The indicators to be included in health dimension

38.1 Does the household have access to a health clinic? 1) yes 0) no

38.2 The household has not faced a child loss previously? 1) yes 0) no

38.3 Does the household able to meet its food needs? 1) yes 0) no

38.4 Household does not have any disabled or seriously ill household head 1) yes o) no

38.5 How is the household health in general? (a) Excellent (b) Very good (c) Good (d) Fair (e) Poor

39) Indicators of the housing dimension

39.1Is the floor of the house is dirt? 1) yes 0) no

39.2 Is the wall of the house made up of cement? 1) yes 0) no

39.3 Is the roof of the house made up of corrugated iron? 1) yes 0) no

39.4 Is the floor of the house made up of cement? 1) yes 0) no

39.5 Does the door of the house made up of grille? 1) yes 0) no

39.6 Does the house have more than two rooms 1) yes 0) no

39.7 Does the house have kitchen inside/outside 1) yes 0) no

40) The indicators to be included in the living standards dimension

40.1 Does the household have access to electricity? 1) yes 0) no

40.2 Does the household have access to improved drinking water sources (pipe,) which is less than 30- minute walk from home? 1) yes 0) no

40.3 Does the household have access to household level toilet? 1) yes 0) no

40.4 Does the household use electricity other than solid fuel for cooking? 1) Yes 0) no

40.5 Does the household have any two or more of the assets that allow access to information (radio, TV, telephone)? 1) yes 0) no

40.6 Does the household have any one of the assets that support mobility (bicycle, motorcycle, Bajaj, car, truck, animal cart)? 1) yes o) no

40.7Do the household own more than one livelihood asserts (refrigerator, bed or mattress)? 1) Yes 0) no

8.1.2 Interview questions for key informants

This interview is primarily intended to collect data for a PhD project on the state of labor migration from rural to urban areas in the Gurage zone. The proposed research will investigate the causes of rural-urban migration and analyze the impact of rural-urban migration on crop productivity and rural household poverty in the area. Your knowledge and the themes that emerge from the interview process will be extremely useful in developing a clear picture of the issue. We hope you will agree to be interviewed as an individual or as part of a key informant group. Please feel free to discuss the issues raised, as your responses in the interview will be kept strictly confidential.

A. General information

Item	Response (Fill non shaded spaces or circle the option that applies)	Remark
Enumerator	Name: Signature:	
Date of Interview	Time: Day: Month:	
Province Name	Gurage zone	
District Name		
Kebele Administration Name		
Category of Key Informant	1) Migrants 2) Community Leader/ Local government representative	

B. *Questions raised to the interviewed migrants*

1. What causes youth migration?
2. What are your thoughts on the specific challenges that rural migrants face in their destination?
3. How do new migrants look for work?
4. Can you tell me about your migration experience?
5. What advice do you have for rural youth and aspiring migrants?
6. What advice do you have for the government on migration?
7. Could you say something other than the queries asked about migration?

C. *Questions raised to the officials*

1. How do you see the phenomenon and magnitude of rural-to-urban labor migration in your area?
2. What group of people is most affected by migration?
3. What are the main drivers you observed for the migration of individuals from rural to urban areas?
4. In terms of rural-urban migration, are you an optimist or a pessimist?

5. How can you compare crop output in your community between migrant-sending and non-migrant households?
6. How can you compare the poverty levels of migrant-sending households and non-migrant households in your community?
7. What are the disadvantages of rural-to-urban labor migration to the community (if any)?
8. 8. What recommendations do you have for rural-to-urban labor migration in order to develop a viable livelihood strategy in your community?
9. Could you elaborate on anything other than the aforementioned issues concerning rural-urban migration?

8.2 List of tables in the appendix

Appendix Table 1: Ivprobit model output with marginal effect

Probit model with endogenous regressors   Number of obs = 384
Wald chi2(11) = 339.00
Log likelihood = -886.3827   Prob > chi2 = 0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
TLU	-.5344075	.0545818	-9.79	0.000	-.6413858	-.4274292
HEADAGE	.0070032	.00695	1.01	0.314	-.0066186	.020625
EDUHEAD	-.0076663	.0144109	-0.53	0.595	-.0359111	.0205785
FSIZE	.2093848	.058297	3.59	0.000	.0951249	.3236448
LSIZE	-.0218274	.0905785	-0.24	0.810	-.1993579	.1557032
ACCINFO	.695853	.1294205	5.38	0.000	.4421934	.9495126
Nfields	.1283609	.0604703	2.12	0.034	.0098414	.2468804
SOILINFER	.3150769	.1553491	2.03	0.043	.0105982	.6195557
Towndistance	-.0370019	.015803	-2.34	0.019	-.0679751	-.0060287
Schdistance	.0246911	.0262156	0.94	0.346	-.0266907	.0760728
FTCdistance	.0892027	.0429323	2.08	0.038	.0050569	.1733486
_cons	-1.182607	.7153226	-1.65	0.098	-2.584613	.2193996
/athrho	1.32351	.2768304	4.78	0.000	.7809319	1.866087
/lnsigma	.4333849	.0360844	12.01	0.000	.3626608	.504109
rho	.8676541	.068426			.6532413	.9532381
sigma	1.54247	.0556591			1.437148	1.65551

Instrumented: TLU
Instruments: HEADAGE EDUHEAD FSIZE LSIZE ACCINFO Nfields SOILINFER Towndistance Schdistance FTCdistance Agecology

Wald test of exogeneity (/athrho = 0): chi2(1) = 22.86 Prob > chi2 = 0.0000

. margins, dydx(*) predict(pr)

Average marginal effects   Number of obs = 384
Model VCE : OIM

Expression : Probability of positive outcome, predict(pr)
dy/dx w.r.t. : TLU HEADAGE EDUHEAD FSIZE LSIZE ACCINFO Nfields SOILINFER Towndistance Schdistance FTCdistance Agecology

	dy/dx	Delta-method Std. Err.	z	P>|z|	[95% Conf.	Interval]
TLU	-.1533994	.0167955	-9.13	0.000	-.186318	-.1204807
HEADAGE	.0020102	.0019701	1.02	0.308	-.0018511	.0058716
EDUHEAD	-.0022006	.0041437	-0.53	0.595	-.0103221	.0059209
FSIZE	.060103	.0155495	3.87	0.000	.0296265	.0905795
LSIZE	-.0062654	.0259127	-0.24	0.809	-.0570535	.0445226
ACCINFO	.1997416	.0354402	5.64	0.000	.13028	.2692031
Nfields	.0368454	.0172946	2.13	0.033	.0029486	.0707423
SOILINFER	.0904415	.0433056	2.09	0.037	.005564	.1753189
Towndistance	-.0106212	.00448	-2.37	0.018	-.0194019	-.0018405
Schdistance	.0070875	.0075732	0.94	0.349	-.0077558	.0219307
FTCdistance	.0256053	.0120593	2.12	0.034	.0019695	.049241
Agecology	0	(omitted)				

Appendix Table 2: Estimates of the continuous treatment regression model

```
. xi: ctreatreg LHI treatment HEADAGE LSIZE FSIZE Gender Nmigrants TLU SOILINFER Agecology,graphate graphdrf delta(
> 10) hetero ( FSIZE TLU)model(ct-ols) ct (Dose) m(3)ci(5)s (25)

macros:
          r(output) : "Tw_1 Tw_2 Tw_3"
```

Source	SS	df	MS
Model	3.54673279	14	.253338057
Residual	8.85499892	369	.023997287
Total	12.4017317	383	.032380501

Number of obs =	384
F(14, 369) =	10.56
Prob > F =	0.0000
R-squared =	0.2860
Adj R-squared =	0.2589
Root MSE =	.15491

LHI	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
treatment	.1098982	.042793	2.57	0.011	.0257494	.194047
HEADAGE	-1.08e-06	.0008009	-0.00	0.999	-.001576	.0015738
LSIZE	.0249765	.0083646	2.99	0.003	.0085283	.0414248
FSIZE	-.0276813	.0083261	-3.32	0.001	-.0440538	-.0113088
Gender	-.0096707	.0207129	-0.47	0.641	-.0504009	.0310595
Nmigrants	.0205404	.013288	1.55	0.123	-.0055893	.0466701
TLU	.0162721	.0070237	2.32	0.021	.0024607	.0300835
SOILINFER	.0121026	.0174319	0.69	0.488	-.0221758	.0463809
Agecology	-.0036058	.0119564	-0.30	0.763	-.0271171	.0199055
_ws_FSIZE	.0143642	.0116471	1.23	0.218	-.0085389	.0372672
_ws_TLU	.0005248	.0094823	0.06	0.956	-.0181213	.0191709
Tw_1	.0029182	.0044902	0.65	0.516	-.0059113	.0117478
Tw_2	-.0000654	.0001131	-0.58	0.564	-.0002878	.0001571
Tw_3	5.25e-07	8.23e-07	0.64	0.524	-1.09e-06	2.14e-06
_cons	.7842208	.0716039	10.95	0.000	.6434178	.9250238

Source: Own survey result, 2021

Appendix Table 3: Probit model output with marginal effects for the determinants of poverty

```
. probit Poverty Migrants hhsize Edulevel Gender TLU Soilinfer2

Iteration 0:   log likelihood = -240.04991
Iteration 1:   log likelihood = -210.85647
Iteration 2:   log likelihood = -210.70701
Iteration 3:   log likelihood = -210.70697
Iteration 4:   log likelihood = -210.70697

Probit regression                               Number of obs   =        384
                                                LR chi2(6)      =      58.69
                                                Prob > chi2     =     0.0000
Log likelihood = -210.70697                     Pseudo R2       =     0.1222
```

Poverty	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Migrants	-.0900571	.0488855	-1.84	0.065	-.1858709	.0057566
hhsize	.1738669	.0507218	3.43	0.001	.0744541	.2732798
Edulevel	.0534579	.0179184	2.98	0.003	.0183384	.0885774
Gender	.2911225	.2073578	1.40	0.160	-.1152912	.6975363
TLU	-.1064683	.0405467	-2.63	0.009	-.1859384	-.0269981
Soilinfer2	.0252202	.1509285	0.17	0.867	-.2705942	.3210345
_cons	-1.414831	.3710208	-3.81	0.000	-2.142018	-.6876431

```
. margins, dydx( Migrants hhsize Edulevel Gender TLU Soilinfer2)

Average marginal effects                        Number of obs   =        384
Model VCE    : OIM

Expression   : Pr(Poverty), predict()
dy/dx w.r.t. : Migrants hhsize Edulevel Gender TLU Soilinfer2
```

	dy/dx	Delta-method Std. Err.	z	P>|z|	[95% Conf.	Interval]
Migrants	-.0280533	.0150228	-1.87	0.062	-.0574975	.0013909
hhsize	.0541605	.0151703	3.57	0.000	.0244273	.0838937
Edulevel	.0166524	.0053941	3.09	0.002	.0060802	.0272247
Gender	.0906862	.0641047	1.41	0.157	-.0349567	.2163291
TLU	-.0331654	.0123881	-2.68	0.007	-.0574456	-.0088853
Soilinfer2	.0078562	.0470176	0.17	0.867	-.0842967	.1000091

Source: Own survey result, 2021

Appendix Table 4: The continuous treatment regression model output

```
. xi: ctreatreg LHI treatment HEADAGE LSIZE FSIZE Gender Nmigrants TLU SOILINFER Agecology,graphate graphdrf delta(
> 10) hetero ( FSIZE TLU)model(ct-ols) ct (Dose) m(3)ci(5)s (25)

macros:
            r(output) : "Tw_1 Tw_2 Tw_3"
```

Source	SS	df	MS
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Residual	8.85499892	369	.023997287
Total	12.4017317	383	.032380501

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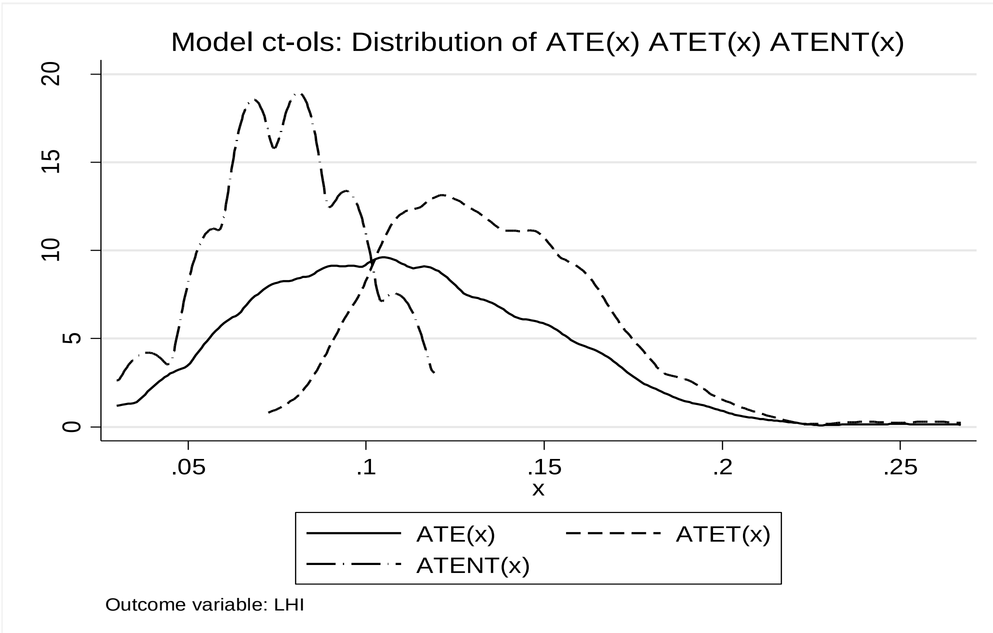
Prob > F	= 0.0000
R-squared	= 0.2860
Adj R-squared	= 0.2589
Root MSE	= .15491

LHI	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
treatment	.1098982	.042793	2.57	0.011	.0257494	.194047
HEADAGE	-1.08e-06	.0008009	-0.00	0.999	-.001576	.0015738
LSIZE	.0249765	.0083646	2.99	0.003	.0085283	.0414248
FSIZE	-.0276813	.0083261	-3.32	0.001	-.0440538	-.0113088
Gender	-.0096707	.0207129	-0.47	0.641	-.0504009	.0310595
Nmigrants	.0205404	.013288	1.55	0.123	-.0055893	.0466701
TLU	.0162721	.0070237	2.32	0.021	.0024607	.0300835
SOILINFER	.0121026	.0174319	0.69	0.488	-.0221758	.0463809
Agecology	-.0036058	.0119564	-0.30	0.763	-.0271171	.0199055
_ws_FSIZE	.0143642	.0116471	1.23	0.218	-.0085389	.0372672
_ws_TLU	.0005248	.0094823	0.06	0.956	-.0181213	.0191709
Tw_1	.0029182	.0044902	0.65	0.516	-.0059113	.0117478
Tw_2	-.0000654	.0001131	-0.58	0.564	-.0002878	.0001571
Tw_3	5.25e-07	8.23e-07	0.64	0.524	-1.09e-06	2.14e-06
_cons	.7842208	.0716039	10.95	0.000	.6434178	.9250238

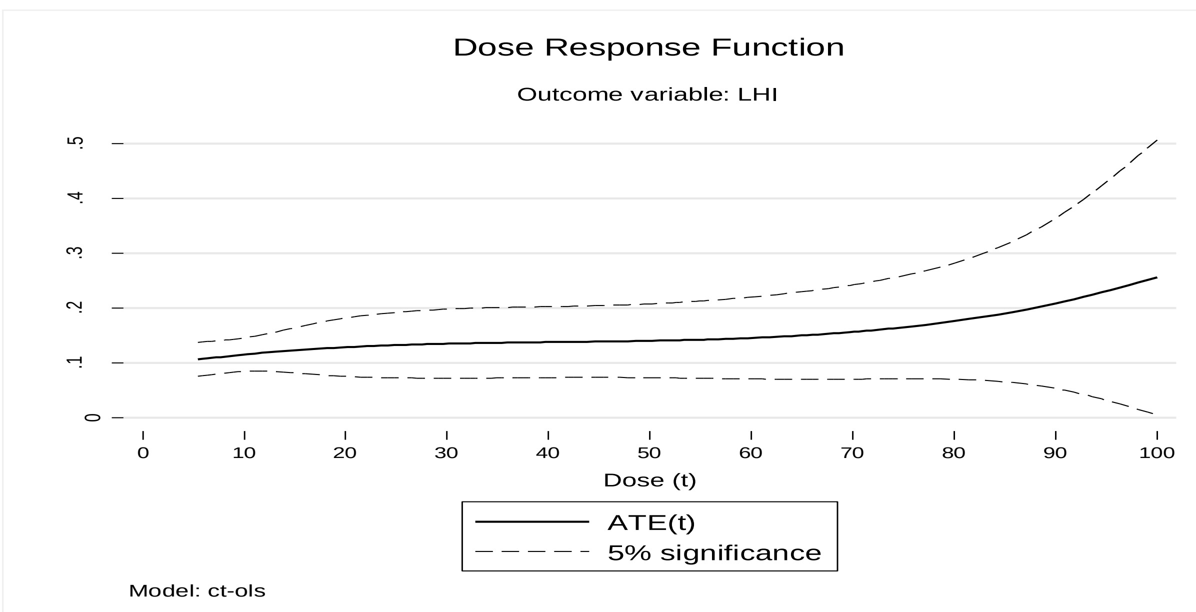
Source: Own survey result, 2021

8.3 List of figures in the appendix



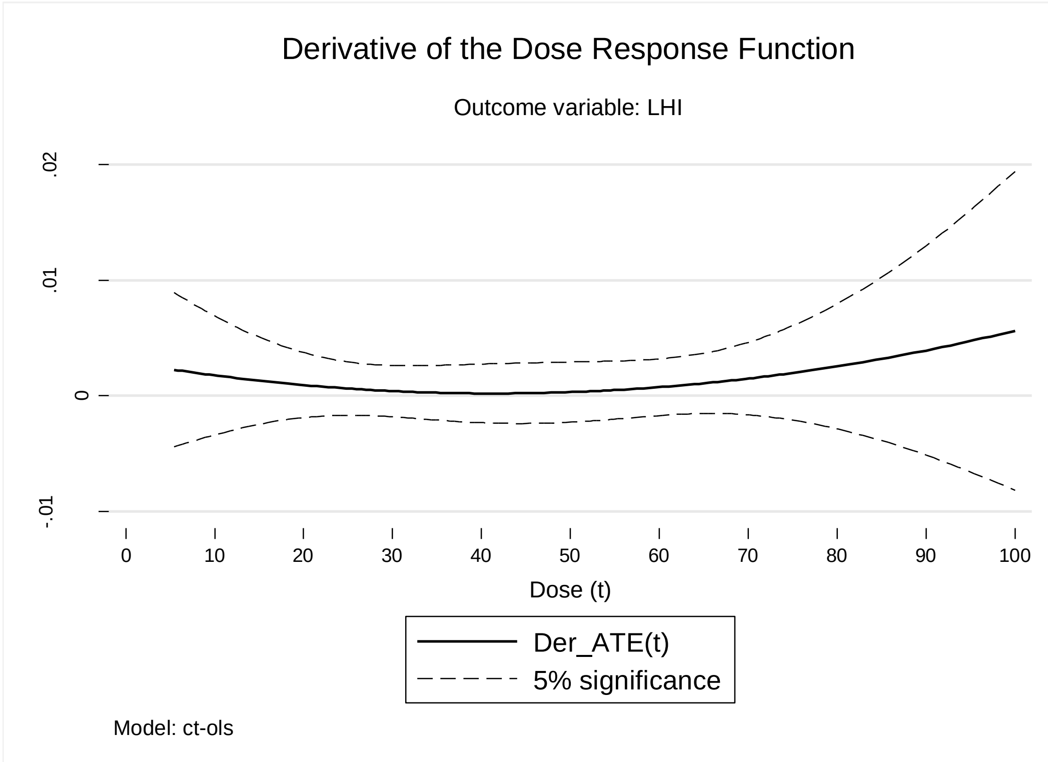
Appendix Figure 1: Distribution of ATE(x) ATET(x) ATENT(x)

Source: Own survey result, 2021



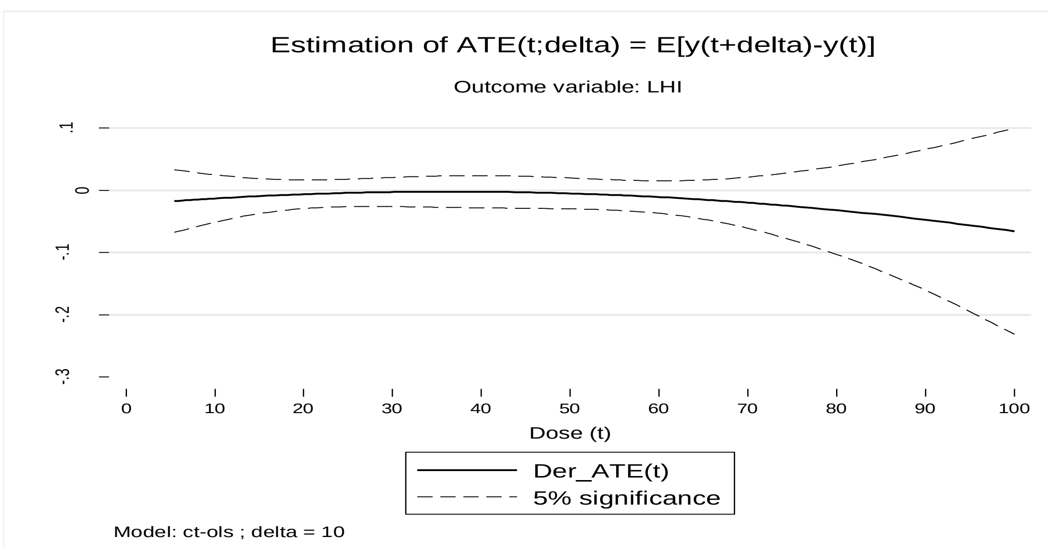
Appendix Figure 2: Dose Response Function

Source: Own survey result, 2021



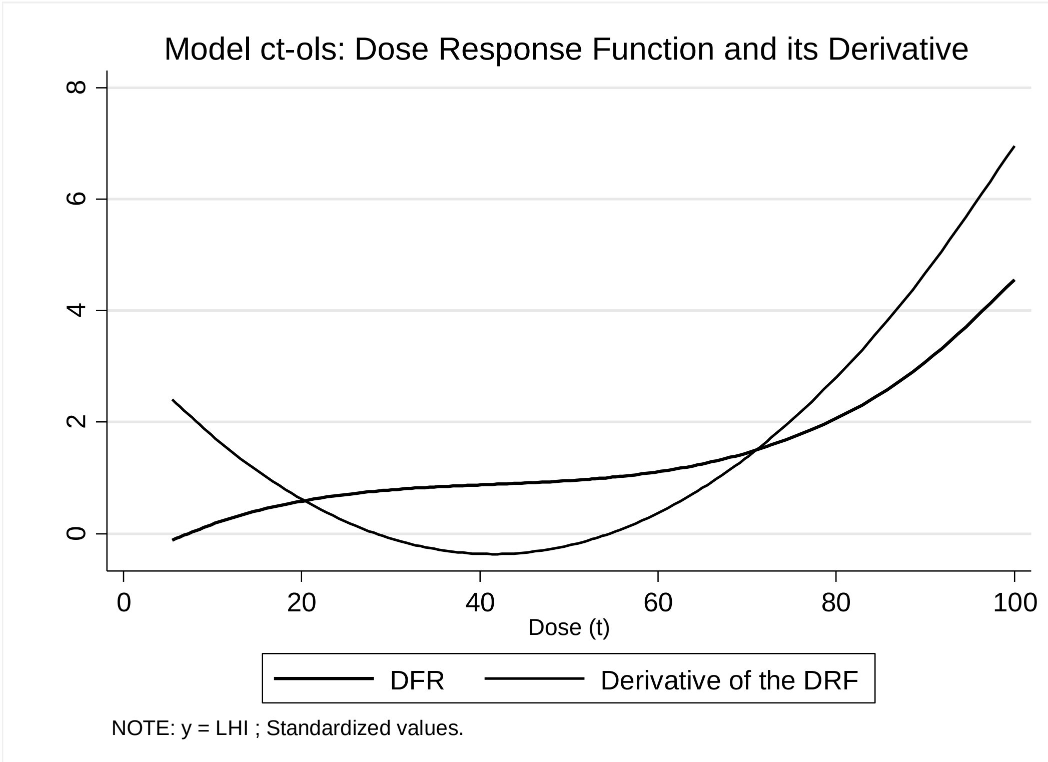
Appendix Figure 3: Derivatives of the Dose Response Function

Source: Own survey result, 2021



Appendix Figure 4: Estimation of ATE (t; delta) = E(y (t+delta)-y (t))

Source: Own survey result, 2021



Appendix Figure 5: Dose Response Function and Its Derivative

Source: Own survey result, 2021