



**Rural Livelihood Diversification and Its Contribution to Child Poverty
Reduction in Ethiopia: The Case of West Arsi Zone, Arsi Negele Woreda,
Oromia Region**

Bogale Gebeyehu

**A Dissertation Submitted to the Center for Rural Development, College of
Development studies**

**Presented in Fulfillment of Requirements for the Degree of Doctor of
Philosophy in Development Studies (Rural Development)**

Addis Ababa University

Addis Ababa, Ethiopia

June 2024

**Addis Ababa University
School of Graduate Studies
College of Development Studies**

**Rural Livelihood Diversification and Its Contribution to Child Poverty
Reduction in Ethiopia: The Case of West Arsi Zone, Arsi Negele Woreda,
Oromia Region Ethiopia**

Bogale Gebeyehu

**A Dissertation Submitted to the Center for Rural Development, College of
Development studies**

**Presented in Fulfillment of Requirements for the Degree of Doctor of
Philosophy in Development Studies (Rural Development)**

Major Advisor: Bamlaku Alamirew (PhD, Associate Professor)

Co-advisor: Bezabih Emana (PhD)

**Addis Ababa University
Addis Ababa, Ethiopia
June 2024**

DISSERTATION APPROVAL
ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

This is to certify that a thesis prepared by Bogale Gebeyehu entitled: Rural Livelihood Diversification and Its Contribution to Child Poverty Reduction in Ethiopia: The Case of West Arsi Zone, Arsi Negele Woreda, Oromia Region Ethiopia, submitted in fulfillment of the requirements for the Degree of Doctor of Philosophy (Rural Development) complies with the regulations of the University and meets the accepted standards concerning originality and quality.

Signed by Examining Committee:

_____	_____	_____
Chair person, Examining Committee	Signature	Date
_____	_____	_____
External Examiner	Signature	Date
_____	_____	_____
Internal Examiner	Signature	Date
_____	_____	_____
Advisor	Signature	Date
_____	_____	_____
Advisor	Signature	Date

Chair of Department or Graduate program coordinator

Declaration

I, the undersigned, declare that this is my original work, has never been presented in this or any other University, and that all the resources and materials used for the dissertation, have been fully acknowledged.

Name: Bogale Gebeyehu

Signature: _____

Date: _____

This dissertation has been submitted for examination with my approval as university supervisor.

Supervisor Name: _____

Signature: _____

Date: _____

Supervisor Name: _____

Signature: _____

Date: _____

Abstract

The concept of livelihood diversification and its relationship with child poverty is a critical issue that affects many families and communities around the world. When considering the relationship between livelihood diversification and child poverty, it is important to recognize that the economic well-being of a household has a direct impact on the welfare of the children within that household. This study examines the status of livelihood diversification and its contribution to child poverty reduction in the Arsi Negele Woreda of Ethiopia. It explores the determinants of livelihood strategies, the state of child poverty, the linkages between household livelihood diversification and multidimensional child poverty, and the linkages between livelihood diversification and child dietary diversity. The study used a multistage sampling procedure to collect cross-sectional data using a semi-structured questionnaire. Household survey questionnaires, child dietary diversity questionnaires and key informant interviews were used to collect primary data from the total sample size of 401 households. STATA software version 16 and SPSS version 25 were used to analyze data. Descriptive and inferential statistics and econometric models were used to analyze data. The Simpson Diversity Index was used to measure the extent of livelihood diversification, and a multinomial logistic regression model was employed to identify the determinants of livelihood strategy choices. The multidimensional poverty measurement approach was used to analyze child poverty, with the multidimensional deprivation headcount measuring the number of children deprived in at least one-third of the weighted indicators. The ordered probit model was used to analyze the factors influencing children's dietary diversity. The descriptive results showed that the majority of households (56%) in the study area were engaged in highly diversified livelihood activities; while maize is the most important cereal crop, accounting for about 34% of crop production in the study area. Other major crops include wheat (31%), teff (22%), barley (3%), and sorghum (1%). The Simpson diversity index results showed that about 62% of households did not diversify their livelihoods while the remaining 38% of households were engaging in multiple livelihood activities. On-farm activities contribute the highest share (41.9%) to household livelihoods, followed by combinations of on-farm and non-farm (26.43%), and on-farm and off-farm (20.2%) activities. The result from the multidimensional poverty analysis showed that 85% of children from the sampled households were multidimensionally poor. Various factors were found to affect child dietary diversity. Children from female-headed households were less likely to consume a highly diverse diet, with a 37.5% lower probability of having high dietary diversity compared to those in male-headed households. Similarly, children from older households head have less probability of consuming a highly diversified diet. The study highlights the challenges and trade-offs associated with livelihood diversification, such as access to resources, market opportunities, and the potential for a lack of specialization. It also highlights the need for targeted policies and interventions to address the multidimensional nature of child poverty in Ethiopia, focusing on improving access to education, healthcare, nutrition, and basic services like water, sanitation, and energy. It is important to consider household livelihood strategies and socioeconomic characteristics when designing interventions to improve child nutrition and dietary diversity in rural Ethiopia.

Keywords: Livelihood strategies, livelihood diversification, multidimensional child poverty, child dietary diversity, probit model

Acknowledgments

Above all, I would like to thank my God whom all the powers and knowledge belong, who bestowed me strength and energy to finish this research work. Many people have stood by my side in many ups and downs from the time I started my coursework to the final research. Without the good will of God and the sincere support of people, this work would not have been completed in this form.

In the next place, my greatest thanks and heartfelt appreciation will go to my major advisor Dr. Bamlaku Alamire (PhD, CIPM, PMP, Associate Professor) for his unreserved devotion to his precious time and energy to comment, providing feedback, and encourage with fatherhood guidance to improve the overall progress of this research starting from the very inception of proposal writing up to the completion of the dissertation. I have learned and benefited a lot from his immense supervision research experiences and knowledge of Development study. I am also grateful to thank Dr. Bezabih Emana (PhD), co-advisor for his valuable and constructive comments, which enabled me to produce this thesis in its present shape and content. In general, without their guidance and professional expertise the completion of this work would not have been possible. I am also grateful to reviewers who read manuscripts that have been submitted and published, and submitted to journals for publication. Their feedback and suggestions helped strengthen the manuscripts.

My thanks also go to all my enumerators for their friendly cooperation and credibly interviewing lengthy interview schedules to collect required data under the conditions of limited transportation facility and sharing their precious time from professional duties to complete data collection on time. I would like also to thank all my sample respondents for their willingness to be interviewed and for giving genuine information that was input for this research.

By the end, the list would be enumerable if I mention all the names of those who directly or indirectly helped me through this journey from my teachers, friends, colleagues, and all those who helped me to learn lessons, I would like to thank all of them for their contributions.

Table of Contents

Abstract.....	v
Acknowledgments	vi
Table of Contents	vii
Lists of Tables.....	x
Lists of Figures	xi
Lists of Appendix Tables	xii
ACRONYMS AND ABBREVIATIONS.....	xiii
CHAPTER ONE: INTRODUCTION	1
1.1. Background and justification	1
1.2. Statements of the problem.....	5
1.3. Research question.....	8
1.4. Objectives of the study	9
1.5. Scope of the study	9
1.6. Significance of the study	10
1.7. Methodological approach.....	10
1.7.1. Description of the study area	10
1.7.2. Philosophical underpinnings	12
1.7.3. Types and sources of data	13
1.7.4. Sampling techniques and sample size determination.....	14
1.7.5. Methods of data collection.....	15
1.7.6. Methods of data analysis.....	15
1.8. Variable definitions and hypothesis	24
1.9. Concepts and theories of livelihood diversification, poverty, and multidimensional child poverty.....	49
1.9.1. Concepts of Poverty	49
1.9.2. Approaches to Multidimensional Poverty Assessment.....	51
1.9.3. Methods to (child) poverty measurements.....	53
1.9.4. Livelihood concepts, definitions, and approaches	55
1.9.5. Determinants of livelihood diversification	57
1.9.6. Empirical evidence on livelihood diversification and poverty reduction	58
1.9.7. Policy context of poverty in Ethiopia	60
1.9.8. Theoretical frameworks	61
1.9.9. Conceptual framework of the study	74
CHAPTER TWO: AN OVERVIEW OF HOUSEHOLD LIVELIHOOD DIVERSIFICATION STATUS	77
Abstract.....	77
2.1. Background and justification	77
2.2. Statements of the problem.....	79

2.3.	Materials and methods	80
2.3.1.	Data sources and methods of data collection.....	80
2.3.2.	Sampling Techniques and Sample Size Determination	81
2.3.3.	Methods of data analysis.....	81
2.4.	Results and discussion.....	82
2.4.1.	Households' demographic characteristics.....	82
2.4.2.	Analyzing the extent of livelihood diversification.....	85
2.4.3.	Status of on-farm activities	86
2.4.4.	Livelihood strategies and household income.....	88
2.5.	Conclusion.....	90
2.6.	Recommendations	90
CHAPTER THREE: HOUSEHOLD LIVELIHOOD STRATEGIES AND ITS DETERMINANTS.....		92
Abstract.....		92
3.1.	Background and justification	92
3.2.	Materials and Methods	95
3.2.1.	Data sources and methods of data collection.....	95
3.2.2.	Sampling Techniques and Sample Size Determination	95
3.2.3.	Methods of data analysis.....	96
3.3.	Results and discussion.....	99
3.3.1.	The demographic structure of sample respondents and patterns of livelihood diversification	99
3.3.2.	Determinants of livelihood diversification	105
3.4.	Conclusion.....	111
CHAPTER FOUR: CHILD POVERTY AND ITS DETERMINANTS.....		113
Abstract.....		113
4.1.	Background and justification	113
4.2.	Materials and methods	115
4.2.1.	Data sources	115
4.2.2.	Sampling techniques and sample size determination.....	116
4.2.3.	Methods of data analysis.....	116
4.3.	Research Results	119
4.3.1.	Status of child poverty	119
4.3.2.	The descriptive results of child poverty determinants	120
4.3.3.	Determinants of child poverty	142
4.4.	Conclusion.....	149
CHAPTER FIVE: LIVELIHOOD DIVERSIFICATION AND MULTIDIMENSIONAL CHILD POVERTY.....		152
Abstract.....		152

5.1.	Background and justification	152
5.2.	Methodology	155
5.2.1.	Sampling techniques and sample size determination.....	155
5.2.2.	Data sources and data collection methods	156
5.2.3.	Methods of data analysis.....	156
5.3.	Results and discussion.....	162
5.3.1.	The extent of livelihood diversification.....	162
5.3.2.	Household socioeconomic characteristics	163
5.3.3.	The features of child poverty deprivation in the study area.....	171
5.3.4.	Livelihood diversification and multidimensional child poverty	178
5.4.	Conclusion and recommendations	180
CHAPTER SIX: LIVELIHOOD STRATEGIES AND CHILD DIETARY DIVERSITY IN RURAL ETHIOPIA: INSIGHTS FROM NEGELE ARSI WOREDA, OROMIA REGION, ETHIOPIA.....		183
Abstract.....		183
6.1.	Background and justification	183
6.2.	Materials and Methods	185
6.2.1.	Data sources	185
6.2.2.	Sampling Techniques and Sample Size Determination	185
6.2.3.	Methods of Data Analysis.....	186
6.3.	Results and discussion.....	187
6.3.1.	Results	187
6.3.2.	Discussion	193
6.3.3.	Conclusions.....	198
CHAPTER SEVEN: SYNTHESIS AND RECOMMENDATIONS		199
7.1.	Synthesis.....	199
7.2.	Conclusion.....	206
7.3.	Recommendations	206
7.4.	Contributions of the Study (Policy Implications)	207
7.5.	Suggestions for future research	208
REFERENCES.....		210
Appendices.....		238

Lists of Tables

Table 1.1: Summary of explanatory variables determining livelihood diversification	22
Table 1.2: Summary of explanatory variables of child poverty.....	23
Table 2.1: The demographic characteristics of sample households.....	83
Table 2.2: Family members and characteristics.....	85
Table 2.3: Extent of Livelihood Diversification	85
Table 2.4: Types and number of livestock production in the study area	87
Table 3.1: Summary of explanatory variables used in the multinomial logit model	98
Table 3.2: The descriptive result of factors affecting livelihood diversification	99
Table 3.3: Summary statistics of continuous variables by the extent of livelihood strategies ...	103
Table 3.4: Contingency coefficient.....	106
Table 3.5: Variance inflation factors	106
Table 3.6: Independence of Irrelevant Alternatives (IIA)	107
Table 3.7: The multinomial logit model results in the determinants of livelihood strategy choices	107
Table 4.1: Multidimensional Child Poverty Status.....	119
Table 4.2: Household head demographic characteristics and child poverty.....	121
Table 4.3: Household Socioeconomic and demographic determinants of child poverty	125
Table 4.4: Child Dietary Intake Status.....	131
Table 4.5: Health-related indicators of child poverty	133
Table 4.6: Multidimensional poverty status of children aged between 6-18 years	136
Table 4.7: Multidimensional child poverty indicators for all age groups.....	137
Table 4.8: Housing condition and access to protected water.....	140
Table 4.9: Contingency coefficient.....	143
Table 4.10: Variance Inflation Factors	144
Table 4.11: The Probit regression model on the determinants of child poverty	144
Table 5.1: Dimensions of child poverty and indicators	158
Table 5.2: Summary statistics of the extent of livelihood diversification	162
Table 5.3: The percentage distribution of sampled households' characteristics	163
Table 5.4: Summary statistics of continuous variables by the extent of livelihood diversification	166
Table 5.5: Status of Child Deprivation	173
Table 5.6: Livelihood diversification and child poverty.....	178
Table 6.1: Summary results of child food consumption	188
Table 6.2: The percentage of the level of dietary diversity by household livelihood strategy ...	190
Table 6.3: Household head characteristics and the level of child dietary diversity.....	192
Table 6.4: Ordinal probit model outputs for the determinants of child dietary intake	195

Lists of Figures

Figure 1.1: Map of the study area	12
Figure 1.2: The conceptual framework of the study	75
Figure 2.1: Major Crops cultivated	86
Figure 2.2: The mean of total annual income by livelihood strategies	88
Figure 2.3: Percentage of the mean of total annual income by livelihood strategies	89
Figure 3.1: Figure Contribution of each activity to household livelihood strategies	102
Figure 4.1: Venn diagrams on the deprivation overlap for children below 5 years.....	128
Figure 4.2: Venn diagrams on the deprivation overlap for children aged between 5 and 18 years	128
Figure 4.3: Status of children's deprivation index across indicators.....	141
Figure 5.1: The percentage distribution of indicators of child poverty	172
Figure 5.2: Percentage distribution of child dietary intake.....	177
Figure 6.1: The percentage distribution of child dietary intake.....	189
Figure 6.2: Percentage distribution of child dietary intake by household livelihood strategies .	190

Lists of Appendix Tables

Appendix Table 1: Dimensions, indicators, and weight attached to multidimensional child poverty	238
Appendix Table 2: Summary statistics of continuous variables	239

ACRONYMS AND ABBREVIATIONS

ACRWC	African Charter on the Rights and Welfare of the Child
AE	Adult Equivalent Scale
ANOVA	Analysis of variances
CAPM	Capital asset pricing model
CSA	Central Statistical Agency
DD	Dietary Diversity
DDS	Dietary Diversity Score
DFID	Department for International Development
EPHI	Ethiopian Public Health Institute
FANTA	Food and Nutrition Technical Assistance Project
FAO	Food and Agricultural Organization of the United Nations
FDRE	Federal Democratic Republic of Ethiopia
FGDs	Focus group discussions
FGM	female genital mutilation
GDP	Gross Domestic Product
GTP	Growth and Transformation Plan
HHs	Households
HIV/AIDS	Human immunodeficiency virus/acquired immunodeficiency syndrome
ICRA	Investment Information and Credit Rating Agency
IFPRI	International Food Policy Research Institute
IIA	Independence of Irrelevant Alternatives
ILO	International Labor Organization
IMF	International Monetary Fund
IRD	Integrated Rural Development
KIIs	Key Informant Interviews
MAD	Minimum acceptable diet
MDD	Minimum dietary diversity
MMF	Minimum meal frequency
MODA	Multiple overlapping deprivation analysis

MOFED	Ministry of Finance and Economic Development
MPI	Multidimensional Poverty Index
NIE	New institutional economics
NNP	National Nutrition Programs
ORS	Oromiya Regional State
PASDEP	Plan for Accelerated and Sustained Development to End Poverty
PPP	Purchasing power parity
PQLI	Physical Quality of Life Index
RNFE	Rural non-farm employment
SDG	Sustainable Development Goal
SID	Simpson diversity index
SL	Sustainable livelihoods
TLU	Tropical Livestock Units
UK	United Kingdom
UNCDF	United Nations Capital Development Fund
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Program
UNICEF	United Nations Children’s Fund
USAID	United States Agency for International Development
USD	United States Dollar
VIF	Variance inflation factors
WB	World Bank
WHO	World Health Organization
WoBANR	Woreda Bureau of Agriculture and Natural Resources

CHAPTER ONE: INTRODUCTION

1.1. Background and justification

The concept of livelihood is diverse, and many people have defined livelihood diversification differently. For example, Hussein and Nelson, (1999) say “It is attempted by individuals and households to find new ways to raise incomes and reduce environmental risk.” Ellis (1997) also defined livelihood diversification as ‘the process by which rural families construct a diverse portfolio of activities and social support capabilities in their struggle for survival and to improve their standards of living.’ Ellis added that livelihood diversification is not necessarily synonymous with income diversification; rather it is the broadening of the range of on-farm activities and pursuing off-farm activities. In both definitions, the purpose of livelihood diversification is to reduce risks to livelihoods and improve living standards. Kimenju and Tschirley (2008) also defined livelihood diversification as ‘the number of economic activities an economic unit is involved in and the dispersion of those activities’ shares in the total economic activity of the unit. The focus on livelihood is relevant, in particular with the discussion on rural poverty reduction (Oyinbo and Olaleye 2016), because poverty is a problem affecting every nation of the world (Chen and Ravallion, 2010).

Rural households in many developing countries diversify their income sources to reduce income-related risks and smoothen their consumption hence, very few households collect all their income from one source and use their assets in just one activity (Ellis, 2000; Barrett, Reardon, and Webb, 2001; Sultana, Hossain and Islam, 2015). Although rural households engage in diverse sources of income-generating activities, agriculture is the dominant livelihood source. Evidence shows that in sub-Saharan Africa, agriculture contributes around 57.3% of the income of 61.4% of the rural population (Dercon and Gollin, 2014). However, the sector is constrained by emerging challenges like lack of markets, globalization, and market liberalization, biotechnology as a technical option to improve yields, poor infrastructure, lack of information, and new institutional economics (NIE) as a tool to solve development problems, HIV/AIDS prevalence and sustainable agriculture (Nambiro, Omare, and Nkamleu, 2008). Rural livelihoods comprise agricultural activities, non-farm activities, and off-farm activities. Studies show that non-farm

activities are also contributing to substantial income for rural households in Sub-Saharan Africa. According to Haggblade *et al.* (2007) cited in Kimenju and Tschirley (2008), non-farming income contributes between 30%-40% of rural household income in developing countries.

Perspectives on the potential of agriculture for poverty reduction and livelihood diversification for poverty reduction have taken two distinct views. Scholars like Christiaensen and Demery (2007) and Diao *et al.*, (2006) have asserted the importance of agricultural productivity for poverty reduction; however, their views were perceived as pessimistic by the contenders of livelihood diversification like Maxwell, Urey, and Ashley (2001) who are emphasizing on livelihood diversification for poverty reduction. However, “pro-agriculturalists” did not also deny that “agro-pessimists” views becoming resurgent after Sub-Saharan Africa failed to replicate Asia’s Green Revolution and limited improvement in agricultural productivity, despite substantial agricultural policy reforms, led many to question agriculture’s potential to reduce poverty. Christiaensen and Demery (2007) have further added that the poverty rate has increased from 42 percent in 1981 to 46 percent in 2001 in Sub-Saharan Africa as compared to East Asia, which declined from 58 percent to 15 percent, and South Asia declined from 52 percent to 31 percent during the same period even after the Green Revolution. However, they still claim that the persistence of poverty and weak agricultural performance in Africa on the one hand, and the sharp decline in poverty and strong agricultural performance in Asia on the other hand, do not necessarily reflect a causal link. They do suggest the need for policymakers to reconsider the contribution that agriculture might make to overall economic development and poverty reduction.

Classical theorists observed that most developing countries are comprised of ‘dual’ economies. In this perspective, labor productivity is typically lower in agriculture than in industry, and hence development requires the movement of agricultural labor into non-agriculture (Lewis 1954; cited in Diao, Hazell, Resnik, and Thurlow, 2006). This proposition appreciates the parallel growth of these two sectors as a precondition to development and poverty reduction, even though the practice is not fully realized and guarantees to absorb surplus unskilled, especially in developing countries like Ethiopia, where the industrial development is low. The labor forces in the agricultural sector are unskilled to satisfy the skills and knowledge demanded by the industrial

sector. The Lewis “Theory of Economic Development/Unlimited Surplus Labor Supply” is criticized mainly for the following reasons: wage rate is not constant in the capitalist sector. This is unrealistic because the wage rate continues to rise over time; the skilled labor problem is not a temporary bottleneck; Lewis does not consider the possibility of progress in the agriculture sector; Labor unions may push the wage rate up; capitalist employers may not use the surplus for development purpose. There is a chance to use the surplus for speculative purposes and rural people may consume more and save less than predicted by the theory thereby dampening the pace of development. This model did not also show how unskilled labor could be employed in the industrial sector on one hand, and the importance of diversification in the agricultural sector for unskilled labor is preferable to exiting agriculture on the other hand.

Earlier development views were dominantly sector-specific. Recently, increased attention has been paid to the diversity of livelihoods in both research and policy following a wide recognition that few rural or urban households, especially poor households in middle- and low-income countries rely on a single income-generating activity (farming or wage employment) to support their livelihoods. According to Chambers and Conway (1992), a livelihood comprises ‘the capabilities, assets (including both material and social resources) and activities required for a means of living.

Rural households combine a diverse set of income-generating and social activities and construct a portfolio of livelihood activities to meet and, if possible, enhance better livelihood outcomes (Davis *et al.*, 2010). Almost two-thirds of the world’s poor people reside in the rural areas of low-income countries, mainly depending on subsistence farming and other natural resources for their livelihood (World Bank Group, 2014). However, low productivity in farming and limited accessibility to non-farm income sources have been increasing the vulnerability of these people who are often poor and deprived of a minimum standard of life (Rigg, 2006; Dixon, Gibbon, and Gulliver, 2001). Although poverty is multi-dimensional, it is highly correlated with a household’s income, asset holding, and other economic activities that mutually generate a household’s livelihood strategy and outcomes (Thorbecke, 2007).

Scholar, Bradbury (2003) has defined poverty as an “unacceptably low standard of living”. This view is also true of child poverty. Bradbury said that what ‘standard of living’ means is a

unidimensional concept for most economists representing either a high or a low level of living standard within certain measurements. For many sociologists and political scientists, living standards are more likely perceived as a multi-faced ‘way of living’, and poverty as a disadvantage among multiple dimensions. Most poverty-related research focuses on household poverty and child poverty has gotten little attention. It is very important to be clear that children exclusively experience poverty differently from adults. Therefore, getting the clear analytical tools to support a clear consideration and debate about the theoretical and practical issues associated with the measurement of (child) poverty and the policy strategies is becoming the primary intention of many social science types of research.

The most common definitions of poverty are ‘absolute’ and ‘overall’ poverty, which remain to this day as the only internationally agreed definitions of poverty. Absolute poverty is defined as a “condition characterized by severe deprivation of basic human needs including food, safe drinking water, sanitation facilities, health, shelter, education, and information” (UN, 1995). However, child poverty was not well conceptualized until the outcome of the World Social Summit 2006 which defined child poverty as “children living in poverty are deprived of nutrition, water and sanitation facilities, access to basic health care services, shelter, education, participation, and protection, and that while a severe lack of goods and services hurts every human being, it is most threatening and harmful to children, leaving them unable to enjoy their rights, to reach their full potential and to participate as full members of society” (United Nations General Assembly, 2006).

The focus on the poverty of children, as opposed to any other group in the population, needs little justification. Children represent a country’s future, an obvious reason for societal concern with child well-being (Bradbury, Jenkins, and Micklewright, 2000). Save the Children UK (2016) estimated that about 570 million children are living in severe monetary poverty worldwide, and many more are living in multidimensional, moderate, relative, and near poverty. The Human Development Report 2014 says that 1.5 billion people are subject to multidimensional poverty; at least half of these are likely children, around 750 million.

Poverty in general and child poverty, in particular, is a global challenge of today’s development; the severity is reasonably high in the least developing countries like Ethiopia. Poverty is one of

the never-ending battles that the world is fighting. Several poverty reduction strategies have been implemented globally, but poverty remains a huge gap that to be addressed. In this regard, research has to play its role in assisting the identification of common livelihood strategies of poor households significant to poverty reduction in general and child poverty in particular.

1.2. Statements of the problem

Livelihood diversification has become a crucial strategy for many households, particularly in developing countries like Ethiopia, where traditional sources of income may be unreliable or insufficient. Studies have shown that livelihood diversification can enhance resilience to shocks such as droughts or price fluctuations. For example, Ellis (2000) found that in Ethiopia, diversification strategies such as off-farm activities, small businesses, or seasonal labor can contribute to greater economic stability for farmers. Moreover, a study by Arsnal *et al.* (2018) highlighted that households in Ethiopia who diversified their livelihoods were more likely to escape poverty. Although there is a significant contribution of livelihood diversification, the common view in the international literature on rural development has been that of a sector driven almost entirely by agriculture, suggesting that rural households depend on the production of food and export crops for their livelihood. Nevertheless, some evidence shows that very few households collect all their income from one source and use their assets in just one activity. Multiple motives prompt households to diversify incomes and activities (Barrett, Reardon, and Webb, 2001). Rural households in sub-Saharan Africa derive their income from different sources with non-agricultural activities accounting for a substantial share of total income (Ellis, 2000). Moreover, there is general agreement in the academic literature that more livelihood diversification and non-farm employment are typically good for individuals and overall economic growth in SSA (USAID, 2017). However, there are dilemmas in understanding how to effectively engender agricultural transformation into household livelihood diversification, and how to more effectively grow common elements of the agricultural and non-agricultural sectors together (Davis, Winters *et al.*, 2010). Therefore, the existing gaps in the literature linking livelihood diversification and poverty in sub-Saharan Africa have attracted the attention of social scientists to the study of rural livelihoods (Nasa *et al.*, 2010).

Although the livelihood of the poor is diverse, agriculture is still the dominant livelihood source in Africa. It employs about 54.2% of the economically active population in Africa in general and 74.4 percent of the economically active population in East Africa in particular (Gollin, 2010). Agriculture plays a multidimensional role in the development process, which includes eliciting economic growth, generating employment opportunities, contributing to value chains, reducing poverty, lowering income disparities, ensuring food security, delivering environmental services, and providing foreign exchange earnings; however, about 75 percent of world poverty is concentrated in rural (World Bank, 2007; Byerlee, de Janvry, and Sadoulet, 2009). Other scholars such as Schneider and Gugerty (2011) stressed that agricultural growth would still be the right pathway out of poverty. They claimed that increases in agricultural productivity could reduce poverty, including real income changes, employment generation, rural non-farm multiplier effects, and food price effects.

The global state of poverty shows that around 700 million people are currently living on less than \$2.15 per day, the extreme poverty line. Moreover, extreme poverty remains concentrated in parts of Sub-Saharan Africa, fragile and conflict-affected areas, and rural areas. Global poverty reduction was dealt a severe blow by the COVID-19 pandemic and a series of major shocks during 2020-22, causing three years of lost progress. Low-income countries were most impacted and have yet to recover. In 2022, a total of 712 million people globally were living in extreme poverty, an increase of 23 million people compared to 2019 (World Bank, 2023). On the other hand, the earlier trends on child poverty showed that the number of children living in extreme poverty decreased by an estimated 63.3 million between 2013 and 2019, from 383 million to 319 million. However, later it increased, especially in Sub-Saharan Africa as a result of economic shocks and the COVID-19 pandemic. According to the World Bank (2023), Sub-Saharan Africa carries the highest burden of children-40%-living in extreme poverty, and accounts for the largest share increase in the last decade, jumping from 54.8% in 2013 to 71.1% in 2022. Rapid population growth, limited social protection measures, and challenging global trends including COVID-19, conflict, and climate-related disasters, have resulted in a steep increase in poverty. Meanwhile, all other regions in the world have seen a steady decline in extreme poverty rates, except for the Middle East and North Africa (World Bank, 2023).

Studies on poverty dominantly focus on household poverty and child poverty has attained little attention from scholars and policymakers too. Understanding and measuring child poverty is difficult and various studies analyze poverty in households, communities, and on a broader scale. UNICEF (2011) also argued that understanding child poverty is difficult due to its multiple dimensions of causes and effects. Hence, the poverty assessment approach focusing on household and above community level ignores systematically child from policy concerns as a key part of the community unit. Save the Children, a report of 2016 has argued that understanding exactly what we mean by poverty and child poverty and how well different measures can serve is more complicated. The report stresses that child poverty should not be treated as a sub-set of adult poverty, because poverty impacts more acutely on children than adults, as they are more vulnerable to the effects of deprivation, less able to address or change their situation, and more greatly at risk of exploitation and other failures to meet and protect their rights (Save the Children, 2016). The same report elaborated that the SDGs report has projected that 500 million children will be in poverty by 2030. Therefore, child poverty is now one of the global concerns of the current development agenda. Poverty is the biggest killer of children globally; it still results in premature death in rich countries even in countries like the UK. However, most frequently kills children in low-income countries because of the lack of well-functioning welfare states in developing countries (Gordon and Nandy, 2012).

Some scholars (Feeny and Boyden, 2003; Mehrotra, 2006) believe that children's needs should be understood separately from the adult nexus to determine the true scale and character of their poverty. According to these scholars, the definition and analysis of child poverty should be expanded beyond the traditional conceptualizations of "...the child-specific requirements in terms of basic needs and the need for specific information for the formulation of child-centered policies are important reasons that calls for the development of child poverty approaches" (Roelen and Gassmann, 2008; Biggeri, Trani, and Mauro, 2010).

Some studies (Gordon & Nandy 2012; Tassew, Adam, and Yisak, 2017; and Save the Children 2016) on child poverty focus on certain dimensions of poverty assessment. These are food, safe drinking water, sanitation facilities, health, shelter, education, information, and access to services. These dimensions of child poverty attracted a multidimensional approach to poverty

assessment rather than the monetary approach; however, there is no clear agreement on the threshold of child poverty concerning these dimensions.

The poverty headcount in Ethiopia has significantly declined since 1995 falling from 45 percent to 29 percent in 2010 (MOFED 2010b and 2010c) and declining to 23.5 percent in 2016 (UNDP, 2018). The infant mortality rate, which is an indicator of child poverty, also declined from 167 to 101 in 2000 and 2010 respectively. However, there are still some threats to effective poverty reduction in the country. Mainly financial crises, economic crises, and climate changes are considered to affect adversely child lives too (Woldehanna *et al.*, 2011). Rural children were more vulnerable to economic shocks than urban children (Woldehanna, 2010b). Shocks affect household wealth, assets, and sources of livelihood in general (particularly in rural areas), leading to child growth faltering, among other things. Studies on child poverty unanimously agreed, “Child poverty should be treated separately from adult poverty”; however, no empirical evidence is revealing how the outcome of livelihood diversification can be fairly distributed among household members specifically for children. All evidence examined in this section used a household lens to perceive child poverty, especially from the household economic aspects. However, they did not show how children might equally enjoy benefits from the economic returns. The current study is specifically intended to investigate the association between household livelihood diversification and child poverty in the study area, and how the outcome of livelihood diversification can be translated to child poverty reduction.

1.3. Research question

The study investigated how livelihood diversification determines child poverty among rural households in Ethiopia. It builds on the basic assumption that livelihood diversification plays an essential role in child poverty reduction in rural Ethiopia. It can be assumed that higher livelihood diversity would reflect better child well-being. At a glance, livelihood diversification, and child poverty were questioned in this context. Hence, the research on livelihood diversification and child poverty in the Negele Arsi *woreda* has centered on the following key questions:

1. What determines the adoption/implementation of livelihood diversification strategies by HHs in your study area?
2. Are HHs that adopted livelihood diversification strategies able to reduce child poverty more than those that did not?
3. Of the different livelihood diversification strategies, which ones are more cost-effective than others?
4. How does the adoption of livelihood diversification vary by gender? Age? Asset ownerships? Access to various institutional interventions?
5. Was the livelihood diversification strategy program effective in reducing child poverty in Negele Arsi woreda?
6. What livelihood diversification policy reforms or program design innovations would increase child poverty reduction?
7. What are the dimensions of livelihood diversification?

1.4. Objectives of the study

The general objective of the study is to analyze the contribution of livelihood diversification to child poverty reduction in the West Arsi zone, Oromia Region.

Specific objectives are:

- To examine the drivers of the different livelihood strategies in the study area
- To analyze the determinants of the adoption of livelihood diversification strategies
- To measure the level of child poverty in the study area
- To examine the link between the adoption of livelihood diversification strategies and child poverty reduction.

1.5. Scope of the study

The concept of livelihoods is wide and encompasses wider theoretical and practical perspectives. Various kinds of literature showed that livelihood diversification is highly linked with households' attempts to mitigate poverty and its correlates. While the concepts of livelihood diversification and poverty are too broad, it is also very difficult to cover all attributes of poverty. At the same time, covering all rural areas is not feasible both economically and timewise.

Therefore, this study covers only child poverty aspects and its linkage with livelihood diversification in the study area.

1.6. Significance of the study

This study, which is about livelihood diversification and child poverty among rural households at West Arsi Zone, Arsi Negele woreda, has a vital significance to understanding livelihood diversification and child poverty linkage in general. Many poverty studies entirely focus on household poverty and a few pieces of evidence are available on child poverty, especially in Ethiopia. Evidence (UNICEF, 2004) on the state of global child poverty confirmed that poverty in childhood is a root cause of poverty in adulthood. Impoverished children often grow up to be impoverished parents who in turn bring up their children in poverty. To break the generational cycle of poverty, the poverty reduction action must begin with child poverty. Therefore, the findings of this study would provide important information on child poverty and various determinants of livelihood diversification in the rural community.

In addition, insights generated by the study would help the concerned bodies such as Governmental Organizations (GOs) and Non-Governmental Organizations (NGOs) to design and implement effective interventions to reduce child poverty that complement the successful and sustainable strategies of the concerned households. Moreover, it will invite scholars for further research interests in child poverty.

1.7. Methodological approach

1.7.1. Description of the study area

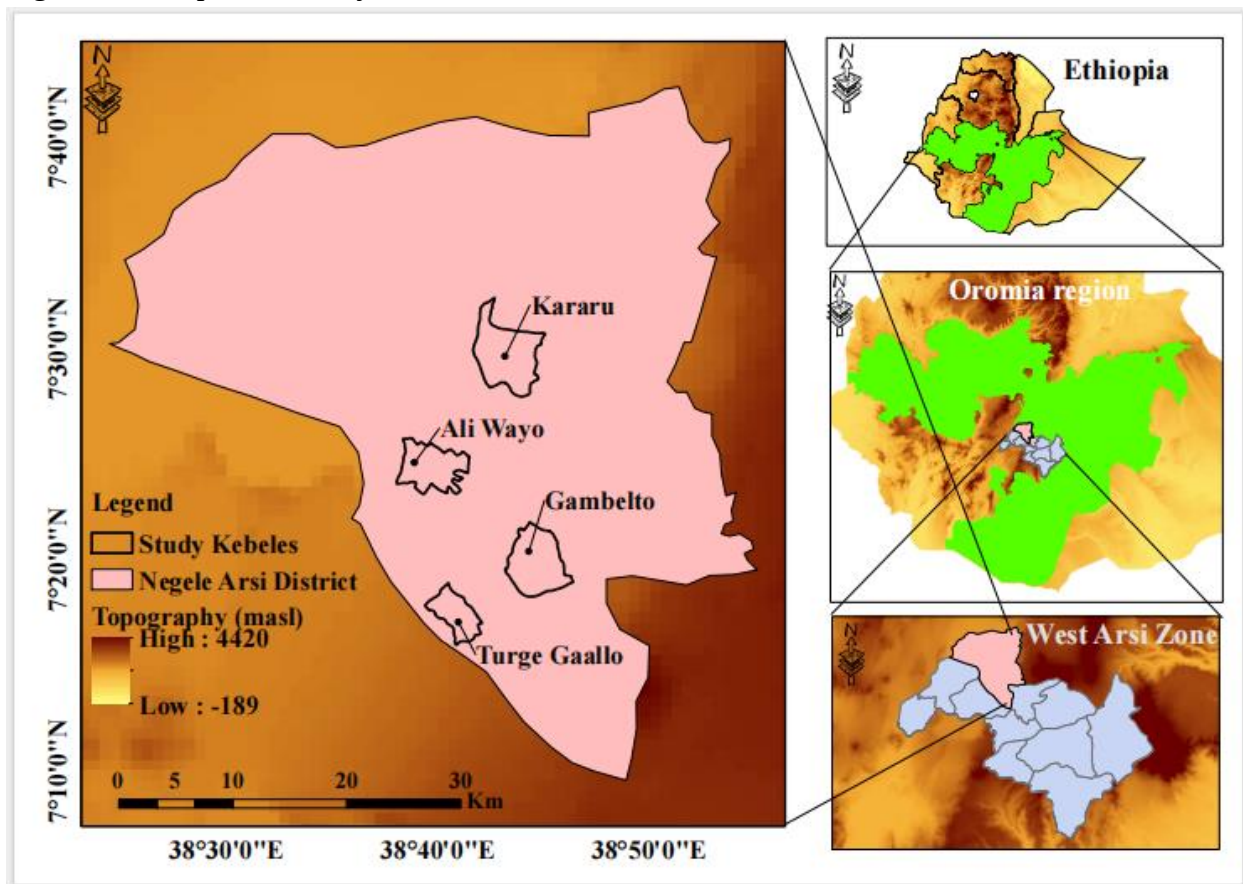
The study area is Arsi Negele Woreda, which is located in the West Arsi Zone of the Oromia Region State. It is located 225 km south of Addis Ababa. Geographically, it is situated in the Ethiopian central rift valley system of 7°09'-7°41'N and 38°25'-38°54'S. The woreda is bordered in the south by Shashemene woreda, in the southwest by Bulbula woreda, which separates it from Seraro, on the west by Southern Nations Nationalities and Peoples Regional State, on the north by Adami Tullu and Jido Kombolch (ORS, 2004). The woreda comprises three agroecological zones namely low land, midland, and high land; and the altitude of the woreda

ranges from 1500-2300 m.a.s.l. (ICRA, 2002). The average annual temperature ranges from 10-25 C⁰ and annual rainfall varies between 500-1000mm (ORS, 2004).

The *woreda* has 36 *kebeles* out of which 3 are urban *kebeles* and 33 are rural *kebeles*. According to the national census report of 2007, the *woreda* has a total population of 260,129 of whom 12,885 were men and 131, 244 were women; 51,535 or 19.81% were urban dwellers. The majority of dwellers were Muslim, with 68.86% of the population reporting they observed this belief, while 20.2% of the population said practiced Ethiopian Orthodox Christianity, 8.99% of the population were protestant and 1.04% were Catholic (CSA, 2007).

The current report of Agriculture and Natural Resources of 2018 shows that the total rural population of the *woreda* is 326,432; out of whom 159,667 are male and 166,825 are female. The total number of households is 32,631; of whom 27,231 are male-headed households and 5,400 are female-headed households. On the other hand, the total urban population of the *woreda* is 67,588; out of whom 33,522 are male and 34,096 are female. The total population of the *woreda* is 394,020 (WoBANR, 2018).

Figure 1.1: Map of the study area



Source: Own construction from GIS

1.7.2. Philosophical underpinnings

The philosophical perspective in social science research refers to the underlying assumptions and beliefs that shape the way researchers conceptualize and conduct studies in the social sciences. It encompasses various philosophical traditions such as positivism, interpretivism, and critical theory, each offering distinct ontological, epistemological, and methodological frameworks for understanding and investigating social phenomena (Corbetta, 2003; Gray, 2014; Grix, 2002).

Positivism, influenced by natural sciences, asserts that social realities can be observed and measured objectively and that social phenomena can be explained through empirical evidence and causal relationships. This perspective emphasizes the use of quantitative methods and seeks to uncover universal laws governing human behavior. For example, a positivist approach may be employed in a study examining the effect of education on income levels, using statistical analysis

to identify correlations and causal relationships. On the other hand, interpretivism challenges the positivist notion of objective and embraces the idea that social realities are constructed through subjective meanings and interpretations. Researchers adopting an interpretivist perspective focus on understanding the lived experiences and perceptions of individuals, often employing qualitative methods such as interviews and ethnographic observation. Furthermore, critical theory, rooted in the works of Marx and other social theorists, emphasizes the role of power, ideology, and social structures in shaping social realities. This perspective advocates for a critical examination of social phenomena, with a focus on identifying and challenging power dynamics and social inequalities.

It is essential for social science researchers to critically engage with different philosophical perspectives, as each offers unique insights and approaches to understanding complex social phenomena. By considering the ontological and epistemological assumptions that underpin their research, scholars can refine their methodologies and enhance the rigor and depth of their inquiries. Charles Sanders Peirce, an American philosopher, introduced knowledge that justifies pragmatism in philosophy in 1878 (Maxcy, 2003). Pragmatism is a philosophical concept that emphasizes practical consequences and real-world application over abstract theories or rigid ideologies. In the context of livelihood strategy choices, pragmatism plays a crucial role in helping individuals make informed decisions that effectively address their livelihood needs and improve their quality of life. This study adopts pragmatism philosophical assumption to mixed research methods in which the inquirers draw liberally from both quantitative and qualitative assumptions. Pragmatism allows one to multiple methods, different worldviews, and different assumptions, as well as different forms of data collection and analysis (Creswell, 2009). Therefore, in this study, mixed methods (both qualitative and quantitative research methods) were employed to analyze livelihood diversification and child poverty of rural households in the West Arsi Zone of Oromia Regional State.

1.7.3. Types and sources of data

Research data can be categorized into two types: qualitative and quantitative. Qualitative data focuses on capturing descriptive information about phenomena through interviews, observations, or open-ended surveys. It provides insights into the meanings, motivations, and beliefs of

individuals or groups. On the other hand, quantitative data involves numerical information that can be measured and analyzed statistically. Data sources are crucial for conducting studies, making informed decisions, and gaining insights into various phenomena. In this context, data sources refer to the origins from which researchers obtain data for analysis. There are two sources of data namely, primary and secondary. Primary data sources can be individuals from whom the firsthand data can be gathered through various techniques. The secondary sources can include the existing data that has already been collected by other researchers, organizations, or institutions. This study utilized both qualitative and quantitative data types collected from both primary and secondary sources.

1.7.4. Sampling techniques and sample size determination

In this research, a multistage sampling technique was employed. In the first stage, the Arsi Negele *woreda* among *woredas* at the West Arsi zone was selected purposively based on convenience to access relevant data and the researcher's experience; in the second stage, stratified random sampling techniques were employed. *Kebeles* were stratified based on the nature of dominant livelihood activities (diversification options). From each stratum, sample households were selected through simple random sampling techniques. Finally, within the stratified *kebeles*, only households that have children were selected using purposive sampling techniques. The sample size is determined based on Yamane's formula of sample size determination (Yamane, 1967). The formula can be written as:

$$n = \frac{N}{1 + N(e)^2}$$

Where **N** is the population size and **e** is the level of precision. In 2022, the population of the *woreda* is 398,551, which consists of 196,321 males (49.3%), and 202,230 females (50.7%). Taking the "e" the level of precision to be 5%, the total sample size is around 398. However, in our study, the sample size is 401. Three more questionnaires were distributed to an enumerator, and since the minimum representative sample as per the calculation was 398, and three additional samples would not have a significant effect on estimation, we did not drop them from the sample.

1.7.5. Methods of data collection

To collect both primary and secondary data, several methods were employed. In the first place, to collect primary data, enumerators were selected and trained based on the information required and they must know how to conduct data collection. In this regard, interview schedules were presented, discussions were made on each question with enumerators, and some technical terms were explained. In addition to this, research ethics was informed to enumerators. After the enumerators' training, primary data collection was started and data were collected from rural sample households using an interview schedule

A key informant interview, and focus group discussion were also conducted to triangulate data collected through the interview schedules. Key Informant Interviews (KIIs) are one method used in rapid assessment and evaluation for gathering information from partner communities. A “key informant” is someone who can provide detailed information and a unique perspective on a particular issue based on his or her expert knowledge. These in-depth interviews are used to gather qualitative information that can provide an enhanced understanding of the quantitative data gathered for regular program monitoring. In this study, four key informant interviews with the agricultural extension team leader, the nutrition program leader, the *woreda* health office leader, and the education sector leader were conducted. A focus group discussion involves gathering people from similar backgrounds or experiences together to discuss a specific topic of interest. It is a form of qualitative research where questions are asked about their perceptions attitudes, beliefs, opinions, or ideas. In this study, four FGDs at each study *kebeles* were conducted with non-respondent households. Checklists were prepared and used to collect qualitative data from focus groups and key informants.

1.7.6. Methods of data analysis

In this study, both qualitative and quantitative data analysis methods were employed. Quantitative data analysis involves the use of mathematical and statistical techniques to analyze and interpret numerical data. It provides a systematic approach to understanding relationships, patterns, and trends within datasets. Common methods used in this study include descriptive statistical methods such as mean, percentage; inferential statistics, chi-square test, correlation analysis, and regression analysis.

Qualitative data analysis is a crucial process in research that involves interpreting non-numerical data such as words, images, and observations to understand underlying meanings, patterns, and themes. One of the key methods in qualitative data analysis is thematic analysis, where researchers identify and analyze recurring patterns or themes within the data. This involves systematically coding the data and categorizing information into themes to discern key patterns and trends. Another method is content analysis, which involves examining the content of text data to identify patterns and trends. Researchers analyze the frequency of particular words or phrases, as well as the context in which they are used, to conclude the data. Additionally, grounded theory is a method that involves developing theories or explanations from the data itself rather than testing pre-existing hypotheses. Researchers start with an open mind and allow themes and theories to emerge from the data through a systematic coding process. Furthermore, in phenomenological analysis, researchers seek to understand the lived experiences of individuals by exploring their perceptions, feelings, and meanings attached to a particular phenomenon. This method involves in-depth interviews or observations, to capture rich and detailed descriptions of the participants' experiences. In this study, the phenomenological method was used to analyze. Quantitative data was coded, entered, and analyzed using STATA version 16.

Livelihood diversification analysis

The first specific objective of the study is to examine the livelihood diversification status of households in the study area. Livelihood diversification is determined by livelihood strategies (Conway, 2001) whereas livelihood strategies comprise agricultural intensification, agricultural expansion, income diversification, and migration (Scoones, 1998). Following the definitions of Ersado, (2003); Reardon, (1997); Escobal, (2001); and Delgado and Siamwalla, (1997), livelihood diversification was a function of income-generating activities in this study. Vector A of livelihood strategies counts containing A_i the number of livelihood activities engaged by individual i . For the determination of diversification status, we consider the diversification function $f(x_i; z)$ as:

$$f(x_i; z) = \begin{cases} 1 & \text{if an individual } i \text{ diversifies his/her livelihood} \\ 0 & \text{if not} \end{cases}$$

Let k be the cutoff. The livelihood of an individual i was considered as diversified or $f(x_i; z) = 1$ if $A_i \geq k$. $f(x_i; z)$ is the identification function relating to the cutoff k .

Where A =total livelihood strategies identified in the study area,

A_i = achievement (number of livelihood strategies a household adopted in)

k = cutoff point (threshold)

Where n is the number of income sources (livelihood strategies) and P_i is the income portion of i^{th} income source.

In practice, only counting the livelihood activities to classify as diversified or not, may not make sense. Therefore, the volume of income earned from each livelihood activity is crucial for poverty analysis. Hence, the income aspects of livelihood diversification were measured using Simpson's Diversity Index. Mathematically, we can write as:

$$DI = 1 - \sum_{i=1}^S (n_i/N)^2 \dots\dots\dots (1)$$

Where S is the number of income sources or activities that are present; n_i (for $i = 1$ to S) is the income value of individuals in the i -th income sources and $N (= \sum n_i)$ is the total income of all income sources. The value of SID ranges from 0 to 1 and, for a household with no diversity (i.e., having only a single income source or activity so that $S = 1$ and $n_1 = N$), DI is zero, and as income diversity increases, DI approaches unity. Using this approach, the livelihood status of a household was deemed as diversified or undiversified.

Determinants of livelihood choices

The **second** specific objective of the study is to identify the determinants of livelihood strategy choices among rural households in the study area. The multinomial logistic regression model was employed to analyze the determinants of livelihood choices. The multinomial logistic regression model is commonly used when there is a dependent categorical variable. The regressors are the same across all choices for each observation. The multinomial logistic model is an extension of generalized linear models allowing for an estimation of an unordered categorical response.

Unlike the ordinal model, unordered categorical response values have no order. The model is specified as:

$$Pr(Y_{i=j}) = \frac{\exp(X_i\beta_j)}{\sum_{j=0}^J \exp(X_i\beta_j)}, j=0-4 \dots \dots \dots (2)$$

Where: P_{ij} = probability representing the i^{th} respondent's chance of falling into category j

X = Predictors of response probabilities

β_j = Covariate effects are specific to the j^{th} response category with the first category as the reference. Livelihood strategies (Y_i): 0= farming only, 1=non-farm only, and 2=off-farm only. Y_0 is the reference case.

Child poverty measurement

The **third** specific objective of the study is to measure the level of child poverty in the study area. In this study, a multidimensional poverty analysis technique is employed. Gordon *et al* (2003) used very strict measures of severe deprivation for the seven indicators (nutrition, health, education, information, shelter, water, and sanitation) as they intended to err on the side of caution. According to Gordon *et al* (2003), child deprivation is a continuum ranging from mild, moderately severe, and extreme deprivations. Similarly, Tassew *et al.* (2017) also analyzed multidimensional poverty by employing similar indicators, which are used by Gordon *et al* (2003) to assess multidimensional poverty.

In Gordon *et al.* (2003), a continuum of deprivation was used to formulate operational definitions of child deprivation for each of the seven dimensions. The child deprivation continuum ranges from no deprivation to mild, moderate, severe, and extreme deprivation (Roelen and Gassmann, 2008:14). The cut-off line or 'poverty line' was set at the severe deprivation level: if the child did not meet that level, s/he is considered deprived in that dimension. The identification and aggregation methods of the study require information on all dimensions to be available for each child. A child was considered to be living in absolute poverty if s/he suffered two or more severe deprivations. The output of the multiple deprivation method was a deprivation count or

deprivation incidence for each of the seven dimensions, and two aggregate poverty counts, namely severe deprivation and absolute poverty (Roelen and Gassmann, 2008).

In measuring multidimensional child poverty, the first step is *identification*. The counting approach was used to identify the poor. This approach assumes certain numbers of poverty dimensions in which people suffered deprivation, i.e. the number of dimensions in which they fell below the threshold'. Atkinson (2003) used this approach for the first time to identify multidimensional poverty; and other studies (Alkire *et al.*, 2015) recently used this approach to identify multidimensional poverty. In the identification of the poor, setting cutoff points and weight for poverty dimensions are very important concerns in multidimensional poverty analysis. Roelen and Gassmann (2008) have proposed the cutoff point for multidimensional child poverty analysis as deprivation in two and above dimensions of poverty. Following this empirical evidence, the deprivation cutoff point was set if children are deprived in two and above dimensions, it is multidimensionally poor. Regarding the weight for dimensions, studies usually used a maximum of 1 and a minimum of 0. However, in the case of nested dimensions, there is no common agreement on how to assign weight across nested dimensions; for example, Minujin and Nandy (2012) have said that, for poverty analysis with four nested dimensions, one dimension is to weigh one half, and the others one-sixth, then the weights are (2, 2/3, 2/3, 2/3) because the sum of these four weights is equal to the number of dimensions, namely four. But, for this argument, they didn't provide theoretical or empirical ground; because there is no convincing justification to assign 2 weights for one dimension and 2/3 for others. Some other studies (Batana, 2008) used a distribution of equal weight across nested dimensions with the aggregated weight of 1. This approach is better, and we used to distribute equal weight across nested dimensions in which the aggregate weight is 1.

For a population of n individuals and considering $d \geq 2$ to be the number of dimensions and $x = [x_i; z]$ the $n \times d$ matrix of achievements, where x_{ij} the achievement of individual i ($i=1, \dots, n$) in dimension j ($j=1, \dots, d$) x can be stated as follows:

$$x = \begin{bmatrix} x_{11} & x_{1j} & x_{1d} \\ x_{i1} & x_{ij} & x_{id} \\ x_{n1} & x_{nj} & x_{nd} \end{bmatrix} \dots \dots \dots (3)$$

Let Z be a row vector of dimension-specific thresholds z_j , x_i the row vector of the individual i 's achievements in each dimension and x_j a column vector of dimension j achievements across the set of individuals. Assuming all dimensions are equally weighted, a matrix of deprivation $\tilde{x}^0 = [\tilde{x}_{ij}^0]$ is derived from x as follows:

$$\text{For all } i \text{ and } j, \tilde{x}_{ij}^0 = \begin{cases} 1 & \text{if } x_{ij} < z_j \\ 0 & \text{otherwise} \end{cases} \dots \dots \dots (4)$$

By summing each row of $\tilde{x}^0$, we obtain a column vector c of deprivation counts containing c_i the number of deprivations suffered by individual i .

For identifying, we consider the identification function $\rho(x_i; z)$ such that:

$$\rho(x_i; z) = \begin{cases} 1 & \text{if individual } i \text{ is multidimensionally poor} \\ 0 & \text{if not} \end{cases} \dots \dots \dots (5)$$

Let k be the cutoff. An individual i was considered poor or $\rho(x_i; z) = 1$ if $c_i \geq k$. $\rho(x_i; z)$ is the identification function relating to the cutoff k . We can rewrite this as:

$$\rho(x_i; z) = \pi(c_i \geq k) = \begin{cases} 1 & \text{if } c_i \geq k \\ 0 & \text{if not} \end{cases} \dots \dots \dots (6)$$

$\pi(c_i \geq k)$ is the standard indicator function taking the value 1 if the expression in brackets holds and the value 0 if not.

There are two concepts regarding the minimum number of k of deprivations an individual should suffer to be considered poor (Batana, 2008). The first is the *union* definition and the second is the *intersection* definition. The former considers an individual as poor if he or she is deprived of at least one dimension i.e. the cutoff $k = 1$. The latter considers an individual as poor only when he or she is deprived in all the dimensions, i.e. with $k = d$. Both definitions have their limitations. For example, the union definition overstates poverty while the intersection definition understates poverty. Therefore, the alternative definition is called the intermediate definition with $1 < k < d$. Therefore, the *intermediate* definition is assumed for this study to state poverty.

Multidimensional deprivation headcount ratio (H)

Depending on the selected cut-off point, the multidimensional deprivation headcount measures the number of children deprived. Accordingly, a child i is considered deprived of certain dimensions if the number of dimensions in which he/she is deprived (D_i) is equal to or larger than the cut-off points K :

$$y_k = 1 \text{ if } D_i \geq k, \quad y_k = 0 \text{ if } D_i < k$$

The multidimensional deprivation headcount ratio is calculated as follows:

$$H = \frac{q_k}{n}, \text{ with } q_k = \sum_{i=1}^n y_k \dots \dots \dots (7)$$

Where,

q_k = number of children affected by at least K deprivations;

n = total number of children included in the analysis;

y_k = deprivation status of a child i depending on the cut-off point K ;

D_i = number of deprivations each child i experiences;

K = cut-off point.

Average deprivation intensity among the deprived (A)

The average value of the intensity of multidimensional deprivation is considered as the sum of all deprivations among children identified as deprived, considering the share of the sum of all possible deprivations among the same group of children.

$$A = \frac{\sum_{i=1}^{q_k} c_k}{q_k \times d}, \text{ with } c_k = D_i \times y_k \dots \dots \dots (8)$$

Where

q_k = number of children affected by at least K deprivations;

d = total number of dimensions considered per child;

c_k = number of deprivations each multi-dimensionally deprived child i experience

Adjusted multidimensional child deprivation headcount ratio (M_0)

Adjusted deprivation headcount ratio is applied to capture not only the number of deprived children (H) but also their deprivation intensity (A).

$$M_0 = H \times A \dots\dots\dots (9)$$

Livelihood diversification and child poverty linkage

The fourth specific objective of the study is to examine the linkage between livelihood diversification and child poverty in the study area. This section will address the linkage between livelihood diversification and child poverty. Child poverty, which is a dependent variable, is a dummy variable taking a value of 1 if a child is multidimensionally poor and otherwise 0. The livelihood diversification under this section is the independent variable explaining child poverty. Following the portfolio theory as a mean-variance estimation of livelihood diversification status, the expected value of the portfolio (mean) was used to state the livelihood diversification status. A two-way-ANOVA test was used to ascertain the association between child poverty and livelihood diversification.

Table 1.1: Summary of explanatory variables determining livelihood diversification

Dependent Variable: Livelihood diversification			
No	Explanatory Variables/Determinants	Measurement	Hypothesis
	Farm income (FI)	Birr	+
	Non-farm income (NFI)	Birr	+
	Off-farm income (OFI)	Birr	+
	Sex of household head (SXHH)	1/0	±
	Age of household head (AHH)	Year	-
	Access to credit (AC)	1/0	+
	Access to extension services (AES)	1/0	+
	Education level of household head (EDHH)	Years of schooling	+
	Livestock holding (LH)	TLU	+
	Distance to nearest market (DIM)	Km/travel hours	±
	Number of plots (NP)	Number	+
	Family size (FS)	Number	-
	Irrigation use (IRU)	1/0	+
	Remittance (RM)	1/0	+

	Means of crop cultivation (MCC)		±
	Manual (MN)	1/0	-
	Oxen (OX)	1/0	+
	Tractor (TRC)	1/0	+

Table 1.2: Summary of explanatory variables of child poverty

Dimensions	Indicators	Thresholds
	Age group 0-5	
Nutrition	Number of meals per day	Deprived if the child has eaten less than three times in a day
	Number of food items consumed per day	Deprived if the child has consumed less than three food items per day
Health	Skilled birth attendant	Deprived if the child was not born with a skilled birth attendant
	Measles vaccination	Deprived if the child has not taken this vaccination
	BCG vaccination	Deprived if the child has not taken this vaccination
	Age group 5-17	
Education	School attendance	Deprived if the child is not enrolled in school
	Years of schooling	Deprived if older than 14 years old but has not finished primary school
Information	Access to information	Deprived if the child does not have access to one of these items – radio, television, phone, or a computer
	All age groups	
Shelter	Overcrowding	Deprived if living with more than four household members per room
	Roof and floor material	Deprived of unsustainable roof and floor material such as mud and thatch
Water	Access to an improved water source	Deprived if no access to protected water
Sanitation	Access to flush toilet or	Children have no access to a toilet facility of any

	pit latrines	kind.
Total income	The proportion of total income	Deprived if the proportion of annual income is <7,184 birr*/adult equivalent/year

*Source from CSA and UNICEF (2020)

1.8. Variable definitions and hypothesis

Definition of Variables for Livelihood Diversification

Livelihood diversification: The dependent variable of this study is livelihood diversification. Livelihood diversification refers to the strategy of making a living through a variety of sources rather than relying on a single income or activity. In Ethiopia, where agriculture is a dominant source of livelihood, diversification can involve engaging in non-farm activities such as small business ventures, handicrafts, or service-based occupations. Research has shown that livelihood diversification can help households maintain economic stability, reduce vulnerability to risks such as climate change or market fluctuations, and improve overall well-being (Gautam and Andersen, 2016). For example, a study in rural Ethiopia found that diversifying income sources led to increased household income and improved livelihood resilience. Another study highlighted the importance of diversification in mitigating the impact of agricultural risks.

Livelihood strategies: The livelihood strategies refer to the various means by which individuals and households secure their basic needs, such as food, shelter, and income. In the context of Ethiopia, where a significant portion of the population relies on agriculture for their livelihood, strategies may include farming, animal husbandry, and agro-processing. Additionally, non-farm activities such as trading, handicrafts, and small businesses are common livelihood strategies.

According to some empirical Studies, the majority of rural households in Ethiopia engage in a mix of livelihood strategies to cope with economic and environmental uncertainties. The study also found that access to education and non-farm employment opportunities can significantly influence livelihood choices and outcomes. For example, the case of a rural household supplementing their income from small-scale farming with income from a local retail business illustrates the diversity of livelihood strategies employed by Ethiopians. Understanding the complexities of these strategies is crucial for sustainable development and poverty alleviation

efforts in the country. In this study, livelihood strategies are conceptualized as on-farm activities, off-farm activities, non-farm activities, and any of the combinations of these specific activities.

Sex of household head: In research, the sex of the household head is motivated by three common assumptions arising from the understanding of the role of household heads and from relevant research on gender differences in access to resources. The first two assumptions are that the household head is mainly responsible for the economic well-being of the household and that women relative to men are disadvantaged in accessing society's economic resources and opportunities. Together these two assumptions imply that although the household head must ensure the economic sustainability of the household irrespective of his or her sex, the means available to do so are not gender neutral. The third assumption arises from research that suggests that the gender of the head of household affects both how household resources are utilized and disbursed within the household, and how households are networked for the exchange of resources with other households (Lloyd and Gage-Brandon, 1993; Haddad, 1990; Bruce, 1989).

Age of the household head: age is a continuous explanatory variable peculiar to the household head. In most rural households, livelihood diversification especially in the agricultural sector for food production and animal rearing is carried out by the head of the household. This is because once his children reach marriage age, they leave the house to make their own house. Therefore, the age of the household head is important concerning livelihood diversification for the survival of the family. As the age of the head of the household increases, the probability of household livelihood diversification decreases, since the older age is unable to diversify to different livelihood strategies and fails to work hard for the survival of his family members. In light of this, the age of the head of the household and livelihood diversification as well as food security is negatively related.

Household size in adult equivalent scale (AE): Members that live together under the same household adjusted this total family to AE. The expectation was that as the family size increases the probability of the household diversifying their livelihoods increases, and this will help households to satisfy the basic necessities of children, if household members are mostly those who can provide labor for agriculture and other activities that household pursued to satisfy their food and other needs. However, household size has a positive relation to food security only when

the household members are at the age of providing labor towards livelihood diversification strategies (on-farm, off-farm/nonfarm activities), and at the same time a household has direct access to livelihood assets. The variable is continuous and measured in terms of the adult equivalent ratio.

Dependence ratio: The age dependence ratio is a crucial demographic measure that provides insight into the population's dependency on the working-age group. It is calculated by dividing the population under the age of 15 and over the age of 64 (the dependent population) by the population aged 15-64 (the working-age population). This ratio helps policymakers, economists, and social scientists understand the potential support burden on the economically active population.

In the context of Ethiopia, understanding the age-dependence ratio is particularly important due to the country's large young population. According to the World Bank (2020), in 2020, approximately 42% of Ethiopia's population was under the age of 15. This high proportion of young people places a significant burden on the working-age population to support and provide for the needs of the dependent population, such as education, healthcare, and social welfare. In this study, the age dependency ratio is hypothesized negatively to associated with livelihood diversification.

Household labor forces (working-age group): The working-age group typically refers to individuals between the ages of 15 and 64 who are considered to be of working age and actively participating in the labor force. In Ethiopia, the working-age population plays a crucial role in the country's economic development and productivity. According to the World Bank, Ethiopia has a significant and growing working-age population, with 70% of the total population falling within the working-age bracket. This presents both opportunities and challenges for the country, as it requires creating sufficient employment opportunities to absorb this labor force and effectively harness their productivity. The availability of economically active labor in the household will help labor intensification, especially in the sector of agriculture. If a household has enough farmland, the availability of active labor helps to diversify agriculture and at the same time reduces the cost of hiring labor to their agricultural activities. The household labor

force is continuous and measured in terms of AE. The measurement of available household labor considered only those who are at the productive age ranging between 15 and 64 years.

Educational status of the household head: the better the educational level of the household head, the higher the chance to maintain the livelihood diversification of his/her family for example through, diverting to other income-generating activities besides agricultural activities and a better chance to adopt agricultural technologies(UNCDF, 2007). The education status of household heads was categorical and conceptualized as literate and illiterate.

Marital status: Marriage is biological and social engagement to support each other both socially and economically. Marriage is established with a view of helping each other and married people pool their resources and reduce costs that would have been spent separately. Moreover, married households put aside some resources for unforeseen circumstances to smoothen their life. In this study, marriage and livelihood diversification status are hypothesized to be associated positively.

On-farm activities: these are all farm activities pursued by farm households on their account farm to generate income. According to Bryceson (2005), on-farm income refers to income generated from own-account farming, whether on owner-occupied land or land accessed through cash or share tenancy. Farm activities, are broadly defined and include livestock as well as crop production and comprise both consumption-in-kind and cash farm own farms.

Off-farm activities: generally refers to activities undertaken away from the household's farm, and some authors (Ann and Craig, 2001) use it to refer exclusively to agricultural laboring on someone else's land, so off-farm used in this sense would not fall within the normal definition of non-farm. Other authors (Barrett *et al.*, 2001) stated off-farm activities as activities that take place away from home. i.e. all activities away from one's property, regardless of sector or functional classification; can be wage or self-employment. They are also used to classify off-farm activities as formal and informal activities. The former stands for wage labor and the latter stands for activities like hunting and gathering

Nonfarm activities: refer to those activities that are not primarily agriculture forestry or fisheries. However, non-farm does include trade or processing of agricultural products (even if,

in the case of micro-processing activities, they take place on the farm). Barrett and Reardon (2001) stress that this definition is sectoral, i.e. it follows the convention used in national accounting systems where a distinction is made between primary production, secondary (manufacturing) activities, and tertiary (service) activities). It does not matter where the activity takes place, at what scale, or with what technology.

Livestock production: Livestock production is a crucial aspect of agriculture in Ethiopia, contributing significantly to the national economy and food security. Therefore, studying this sector as one of a livelihood aspect is essential to understanding the various aspects of livestock production, including breeding, nutrition, health management, and market dynamics.

Ethiopia has a diverse agricultural landscape, providing ample opportunities for livestock production. The country is known for its large population of cattle, sheep, goats, and poultry, supporting the livelihoods of millions of people. However, despite its potential, the sector faces challenges such as limited access to quality feed, lack of veterinary services, and low productivity. Understanding these principles and applying them in practice can help address the challenges faced by the livestock production sector in Ethiopia and contribute to its sustainable development. As a potential in this field, it is important to stay informed about the latest research and best practices to make a meaningful impact. In this study, it is hypothesized that livestock production has a positive and significant association with livelihood diversification.

Irrigation practice: irrigation is the process through which crops are artificially watered using canals, pipes, sprinklers, or any other man-made infrastructures, rather than exclusively depending on rainfall.

Definitions of Variables for Household Livelihood Strategies and Its Determinants

Livelihood strategies: The dependent variable of this study is household livelihood strategies. The livelihood strategies refer to the various means by which individuals and households secure their basic needs, such as food, shelter, and income. In the context of Ethiopia, where a significant portion of the population relies on agriculture for their livelihood, strategies may include farming, animal husbandry, and agro-processing. Additionally, non-farm activities such

as trading, handicrafts, and small businesses, and off-farm activities such as agricultural laboring and harvest share are common livelihood strategies.

Access to credit: Access to credit refers to the ability of individuals and businesses to obtain financial resources from lending institutions. In Ethiopia, access to credit has been a challenge, particularly for small and medium-sized enterprises, farmers, rural youths, and women in rural areas. According to the World Bank (2012), only 22% of adults in Ethiopia have access to formal financial services, indicating a significant gap in credit accessibility.

This limited access to credit has hindered economic growth and development. However, various initiatives have been put in place to improve access to credit in the country, such as the establishment of microfinance institutions and the introduction of mobile banking services. These efforts have shown some success in increasing credit accessibility, particularly among rural populations. The current study also hypothesized that access to credit would have a significant and positive effect on livelihood strategy choices in the study area.

Age of the household head: age is a continuous explanatory variable peculiar to the household head. In most rural households, livelihood diversification especially in the agricultural sector for food production and animal rearing is carried out by the head of the household. This is because once his children reach marriage age, they leave the house to make their own house. Therefore, the age of the household head is important for livelihood diversification for the survival of the family. As the age of the head of the household increases, the probability of household livelihood diversification decreases, since the older age is unable to diversify to different livelihood strategies and fails to work hard for the survival of his family members. In light of this, the age of the head of the household and livelihood diversification as well as food security is negatively related.

Average annual income: Average annual income refers to the total income earned from different livelihood activities divided by the number of income-generating activities actual income is earned from within the year. In Ethiopia, the average annual income is an important measure of economic well-being and standard of living. In this study, average annual income refers to the total income earned from different livelihood activities divided by the actual

income-generating activities adopted by a household that generates income. It was hypothesized that average annual income would have a significant and positive effect on livelihood strategy choices.

Costs of transporting farm inputs and outputs: Farm inputs and outputs transportation costs refer to total expenses incurred in moving inputs like fertilizers, seeds, and machinery to farms, as well as transporting harvested crops and livestock to markets, homes, or processing facilities. In Ethiopia, particularly in rural, transportation costs significantly affect the agricultural sector due to challenges such as inadequate infrastructure, poor road conditions, and long distances to markets. In this study, it was hypothesized that transportation costs would significantly affect particularly on-farm activities.

The dependence ratio: The age dependence ratio is a crucial demographic measure that provides insight into the population's dependency on the working-age group. It is calculated by dividing the population under the age of 15 and over the age of 64 (the dependent population) by the population aged 15-64 (the working-age population). This ratio helps policymakers, economists, and social scientists understand the potential support burden on the economically active population.

Education status of household head: The education status of the household head refers to the level of educational attainment of the person responsible for the household. Research has consistently shown that the education status of the household head has a significant implication for the overall well-being and development of the household. Studies have found that higher levels of education among household heads are associated with better economic outcomes, improved health outcomes, and greater social mobility for the household members. For example, a study by the World Bank found that children living in households headed by individuals with higher levels of education are more likely to have access to education themselves, breaking the cycle of intergenerational poverty.

In Ethiopia, where access to education has historically been limited, the education status of the household head can have a particularly profound effect on livelihood strategy choices. This study

hypothesized that the education status of household heads would have a significant effect on livelihood strategy choices in the study area.

Frequency of extension contact: Frequency of extension contact refers to the number of times an individual has contact with an extension agent, services, or program within the specified period, in this case per month. In the context of agriculture, extension contact is crucial for disseminating information, providing technical assistance, and promoting innovation among farmers. Research has shown that frequent extension contact leads to higher adoption of improved agricultural practices and technologies, resulting in increased productivity and income for farmers. In this study, it was hypothesized that the frequency of extension contact would have a positive and significant effect on livelihood strategy choices.

Health status of household head: The health status of the household head is crucial for the overall well-being of the family. In Ethiopia, where access to healthcare may be limited, the health status of the household head can significantly affect the entire family's health. In this study, it was hypothesized that the health status of household heads would significantly affect livelihood strategy choices.

Household size in AE: Members that live together under the same household adjusted this total family to AE. The expectation was that as the family size increases the probability of the household diversifying their livelihoods increases, and this will help households to satisfy the basic necessities of children, if household members are mostly those who can provide labor for agriculture and other activities that household pursued to satisfy their food and other needs. However, household size has a positive relation to livelihood diversification only when the household members are at the age of providing labor towards livelihood diversification strategies (on-farm, off-farm/nonfarm activities), and at the same time a household has direct access to livelihood assets. The variable is continuous and measured in terms of the adult equivalent ratio.

Irrigation practice: Irrigation practices play a crucial role in agriculture, particularly in countries like Ethiopia where water scarcity is a significant challenge. There are various irrigation methods, including surface irrigation, drip irrigation, and sprinkler irrigation, each with its advantages and limitations. For example, drip irrigation is more water-efficient and suitable

for areas with limited water resources, while sprinkler irrigation is effective for large, flat areas. In Ethiopia, where agriculture accounts for a significant portion of the economy, efficient irrigation practices can significantly improve crop yields and food security. In this study, it was hypothesized that irrigation practice would have a significant effect, especially on on-farm diversification such as multiple cropping in a single cropping season, improving household well-being.

Livestock rearing: Livestock rearing, also known as animal husbandry is the practice of breeding and raising domesticated animals for various purposes, including food production, clothing, and labor. In Ethiopia, livestock rearing plays a crucial role in the economy and the livelihoods of many people, with the country being home to a large population of cattle, sheep, goats, and other livestock. The study hypothesized that owning more livestock would significantly decrease the probability of a household engaging in diverse livelihood activities.

Marital status: Marriage is biological and social engagement to support each other both socially and economically. Marriage is established with a view of helping each other and married people pool their resources and reduce costs that would have been spent separately. Moreover, married households put aside some resources for unforeseen circumstances to smoothen their life. In this study, marriage and livelihood strategies are hypothesized to be associated positively.

Number of plot lands: In Ethiopia, the number of plots of land owned is an important factor in understanding land ownership and agricultural practices. According to research published in the Ethiopian Journal of Economics, land fragmentation, where a farmer owns multiple small plots of land, is a common issue in the country. This can lead to inefficiencies in farming practices and lower agricultural productivity. It is important to study this aspect to understand the social, economic, and agricultural implications of land fragmentation in Ethiopia. In this study, it was hypothesized that owning more plots of land would significantly affect livelihood strategy choices, mostly promoting on-farm diversification, but limiting households' participation in diverse livelihood strategies.

Sex of household head: In research, the sex of the household head is motivated by three common assumptions arising from the understanding of the role of household heads and from

relevant research on gender differences in access to resources. The first two assumptions are that the household head is mainly responsible for the economic well-being of the household and that women relative to men are disadvantaged in accessing society's economic resources and opportunities. Together these two assumptions imply that although the household head must ensure the economic sustainability of the household irrespective of his or her sex, the means available to do so are not gender neutral. The third assumption arises from research that suggests that the gender of the head of household affects both how household resources are utilized and disbursed within the household, and how households are networked for the exchange of resources with other households (Lloyd and Gage-Brandon, 1993; Haddad, 1990; Bruce, 1989).

Total land holding in hectare: Total land holding in hectare refers to the total amount of land owned or leased by an individual, measured in hectares. In Ethiopia, land holding is a crucial aspect of the agricultural sector, as it directly affects food production, livelihoods, and economic development. Smallholder farmers typically have limited land holdings, which can hinder their ability to generate sufficient income and improve their livelihoods. It was hypothesized that landholding will significantly affect livelihood strategy choices.

Total number of livestock in TLU: In Ethiopia, Tropical Livestock Units (TLU) is a commonly used measure to assess the total number and size of livestock owned by farmers. TLU takes into account the different types of livestock and their varying sizes and uses a standardized measure to provide a more accurate representation of the total livestock wealth. Livestock plays a vital role in the Ethiopian economy, contributing to food security, income generation, and overall livelihoods. In this study, it was hypothesized that owning more livestock would significantly affect households' livelihood strategy choices.

Definitions of Variables for Child Poverty and Its Determinants

Multidimensional child poverty: The dependent variable of the study is multidimensional child poverty. Multidimensional child poverty refers to the experience of children living in poverty across various dimensions, including health, education, and living standards. In Ethiopia, multidimensional child poverty is a significant issue, with a high proportion of children experiencing deprivation in multiple areas. According to CSA and UNICEF (2018), 88% of

Ethiopian children under the age of 18 years old are considered multidimensionally poor, facing challenges such as lack of access to education, healthcare, clean water, and adequate housing.

Access to credit: Access to credit refers to the ability of individuals and businesses to obtain financial resources from lending institutions. In Ethiopia, access to credit has been a challenge, particularly for small and medium-sized enterprises, farmers, rural youths, and women in rural areas. According to the World Bank (2012), only 22% of adults in Ethiopia have access to formal financial services, indicating a significant gap in credit accessibility.

This limited access to credit has hindered economic growth and development. However, various initiatives have been put in place to improve access to credit in the country, such as the establishment of microfinance institutions and the introduction of mobile banking services. These efforts have shown some success in increasing credit accessibility, particularly among rural populations. The current study also hypothesized that access to credit would have a significant and positive effect on livelihood strategy choices in the study area.

Age of the household head: age is a continuous explanatory variable peculiar to the household head. In most rural households, livelihood diversification especially in the agricultural sector for food production and animal rearing is carried out by the head of the household. This is because once his children reach marriage age, they leave the house to make their own house. Therefore, the age of the household head is important for livelihood diversification for the survival of the family. As the age of the head of the household increases, the probability of household livelihood diversification decreases, since the older age is unable to diversify to different livelihood strategies and fails to work hard for the survival of his family members. In light of this, the age of the head of the household and livelihood diversification as well as food security is negatively related.

Average household income: Average household income refers to the total income earned by all members of the household, including wages, salaries, investments, and government assistance, divided by the number of people in the household. In Ethiopia, the average household income is an important measure of economic well-being and standard of living. In this study, average household income refers to the total income earned from different livelihood activities divided

by household size as measured in adult equivalent (AE). It was hypothesized that average household income would have a significant and positive effect on livelihood strategy choices.

Dietary diversity score: The dietary diversity score (DDS) was defined as the number of food groups consumed by the child the previous day. A DDS is used to assess the quality of diets and nutritional status. Research by Belachew *et al.* (2016) found that higher DDS is associated with a lower prevalence of stunting and underweight among Ethiopian children. Understanding DDS is crucial for addressing malnutrition challenges in the country. By promoting a diversified diet, individuals can improve their nutritional intake and overall health. In this study, it was hypothesized that DDS can significantly affect child poverty in the study area.

Education status of household head: The education status of the household head has a significant impact on child poverty. Research studies have consistently shown that children living in households headed by individuals with lower levels of education are more likely to experience poverty. In Ethiopia, children living in households headed by individuals with no formal education were significantly more likely to be living in poverty compared to those whose household heads had higher levels of education. In this study, it was also hypothesized that education status would have a significant association with multidimensional child poverty.

Health status of household head: Household head health status can affect child poverty in various ways. For example, when the head of household is in poor condition, it can lead to decreased income, limited access to resources, and increased medical expenses, all of which contribute to child poverty. Evidence revealed that children in households with a sick head are more likely to suffer from malnutrition and have a higher rate of school dropout. Therefore, addressing household head health is essential in reducing child poverty in the study area. It was hypothesized that the health status of a household head would have a significant effect on child poverty.

Household size in adult equivalent scale (AE): The effect of household size on child poverty is a significant and complex issue that has been widely studied by researchers and experts. Numerous studies have shown that larger household sizes are often associated with higher rates of child poverty. This is due to several factors, including limited financial resources per child,

increased competition for resources within the household, and greater difficulty in meeting basic needs such as food, shelter, and education. In this study, it was hypothesized that household size would have a significant effect on child poverty.

Housing condition: The housing conditions would have a profound effect on child poverty. Inadequate housing, such as overcrowding, poor ventilation, and exposure to environmental hazards, directly contribute to poor health and development outcomes for children. In this study, it was hypothesized that housing conditions would significantly affect child poverty.

Incidence of household poverty: The incidence of household poverty would have a significant effect on child poverty. Research shows that children in impoverished households are more likely to experience poor health, limited access to education, and overall lower well-being (CSA and UNICEF, 2018). The same resource indicated that 88% of Ethiopian children living in rural areas are multidimensionally poor, meaning they lack access to basic necessities such as clean water, education, and healthcare. It was hypothesized that the incidence of household poverty would significantly affect child poverty.

Irrigation practice: Irrigation practice can significantly affect child poverty. Access to irrigation can increase crop production, leading to improved food security and reduced poverty levels. In areas where irrigation is practiced, household incomes would be increased, providing families with the resources to send their children to school and access healthcare services. Therefore, it was hypothesized that irrigation practices would significantly affect child poverty in the study area.

Laboring on another's farm: Laboring on another person's farm can have a significant effect on child poverty. For example, children who are forced to work on farms instead of attending school are more likely to experience poverty as adults. Children who work on farms are less likely to receive an education, leading to reduced earning potential and perpetuating the cycle of poverty. According to the International Labor Organization, over 60% of Ethiopian children between the ages of 5 and 17 are engaged in child labor, with many of them working on farms. This not only deprives children of their right to education but also contributes to the perpetuation

of poverty within the country. It was hypothesized that laboring on another person's farm would significantly affect child poverty.

Marital status of the household head: The marital status of the household head can have a significant effect on child poverty. World Bank (2006) shows that children in single-parent households are at a higher risk of living in poverty compared to those in two-parent households. This is due to the reduced income and financial instability that single-parent households often face. In Ethiopia, where single-parent households are prevalent, children in these households are more likely to experience poverty, lack access to education, and suffer malnutrition. It was hypothesized that marital status would significantly affect child poverty.

Meal cooking fuel: Types of meal cooking fuels have a significant effect on child poverty, especially in developing countries like Ethiopia. Studies have shown that traditional solid fuels such as wood, charcoal, and animal dung, which are commonly used for cooking in low-income households, contribute to indoor air pollution, leading to respiratory diseases and negatively affecting children's health. This, in turn, increases health expenses and reduces productivity, perpetuating the cycle of poverty.

Transitioning to cleaner cooking fuels like liquefied petroleum gas (LPG), biogas, or improved cook stoves can reduce indoor air pollution and its associated health costs, benefiting children and families. According to the WHO and UNICEF (2021), transitioning to cleaner cooking fuels can prevent over 4 million deaths annually. Moreover, in rural areas, where the sources of cooking fuels are wood, women and children are responsible for collection, which in turn affects children's schooling. Therefore, it was hypothesized that cooking fuels can have a significant effect on child poverty.

Minimum acceptable diet (MAD): The indicator assesses the acceptability of a child's diet based on its micronutrient adequacy and meal frequency (WHO and UNICEF, 2021). For breastfeeding children, MAD assesses children receiving at least the minimum dietary diversity (consumed 4 or more food groups from 8 group lists) and minimum meal frequency (3 or more meals) for their age during the previous day. On the other hand, for non-breastfeeding children, MAD assesses children receiving at least, the minimum dietary diversity (consumed 4 or more

food groups from 7 group list) and minimum meal frequency (4 or more meals) for their age during the previous day as well as at least two milk feeds. It was hypothesized that MAD would have a significant effect on child poverty.

Minimum meal frequency (MMF): Feeding meals less frequently than recommended by WHO and UNICEF (2021) can compromise a child's total energy and micronutrient intake, which in turn may cause stunting and micronutrient deficiencies. Therefore, this indicator measures the proportion of children who consumed meals/snacks at least the recommended number of times. Attaining the minimum meal frequency was expected to have a negative and significant effect on child poverty.

Number of plots of land: Child poverty is a critical issue, especially in developing countries like Ethiopia. Research has shown a strong correlation between the number of plots of land owned by a household and child poverty. Households with more land might tend to have better economic stability, which directly affects child well-being. Therefore, it was hypothesized that many plots of land owned by a household at different locations can have a significant effect on child poverty.

Participation in off-farm for harvest share: Off-farm activities for harvest share refer to the participation of rural households in off-farm agricultural income-generating activities to supplement their income from their farming. This strategy is often employed to mitigate the risk of crop failure and to improve livelihoods. Off-farm activities can have a positive effect on reducing child poverty in rural areas. It was also hypothesized that a household's participation in off-farm activities for harvest share can have a significant and negative effect on child poverty.

Petty trade: Petty trading or small-scale business refers to the buying and selling of goods on a small scale, often in an informal market. In many developing countries, including Ethiopia, petty trading is a common source of income for households, but it can have negative effects on child poverty. Children of petty traders might often face economic insecurity, limited access to education and healthcare, and are at risk of exploitation and child labor. It was expected that petty trading could have a significant effect on child poverty.

Sex of household head: In many developing countries, including Ethiopia, the sex of the household head has significant effects on child poverty. Female-headed households are more likely to experience higher levels of poverty than male-headed households. This can be attributed to factors such as limited access to resources, education, and employment opportunities for women, leading to a higher risk of child poverty. Therefore, it was expected that the sex of the household head could significantly affect child poverty in the study area.

Total land holding: Landholding size refers to the amount of land that a household owns or controls for agricultural purposes. In Ethiopia, where a significant portion of the population relies on agriculture for their livelihood, landholding size can directly affect child poverty. Smaller landholding can be associated with higher levels of child poverty, as they limit the household's ability to produce enough food and generate income. It was hypothesized that landholding size could significantly affect child poverty.

Total livestock in TLU: Livestock ownership has a significant effect on child poverty in Ethiopia. Households with a higher number of livestock might be less likely to experience child poverty. Livestock ownership provides multiple benefits, including increased income, improved nutrition, and better access to education and healthcare for children. According to Hoddinott *et al.* (2015) households in rural Ethiopia, owning livestock was associated with a 19% lower likelihood of child stunting, a common indicator of poverty and malnutrition. It was expected that livestock ownership could have a significant effect on child poverty in the study area.

Definitions of Variables for Livelihood Diversification and Multidimensional Child Poverty

The extent of livelihood diversification: The dependent variable of this study is the extent of livelihood diversification. Livelihood diversification refers to the process by which individuals and households spread their income-earning activities across different sources to reduce risk and improve their overall well-being. The extent of livelihood diversification in this study is a categorical variable ranging from undiversified to very highly diversified levels. Various factors can affect the extent of livelihood diversification, and some of the expected variables are explained as follows:

Age of household head: Research has shown that older household heads tend to engage in less diversified livelihood strategies (Mekonnen and Gerber, 2010). This is often due to factors such as reduced ability to engage in physically demanding activities, limited access to new information and technology, and conservative attitudes towards risk-taking and innovation. Therefore, it was expected that the age of the household and the extent of livelihood diversification to be negatively and significantly associated, which also negatively affects child poverty reduction.

Charcoal production: Charcoal production and selling can significantly affect livelihood diversification. According to a study by the International Food Policy Research Institute, charcoal production is a major source of income for many households in Ethiopia, particularly in rural areas. However, this activity also contributes to deforestation and environmental degradation, affecting the availability of alternative livelihood options such as farming and eco-tourism. Furthermore, the reliance on charcoal as a source of energy perpetuates a cycle of poverty, as households become dependent on a single income-generating activity. This activity would significantly affect both livelihood diversification and child poverty.

Distance to the nearest market: In many rural communities, distance to the nearest market can significantly affect livelihood diversification. Research has shown that increased distance to the market can limit opportunities for households to engage in diverse economic activities. A study by Barrett et al. (2001) found that households located further from markets were less likely to engage in non-farm activities, thereby limiting their income diversification. Additionally, a study by Dercon and Krishnan (2000) highlighted that limited access to markets can also restrict the ability of households to access resources and information necessary for diversifying their livelihoods, which in turn, can affect child poverty.

Economically active labor: Economically active labor (working age) refers to individuals who are engaged in income-generating activities, such as employment or entrepreneurship. Livelihood diversification, on the other hand, involves spreading out income-generating activities to reduce risk and improve overall livelihoods. In the context of Ethiopia, where a significant portion of the population relies on agriculture for their livelihoods, economically active labor can greatly affect livelihood diversification. Research by Abebe *et al.* (2015) found

that households with economically active members were more likely to engage in diversified livelihood strategies, including off-farm activities and non-farm activities. This diversification not only reduces vulnerability to agricultural risk but also improves household income and child nutrition.

Education status of household head: In many developing countries, the education status of the household head has a direct effect on livelihood diversification and child poverty. Individuals with higher levels of education are more likely to engage in multiple income-generating activities, leading to increased economic stability and reduced poverty. This is particularly important for children in these households, as a stable income can ensure access to basic needs such as food, education, and healthcare. Therefore, it was hypothesized that the education status of the household head could significantly affect both livelihood diversification and child poverty.

Farming experience in years: Farming experience can play a significant role in shaping livelihood diversification and child poverty in rural areas. Research has shown that households with more agricultural experience are more likely to diversify their livelihoods, reducing their dependence on farming alone. This diversification could lead to increased income and improved living standards of families, ultimately affecting the child poverty level. For example, farmers who had diversified livelihoods might have better child nutrition and health outcomes compared to those who rely solely on farming.

Frequency of extension contact: The frequency of extension contact can have a significant effect on livelihood diversification and child poverty. Livelihood diversification refers to the process of households spreading their income-generating activities across multiple sources, which can enhance resilience and reduce poverty. Increased frequency of extension contact, such as agricultural training and support, can lead to greater adoption of diversified livelihood strategies among rural households, which in turn affects child poverty.

Health status of household head: The health status of a household head has a significant effect on livelihood diversification and child poverty. Research from the World Bank (2012) indicates that when the household head is in poor health, it limits their ability to engage in various income-generating activities, resulting in decreased livelihood diversification. This, in turn, exacerbates

child poverty, as limited resources are available for the children's well-being. For example, households with unhealthy heads might be more likely to rely solely on agriculture for income, limiting their ability to invest in their children's education and healthcare. Therefore, it was hypothesized that the health status of a household head would significantly affect child poverty.

Household size: Household size can significantly affect livelihood diversification and child poverty. Research has shown that large household sizes often lead to greater livelihood diversification as families seek to mitigate poverty through various income-generating activities. However, this can also result in higher levels of child poverty due to the limited resources available to each child within a larger household. Households with more members might be more likely to engage in diverse income-generating activities such as farming, small business, and wage labor. This can have a positive effect on overall household income but may also lead to greater disparities in resource allocation, potentially resulting in higher levels of child poverty within these households. Therefore, it was hypothesized that household size would have a significant effect on livelihood diversification and child poverty.

Incidence of household poverty: The incidence of household poverty can have a significant effect on both livelihood diversification and child poverty. In Ethiopia, where poverty rates are high, households often engage in various income-generating activities to diversify their livelihoods and mitigate the impact of poverty. However, the incidence of household poverty can limit the ability of families to invest in their children's well-being, including education and healthcare, thereby perpetuating child poverty. It was hypothesized that the incidence of household poverty would significantly affect both livelihood diversification and child poverty.

Laboring on another's farm: Livelihood diversification, including laboring on another person's farm, can affect child poverty in rural Ethiopia. In rural areas, many families rely on farming as their main source of income. When parents engage in laboring on other's farms to diversify their livelihoods, it can lead to increased income and reduced poverty. However, if children are required to help with farm work, it can affect their education and overall well-being. It was hypothesized that, engaging on other person's farms as labor work would significantly affect both livelihood diversification and child poverty.

Marital status of household head: Marital status can affect livelihood diversification and child poverty. Research has revealed that married households tend to have more diversified livelihoods compared to unmarried households, which can have a positive impact on their economic stability and the well-being of their children. It was expected that the marital status of the household head could significantly affect both livelihood diversification and child poverty.

Number of plot lands owned: The number of plots of land owned at different locations can significantly affect on-farm diversification and ultimately affect child poverty. Households with more plots of land might engage in diverse income-generating activities. This, in turn, can have a significant effect on child poverty reduction.

Participation in petty trading: Petty trading, which refers to small-scale, informal trading activities, can significantly affect livelihood diversification and child poverty in low-income countries like Ethiopia. Petty trading often serves as a primary source of income for many households, particularly those in rural areas where formal employment opportunities are limited. As a result, families may become overly reliant on this unstable source of income, hindering their ability to diversify their livelihoods and escape poverty.

Participation on off-farm for harvest share: Off-farm participation for harvest share refers to the practice of exchanging labor inputs for a share of harvest, which can affect livelihood diversification and child poverty. Research by Hoddinott and Winters (2003) found that off-farm participation can contribute to increased income and food security for households in rural areas. This allows families to diversify their livelihoods beyond agriculture, reducing their vulnerability to agricultural shocks and ultimately improving their overall well-being.

Sex of household head: The sex of the household head can significantly affect livelihood diversification and child poverty. In many societies, men and women have different access to resources, which can affect their ability to engage in diverse income-generating activities. Female-headed households are more likely to face economic challenges and might have limited access to assets and opportunities for livelihood diversification. This can lead to higher levels of child poverty within these households.

Total annual income: The total annual income is the overall income earned from different livelihood activities annually. The total annual income can play a crucial role in shaping livelihood diversification and child poverty. Studies, such as those by the World Bank, have shown that households with higher annual incomes are more likely to engage in diverse economic activities, reducing their vulnerability to economic shocks. This diversification, in turn, can positively affect child poverty by providing families with more stable sources of income.

Total land holding: Total land holding refers to the amount of land an individual or household possesses for agricultural activities. Landholding might have a direct impact on livelihood diversification and child poverty. In rural Ethiopia, households with larger landholdings are more likely to engage in diverse income-generating activities, which can help to reduce the risk of child poverty. On the other hand, households with smaller landholdings may struggle to secure alternative sources of income, leading to increased vulnerability to poverty for children.

Total number of livestock in TLU: Livestock plays a crucial role in the livelihoods of rural communities, particularly in developing countries like Ethiopia. The total number of livestock owned by a household can have a significant impact on livelihood diversification and child poverty. Research has revealed that households with a higher number of livestock are better able to diversify their income sources, reducing their reliance on a single agricultural activity and improving their resilience to economic shocks. However, it is important to note that the benefits of livestock ownership can vary depending on factors such as the type of livestock, access markets, and the presence of supporting policies.

Definitions of Variables for Livelihood Strategies and Child Dietary Diversity in Rural Ethiopia

Dietary diversity: The dependent variable of this study is the level of dietary diversity. Dietary diversity is a qualitative measure of food consumption that reflects household access to a variety of foods and is a proxy for nutrient adequacy of the diet of individuals. Various factors can affect a child's dietary intake. Some of the expected factors are explained as follows:

Age of household head: The age of the household head can significantly affect livelihood strategy choices and child dietary diversity. In Ethiopia, younger household heads are more likely to engage in riskier livelihood strategies, such as wage labor or off-farm activities, to meet their household's needs. This often results in limited access to nutritious food for children, leading to lower dietary diversity and increased risk of malnutrition. In contrast, older households are more likely to prioritize stable and diversified livelihood strategies, such as agriculture, which can contribute to improved child dietary diversity. It was expected that the age of the household heads would have a significant effect on livelihood strategy choices and child dietary diversity.

Distance to the nearest market: Studies have shown that the distance to the nearest market directly affects livelihood strategy choices and child dietary diversity in rural Ethiopia. Research by Akalu Teshome and others (2015) found that households located farther from markets are more likely to engage in subsistence agriculture, leading to limited access to diverse food options and ultimately affecting the dietary diversity of children. This is supported by a study conducted by Kibrom Tafere (2019), which showed that households near markets have better access to diverse and nutritious food, leading to improved child dietary diversity. Additionally, a case study by Fikirte Mekonnen (2020) highlighted that proximity to markets allows households to engage in income-generating activities, which in turn enables them to purchase a variety of foods for their children. Therefore, distance to the nearest market plays a crucial role in shaping livelihood strategies and child dietary diversity in rural Ethiopia.

Education status of household head: The education status of a household head can significantly influence livelihood strategy choices and child dietary diversity. The higher education levels of a household head can be associated with better livelihood strategies and improved child dietary diversity. In Ethiopia, for example, a study published in the BMC Public Health journal found that households with educated heads were more likely to adopt diverse and sustainable livelihood strategies, leading to improved child dietary diversity. Therefore, in this study, it was hypothesized that the education status of a household head would significantly affect the livelihood strategies choices resulting in a significant effect on child dietary diversity.

Health status of the household head: The health status of a household head can have a significant effect on livelihood strategy choices and child dietary diversity in various ways. Research published in the International Journal of Environmental Research and Public Health found that households headed by individuals in poor health are more likely to experience food insecurity, as they may have limited physical capability to engage in labor-intensive livelihood activities. This can lead to reduced income and limited access to diverse and nutritious foods for their children. Therefore, it was hypothesized that the health condition of a household head could significantly affect livelihood strategy choices and child dietary diversity.

The incidence of household poverty: Household poverty can have a significant effect on livelihood strategy choices and child dietary diversity. Research shows that in low-income households, limited financial resources restrict access to diverse nutritious food, leading to poor dietary diversity among children. A study in Ethiopia found that children in poor households had lower dietary diversity scores compared to those in wealthier households, affecting their overall health and development. In this study, it was hypothesized that the incidence of household poverty would have a significant effect on livelihood strategy choices resulting in a significant effect on child dietary diversity in the study area.

Number of livelihood activities practiced: The number of livelihood activities practiced by a household can affect the livelihood strategy choices and child dietary diversity. In rural areas, households engaged in multiple livelihood activities, such as farming, livestock rearing, and non-farm enterprises might be more likely to have diverse and nutritious diets for their children. This is because diverse livelihood activities provide households with a more stable and diverse income, allowing them to afford a greater variety of foods. It was hypothesized that the number of livelihood activities practiced by a household would have a significant effect on the choices of livelihood strategies and child dietary diversity.

Marital status of household head: The marital status of the household head can significantly affect the livelihood strategy choices and child dietary diversity. In many cultures, married individuals may have more stability and resources to allocate towards various livelihood strategies, including diversifying their income sources and investing in their children's nutrition.

Therefore, it was hypothesized that the marital status of the household head would have a significant effect on the choices of livelihood strategies and child dietary diversity.

On-farm activities: On-farm activities, such as crop production and livestock rearing, may have a significant effect on livelihood strategy choices and child dietary diversity. Households engaged in agricultural activities might tend to have better access to diverse and nutritious food, leading to improved child dietary diversity. However, the choice of farming practices, crop selection, and livestock management can also influence access to food and dietary diversity. Therefore, we hypothesized that; on-farm activities would have a significant effect on the choices of livelihood strategies, which in turn affects the child's dietary diversity.

Off-farm activities: Off-farm activities can significantly affect livelihood strategies and child dietary diversity in rural communities. Studies have shown that households engaging in off-farm activities often have higher incomes, which can lead to improved access to diverse and nutritious food for their children. Therefore, it was hypothesized that off-farm activities would have a significant effect on both livelihood strategy choices and child dietary diversity.

Non-farm activities: Non-farm activities can have a significant effect on livelihood strategy choices and child dietary diversity in rural Ethiopia. Households participating in non-farm activities might be more likely to have diversified livelihood strategies, leading to increased income and improved access to food. This, in turn, may have a positive effect on child dietary diversity. Therefore, it is crucial to study the complex association among non-farm activities, livelihood strategy choices, and child dietary diversity in the study area.

Sex of household head: The sex of household head can significantly affect livelihood strategy choices and child dietary diversity. Female-headed households might sometimes be more likely to engage in diverse livelihood strategies, mainly limited access to farmland, leading to improved child dietary diversity. Moreover, due to the conscious gender role identification, female-headed households might be more likely to invest in their children's nutrition and education compared to male-headed households. Therefore, it was hypothesized that the sex of the household head would have a significant effect on both livelihood strategy choices and child dietary diversity.

Household sizes: Household size can have a significant effect on livelihood strategy choices and child dietary diversity. Larger households might often have limited resources, leading to a greater reliance on subsistence farming or low-income employment. This can affect the availability of diverse and nutritious food options for children, ultimately affecting their dietary diversity and overall health. Therefore, it was hypothesized that household size would have a significant effect on both livelihood strategy choices and child dietary diversity.

Total annual income: Total annual income can significantly affect livelihood strategy choices and child dietary diversity. For example, lower household income may be associated with limited access to nutritious food options, leading to poor dietary diversity for children. This is particularly evident in low-income countries like Ethiopia, where economic constraints can affect food availability and accessibility. On the other hand, higher household income can be linked to better child dietary diversity and improved nutrition outcomes. It was hypothesized that total annual household income would have a significant effect on both livelihood strategy choices and child dietary diversity in the study area.

Total land holding in hectares: Total land holding size can affect livelihood strategy choices and child dietary diversity in various ways. For example, households with larger land holdings may tend to have more diverse livelihood strategies, including a combination of crop production, and livestock rearing. This diversity of livelihood strategies can lead to greater household income and food security, which in turn can positively affect child dietary diversity. Therefore, it was hypothesized that total land holding size can significantly affect both livelihood strategy choices and child dietary diversity.

Total number of livestock in TLU: Livestock can play a crucial role in the livelihood strategy choices and child dietary diversity in rural Ethiopia. Households with a higher total number of livestock may have more diverse livelihood strategies, as they can rely on income from livestock sales, milk production, and other livestock-related activities. This may allow them to have more diverse and nutritious diets for their children. It was expected that the total number of livestock owned could have a significant effect on livelihood strategy choices and child dietary diversity.

1.9. Concepts and theories of livelihood diversification, poverty, and multidimensional child poverty

This section briefly highlighted different concepts of livelihood diversification, poverty, and multidimensional child poverty, and theories related to livelihood diversification and child poverty.

1.9.1. Concepts of Poverty

The concept of poverty is too broad and has different meanings to different people. However, most of the literature focuses on three major concepts to explain poverty. The first concept focuses on well-being to explain poverty as a lack of economic well-being. According to this concept, poverty is an economic problem that can be measured quantitatively. While there are many ways to poverty measurement, it has been defined following the economic well-being tradition and while there are many dimensions poverty may take, these definitions and dimensions point essentially to the common theme of ‘economic deprivation’ (Wagle, 2008). In line with this view, Ringen (1987) understands poverty as a low standard of living resulting from the inadequacy of resources. The well-being approach primarily focuses on the insufficiency of economic resources for human consumption (Wagle, 2008).

The notion of **economic well-being** relates to the physical quality of life or welfare for which the consumption of not only food but also clothing, shelter, and other necessities is important. According to Citro and Michael (1995), poverty “pertains to people’s lack of economic resources including money or near-money income for consumption of economic goods and services like food, housing, clothing, transportation”. Although this definition rests on the concept of economic resources needed for consumption, this does not fully specify the type and magnitude of consumption. In line with this observed gap, Morris (1979) has specified the true indicator of the quality of life as health status; because health status can accurately gauge the state of one’s physical life. An indicator of the quality of life according to Morris (1979) is the infant mortality rate, life expectancy, and adult literacy; and has developed the physical quality of life index (PQLI). However, Wagle (2008) did not hesitate to challenge that the consumption approach to the physical quality of life is not a perfect and accurate measurement of poverty. This is mainly due to consumption being determined by taste and preference and varies across the place,

culture, time, and other factors. Therefore, in his argument, he prefers the income indicator as a proxy for consumption measures.

The second concept of poverty focuses on **capability** issues. This concept was initially introduced by Sen during the period of the 1980s. The capability discourse shifted or more importantly broadened the focus of poverty from narrowly defined economic welfare to more comprehensive, freedom, and human well-being. The capability approach underscores the need to see poverty as a shortfall in the fundamental capabilities of a person, which indicates the degree of freedom needed to achieve valuable ‘functionings.’ Central to this exposition is the capability that indicates how much freedom one enjoys, serving as a more accurate basis for assessing the level of deprivation experienced.

The capability approach is based on a view of living as a combination of various ‘doings and beings,’ with quality of life to be assessed in terms of the capability to achieve valuable functionings.” Quality of life or well-being can be assessed by looking at one’s capabilities that enable one to achieve the functioning one value.

Sen (1999) argues that capability deprivation captures the true notion of poverty that people experience in everyday life. First, the capability approach constitutes a more sensible approach to conceptualizing poverty as it focuses on the part of the deprivation or well-being that has intrinsic value rather than on instrumentally significant lowness of income. Second, capability deprivation offers a wide-ranging appeal as it generates from a variety of traits or characters rather than simply from the lowness of income. Third, while income has an instrumental impact on capability, the true relationship is less than universal and in fact, variable depending on communities, families, and individuals. How much capability one can generate out of a given income depends, inter alia, on age, gender, social roles, location, public health concerns specific to the place or region, and other variations that are beyond the control of the individual. Issues such as intra-family distributions and the contingency of the transformation of income into functioning tend to affect the way income affects capability.

The capability approach has veritably revolutionized the way people think about poverty, but it still lacks appropriate measurement schemes for practical application because of the complexity of identifying the elements of capability and functioning (Sen 1993).

The third concept of poverty focuses on **social exclusion**. ‘Social exclusion,’ first popularized in Europe and particularly in France in the 1970s and 1980s, has been widely used today in most industrial countries in its exclusive and tacit forms (Wagle, 2008). This approach focuses on the relationship of a person with broader social institutions and frameworks, identifying one’s social and relational resourcefulness needed to achieve human well-being. Proponents of this approach assert that people may be poor despite having adequate income or adequate means of survival if they lack a favorable social order that would give them adequate protection when they need it (*ibid*).

1.9.2. Approaches to Multidimensional Poverty Assessment

Studies show that various non-income approaches have been introduced to poverty assessment since the 1970s. Hence, the recognition of multidimensional poverty assessment is not new. According to Alkire *et al* (2015), there are seven different approaches to multidimensional poverty assessment. These are the dashboard approach; the composite indices approach, Venn diagrams, the dominance approach, statistical approaches, fuzzy sets, and the axiomatic approach. The classification of these approaches is based on two main perspectives such as aggregation of data and joint distribution of deprivations. Alkire *et al* (2015) have examined that the dashboard approach assesses every dimension separately but a priori imposes no hierarchy across these dimensions. It does not also identify who is to be considered multidimensionally poor. Thus, the dashboard method can be classified as the first category and does not indicate the direction and extent of changes in overall poverty.

Composite indices have ‘the powerful attraction of a single headline figure’ (Stiglitz *et al*. 2009) but like the dashboard approach, have the disadvantage of missing a key aspect of multidimensional poverty assessment: the joint distribution of deprivations. On the other hand, the Venn diagrams approach graphically represents the joint distribution of individuals’ deprivations in multiple dimensions. Yet they become difficult to read when more than four

dimensions are used and do not per se contain a definition of the poor. Alkire *et al* (2015) argued that the dominance approach enables us to state whether a country or region is or is not unambiguously less poor than another concerning various parameters and functional forms, but it becomes empirically difficult to implement beyond two or more dimensions. It also shares with the Venn diagrams the disadvantage of not offering a summary measure. Moreover, the dominance approach only ranks regions or poverty levels from different periods ordinaly; it does not permit a cardinally meaningful assessment of the extent of the differences in poverty levels. Venn diagrams and dominance approaches are classified as the second group of methods according to Alkire *et al* (2015) arguments.

Statistical approaches comprise a wide range of techniques. Techniques such as principal component analysis and multiple correspondence analyses extract information on the correlation or association between dimensions to reduce the number of dimensions; other techniques, such as cluster analysis, identify groups of people who are similar in terms of their joint deprivations. These and other methods, such as factor analysis and structural equation models, can be used to construct overall indices of poverty. It should be noted that even when overall indices of poverty can be obtained because statistical techniques rely on the particular dataset used, it may be difficult to make intertemporal and cross-country comparisons.

The fuzzy set approach also falls within the second category of techniques and builds on the idea that there is ambiguity in the identification of who is deprived or poor. Thus, instead of using a unique set of deprivation cut-offs for identification, it uses a band of deprivation cutoffs for each dimension. A person falling above the band is identified as unambiguously non-deprived, whereas a person falling below the band is identified as unambiguously deprived. Within the band of ambiguity, a membership function is chosen to assign the degree to which the person is deprived. Fuzzy sets are used to construct a summary measure, and they may address joint deprivations. The challenge lies in selecting and justifying the membership function, as well as in communicating results.

Finally, the axiomatic approach articulates precisely some of the properties of multidimensional poverty measurement they satisfy. Measures that specify the axioms or properties they satisfy enable the analyst to understand the ethical principles they embody and to be aware of the

direction of change they will exhibit under certain transformations. The appropriateness of axiomatic measures critically depends on whether their properties are essential or useful given the purpose of measurement.

1.9.3. Methods to (child) poverty measurements

A study (Minujin and Nandy, 2012) shows that there are three commonly used methods for poverty measurement. These are the World Bank's US\$1 a day method, the Wealth Index method, and the recently developed Multidimensional Poverty Index method of Alkire and Foster. The World Bank's US\$1 a day method is one of the most widely used methods of poverty assessment. This method is not designed to measure child poverty and the World Bank has never attempted to use the methodology for this purpose. There are a large number of critiques of the US\$ 1-a-day methodology (Townsend, 1997; Townsend and Gordon, 2002; Kakwani and Son, 2006; Himanshu, 2008; UNDESA, 2010). Gordon *et al.* (2003) argued that the US\$1 a day PPP methodology is not suitable for measuring child poverty mainly because the World Bank's method is that it adjusts the poverty line using purchasing power parity (PPPs). In line with this argument, the World Bank and International Monetary Fund (IMF) agree that PPPs should be used, as the market exchange rates do not reflect the 'true' value of each currency; that is, they are subject to distortions, even if average monthly or yearly rates are used (Minujin and Nandy, 2012). According to Kravis (1986), the exchange rates obscure the relationship between the quantity aggregates of different countries, and it systematically understates the purchasing power of the currencies of low-income countries and thus exaggerates the dispersion of national per capita incomes. Similarly, for Freeman (2007), the PPP and currency exchange rates produce significantly different results when used to compare the incomes of the poor in different countries.

The differences in the extent and depth of child poverty in rich and poor countries are not just a result of households in rich countries having more money. Children in rich countries also have access to an extensive range of capital goods, for example, schools, hospitals, roads, electricity distribution, water supply infrastructure, sewerage systems, etc. In developing countries, millions of children do not have access to schools, hospitals, safe water, and so on because these capital goods simply do not exist close to where they live. This is important because, by understating the

monetary cost of capital goods in developing countries, the PPP conversion, which is an integral part of the US\$1 a day poverty methodology, obscures the costs of providing children with the services they need to escape from absolute poverty.

The second approach to child poverty measurement examined in this study is “The Wealth Index method”. This approach assumes that children in households with the lowest asset index scores (for example, bottom 10% or 20%) are sometimes defined as ‘poor’ (Minujin and Nandy, 2012). It can also be used to measure disparities among households with children. The method is based on the work of Filmer and Pritchett (1998, 1999, 2001), who used Principal Components Analysis (PCA) to produce a weighted index of household assets. The lack of an adequate theory to underlie the index and the parochial nature of the literature reviewed resulted in not just a ‘reinvention of the wheel’ but also a ‘reinvention of the mistakes made when the wheel was first invented. To paraphrase George Santayana, it seems that those who cannot learn from history are doomed to repeat it. Application of this method to an asset-based approach (Asset Index) will lead to mistakes in estimation. This is because the PCA assumption goes with continuous data while asset ownership may be assessed as to whether a household owns an asset or not (yes or no). Therefore, Boelhouwer and Stoop (1999) recommended that a non-linear canonical correlation analysis is preferable over PCA. In case the assumption (continuous data) of PCA is violated, the technical solution to correct the statistical error of including binary variables in a PCA analysis is to calculate the tetrachoric (or polychoric) correlation coefficients for the binary variables and then use the resulting correlation matrix in the PCA analysis (Kolenikov and Angeles, 2009).

Asset Index also makes the even more severe ‘area poverty’ error by combining a lack of household durables with a lack of community facilities in a theoretical manner, thereby misclassifying ‘rich’ households who live in ‘poor’ rural areas as relatively impoverished.

The third approach to child poverty measurement examined in this paper is Alkire and Foster’s Multidimensional Poverty Index method. According to Minujin and Nandy, (2012), Sabina Alkire and James Foster (2007, 2009) have recently developed a method designed to produce a Foster, Geer, and Thorbecke Index (Foster *et al.*, 1984, 2010) using child deprivation measures. Alkire and Santos (2010) also produced a Multidimensional Poverty Index consisting of 10

indicators grouped into three domains and based on household microdata from 104 countries. Additionally, Roche (2009), and Alkire and Roche (2010) suggest a 12-step child poverty measurement methodology that builds on the work of Gordon et al. (2003). They illustrate this methodology using an example from Bangladesh for children under five years of age and eight deprivation indicators (Roche, 2009).

1.9.4. Livelihood concepts, definitions, and approaches

A livelihood comprises the capabilities, assets (stores, resources, claims, and access), and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks, maintain and enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term” (Chambers and Conway, 1992).

According to Adato and Meinzen (2002), the concept of “livelihoods” has become increasingly popular in development thinking as a way of conceptualizing the economic activities of the poor. Scoones (1998) stated that the concept of ‘sustainable rural livelihoods’ is becoming increasingly central to the debate about rural development, poverty reduction, and environmental management.

The increasing popularity amongst development actors for the use of livelihood approaches can be explained by the strengths and objectives of the approach. The Sustainable Livelihood (SL) approach is more dynamic and holistic, covers a broad range of strategies, and places emphasis on both the social and economic aspects of rural life. Carney (1999) elaborates further on the key strengths of SL. Firstly; SL projects represent what is known about rural life and poverty and are therefore able to better target interventions. Next, it recognizes the importance of multi-actors involved in the development process (from the private sector to national ministries, community-based organizations to decentralized governments) to form a wider range of partners. It is also known to place great emphasis on the importance of macro-level policy and institutions to the livelihood options of rural communities. Lastly, it has a multi-faceted view of sustainability—the concept of sustainability goes beyond tangible assets such as natural assets. Sustainability in this

context refers to the reduced vulnerability of rural communities to the overall sustainability of their livelihoods.

The ‘livelihoods approaches’ to rural poverty alleviation are quite new and have much appeal. However, there have been concerns voiced. Many academics have contemplated whether the (SL) approach is just another version of integrated rural development (IRD) as they are similar on many levels. Advocates of the SL approach argued that while it may be constructed based on the strengths of IRD it did not follow its example. SL focuses on agricultural production, income diversification, and infrastructure. The other concern about the livelihoods approach is that it may be unrealistic and impractical. It thrives on the holistic approach and dynamism but overlooks the process from analysis to action. Rural dynamics differ for each location; therefore, the approach has to be area-specific.

Livelihood diversification is defined as “attempts by individuals and households to find new ways to raise incomes and reduce environmental risk, which differ sharply by the degree of freedom of choice (to diversify or not), and the reversibility of the outcome” (Hussein and Nelson, 1999). The ways of income acquisition include all on-farm activities, non-farm and off-farm activities. On-farm activities include all activities such as crop production and livestock rearing undertaken on own account farm Bryceson (2005) and can be termed as agricultural activities. Livelihood diversification strategies based on agriculture have two important dimensions as stated by FAO (2005); these are either agricultural intensification or agricultural expansion. In the Ethiopian context, the latter strategy might be difficult to be practical as agricultural land (arable) land is continuously diminishing with an increase in the human population.

In making living strategies, livelihood diversification is a means by which rural households cope with the food insecurity problem. Although the concept comprises different types of strategies such as farm activities (crop and livestock production), and off-farm and non-farm activities, the majority of rural households in Ethiopia largely experienced agriculture which contributed 84% of labor employment.

1.9.5. Determinants of livelihood diversification

Livelihood diversification is a crucial concept in the field of development studies, and it plays a significant role in the lives of people in many parts of the world. The determinants of livelihood diversification refer to the factors that influence individuals and households to engage in a variety of economic activities to support their livelihoods. One important determinant of livelihood diversification is the level of income and wealth inequality within a community. When there is a high degree of inequality, people may be forced to engage in a variety of economic activities to make ends meet. This is particularly relevant in rural areas, where farming is often the primary source of income, but is subject to the vagaries of weather and market fluctuations. Research by Ellis (2000) has shown that households with lower incomes are more likely to engage in diversification strategies as a way to mitigate risk and uncertainty.

Another determinant is access to capital and resources. For example, households with limited access to land, credit, and other productive resources may be more likely to diversify their income activities to make the most of the resources they do have. Access to education and skills training also plays a role, as individuals with more diverse skill sets may be better equipped to engage in a variety of economic activities. Additionally, market conditions and infrastructure also influence livelihood diversification. In areas with limited market access, poor infrastructure, and inadequate transportation, households may need to engage in a variety of economic activities to take off any available opportunities. On the other hand, research by Walelign *et al.* (2019) has found that improved market access and infrastructure can lead to more focused livelihood strategies, as households can specialize in more profitable economic activities.

According to Barrett *et al.* (2001), very few people collect all their income from any one source, hold all their wealth in the form of any single asset, or use their assets in just one activity. Hence, multiple motives prompt households and individuals to diversify assets, incomes, and activities. The first set of motives comprises what is traditionally termed “push factors”: risk reduction, response to diminishing factor returns in any given use, such as family labor supply in the presence of land constraints driven by population pressure and landholdings fragmentation, reaction to a crisis or liquidity constraints, high transactions costs that induce households to self-provision in several goods and services, etc. The second set of motives comprises “pull factors”:

realization of strategic complementarities between activities, such as crop-livestock integration or milling and hog production, specialization according to comparative advantage accorded by superior technologies, skills, or endowments, etc.

They also stressed that in the “push factor perspective,” diversification is driven by limited risk-bearing capacity in the presence of incomplete or weak financial systems that create strong incentives to select a portfolio of activities to stabilize income flows and consumption, by constraints in labor and land markets, and by climatic uncertainty. From the “pull factor perspective,” local engines of growth such as commercial agriculture or proximity to an urban area create opportunities for income diversification in production- and expenditure-linkage activities.

1.9.6. Empirical evidence on livelihood diversification and poverty reduction

Livelihood in rural Africa is entirely dependent on agriculture (Taruvunga et al. 2018; Babatunde, 2008; Ibekwe, 2010; Senadza, 2012); hence, rural development initiatives for poverty reduction also skewed toward the role of agriculture for poverty reduction (Babatunde, 2008). Contrary to this view, there are arguments confirming that rural communities in Africa generate all their income from various livelihood sources and use their assets in different livelihood portfolios (Dercon and Krishnan, 1996; Barrett *et al.*, 2001; Block and Webb, 2001; Senadza, 2012). The role of off-farm income in poverty reduction is significantly increasing in Africa (FAO, 1998; Matshe and Young, 2004; Winters *et al.*, 2010; Haggblade *et al.*, 2007).

Various studies are aiming at examining the linkage between livelihood diversification and poverty reduction and pointed out that, there is considerable importance of livelihood diversification beyond agricultural activities in rural Africa. Non-farm enterprises contribute between 40-50 percent of incomes in rural Africa, with around 42 percent of employment opportunities (Nkechi and Wim, 2014; Rijkers and Costa, 2012; Haggblade *et al.*, 2010; Nagler and Naudé, 2014). A study conducted by Yohannes and Tafese (2017) which was aimed at assessing livelihood strategies and examining major socio-economic determinants of livelihood diversification at the household level, has identified that agriculture is a major contributor (87%) of livelihoods for rural communities in Ethiopia. They also identified that participation in

diversified sources of income-generating activities is constrained by the low awareness level of farmers to adopt modern technologies, lack of credit, weak extension services, lack of skill, the wrong attitude of the local community, and household average income. Similarly, Nkechi and Wim (2014) also finds that factors like education, age, household size; religious affiliation, and community infrastructure are the most significant determinants of non-farm enterprises in Ethiopia and Nigeria. Another study conducted by Ana and Demmelash (2017) at Moyale District Oromia Regional State, Ethiopia, which was aimed to examine the reason why households participate in nonfarm activities, examine the constraint of entry in non-farm activities in the district, and investigate the contribution of nonfarm income to total household income, has also found that age, family size, credit, livestock holding, education, marital status, distance to market and main road are the most influencing variables in determining households to participate in non-farm activities.

Although agriculture contributes a large share of the GDP, evidence shows that the sector in Ethiopia is weak, traditional, and subsistence-oriented (Alemu *et al.*, 2008). Low productivity of the agricultural sector is attributed to the degradation of natural resources, and lack of access to agricultural inputs and markets (Jayne *et al.*, 2003). With a rapidly growing human population and diminishing land holding, there is high demand for income diversification approaches, so the promotion of non-farm enterprise activities is being considered a promising facilitator of development by the Ethiopian government, as manifested in the Plan for Accelerated and Sustainable Development to end Poverty (PASDEP) (Loening *et al.*, 2008). Various studies from abroad also revealed that non-farm and off-farm income is playing a pivotal role in poverty reduction (Shehu and Abubakar, 2015; Haggblade *et al.*, 2007; Lanjouw, 2007; Ali and Peerlings, 2012; Chawanote and Barrett, 2014).

Some studies on the linkage between poverty reduction and livelihood diversification strategies came up with contradicting results under varying contexts. For example, Reardon, *et al.* (2000), find out that the share of non-farm income in total income is higher for wealthy households than for the poor due to entry barriers. On the other hand, Jayne, *et al.* (2003) found that the share of nonfarm income is highest for the poor, whereas Woldehanna (2000) found that non-farm employment worsened income distribution for a case study of Tigray in northern Ethiopia. Marrit

and Girma (2006) have justified that contradictory results were recorded due to the dissimilarity of areas in terms of the development of markets and institutions and the biophysical environment. Similarly, Reardon and Taylor (1996) found that non-farm income had an unequalising effect in Northern Burkina Faso (a poor and risky agricultural zone) and an equalizing effect in Southern Burkina Faso (a favorable agro-climatic zone with dynamic agriculture).

Empirical evidence under this section revealed that there is strong evidence that livelihood diversification can reduce poverty; however, none of these studies attempted the linkage between livelihood diversification and child poverty. The livelihood diversification perspective on child poverty reduction is a relatively new concept. Several studies linking livelihood to poverty reduction entirely focus on household-level poverty assessment. In general speaking, the subject of poverty is to neither academics nor policymakers; however, is the question “Why does poverty persist especially in rural?” not fully answered. There is a strong argument favoring that investing in children can better pave the way toward tackling intergenerational poverty. This is because some scholars argued, “Poverty begets poverty because child poverty perpetuates it” (Vandemoortele, 2012).

1.9.7. Policy context of poverty in Ethiopia

Ethiopia is one of the poorest countries in the world ranking 164th out of 187 countries (World Bank, 2017). The country has implemented various policies related to poverty reduction since 2004 and witnessed a significant improvement in development and poverty reduction. Current evidence shows that Ethiopia overtook Kenya as East Africa’s largest economy (IMF, 2017). The poverty reduction strategies implemented include Sustainable Development and Poverty Reduction Programme (2001/02-2005/06); the Plan for Accelerated and Sustained Development to End Poverty (2005/06-2009/10); and, from 2010, the Growth and Transformation Plan I and II (GTP I & II) (2010/11-2014/15 and 2015/16-2019/10) (Young Lives, 2018). Despite impressive economic growth, a significant number of children, especially in rural areas, remain locked in a vicious circle of poverty and vulnerability to environmental and socio-economic shocks (ibid).

Evidence shows that the Sustainable Development and Poverty Reduction Program had a strong focus on reducing child malnutrition and increasing primary school enrolment following the Millennium Development Goals. Institutionally, youth issues were given prominence through the establishment in 2001 of the Ministry of Youth, Sports, and Culture with a mandate to promote youth training and their involvement in development (Alula *et al.*, 2018).

The government of Ethiopia has placed due concern on children since 2000 by introducing policies specifically related to children. For example, in 2000 the Revised Family Code outlined the rights and responsibilities of parents and children, notably setting the minimum age for marriage at 18 for both spouses. In 2002, Ethiopia ratified the African Charter on the Rights and Welfare of the Child (ACRWC) adopted by the Organization of African Unity in 1990. The ACRWC presented further elements beyond the basic tenets of the CRC, recognizing important socio-cultural and economic realities and cultural values particular to Africa. The 2004 Criminal Code prohibited violence against children, including protection against maltreatment, abduction, harmful traditional practices – notably female genital mutilation (FGM) and child marriage – trafficking of children, and child pornography (Alula *et al.*, 2018).

The Plan for Accelerated and Sustained Development to End Poverty (PASDEP) was also formulated with more emphasis on children's issues, with a strengthening of the role of education and health in national development, through a change of focus from access to quality of services. The PASDEP recognized the need for a special policy focusing on children and young people as having distinct developmental needs and experiences of poverty. It also perceived child poverty as a multidimensional phenomenon with differential impacts on diverse groups and children of different genders, and ages living in different locations (*ibid*). Hence, reducing child undernutrition is becoming a top national priority (Government of Ethiopia, 2013).

1.9.8. Theoretical frameworks

In the social sciences, it is usual to start with conceptions or definitions of a social problem or phenomenon and proceed first to its measurement and then its explanation before considering, or leaving others to consider, alternative remedies. Various theories underpin the concepts of

livelihood diversification and poverty. In this study, various theories related to livelihood diversification, and child poverty were explained. In the first section, theories related to household livelihood diversification were explained. In the second section, some selected theories related to child poverty were explained.

1.9.8.1. *Basic concepts of portfolio theory*

Portfolio theory originally was developed by Markowitz (1952) for financial investment and has implications for household livelihood strategy choices. In a nutshell, portfolio theory suggests that diversifying investment leads to reduced risk and increased returns. Applying this to household livelihood strategy choices means spreading resources across different income-generating activities can improve a household's resilience to economic shock.

Markowitz's (1952) work led to the development of a single-period equilibrium model, the Sharpe-Lintner capital asset pricing model (CAPM), (Sharpe, 1964; Lintner, 1965a, 1965b; and Merton 1973) extended the CAPM to a continuous-time model using Lognormal diffusion processes to represent stock price series and showed that the original conclusion continued to hold virtually without change. In this continuous-time model, it became possible to observe the dynamic interaction between investors' behavior and the behavior of stocks. Rosenberg and Ohlson (1976) showed that this interaction led to internal inconsistencies in the continuous-time CAPM. However, it is still possible to apply this model to diversification concepts with the assumption of long-term portfolio performance compatible with equilibrium constraints on national/local market portfolio structure.

The implication of portfolio theory to household choices of livelihood strategy

Portfolio theory is a concept commonly used in finance to manage risk and return. However, its application extends beyond the realm of finance and can also be applied to household livelihood strategy choices. In the context of household decision-making, portfolio theory refers to the allocation of resources across different assets or activities to maximize utility or well-being.

One of the key implications of portfolio theory to household livelihood strategy choices is the concept of diversification. Just as investors diversify their investment portfolios to spread risk

(Elton *et al.*, 2014), households can diversify their livelihood strategies to spread risk and improve resilience. This means that households can engage in a mix of activities such as farming, livestock rearing, wage labor, and small business entrepreneurship (.e.g. petty trading) to reduce their vulnerability to external shocks such as crop failure, price fluctuations, or job loss.

Research has shown that households that diversify their livelihood strategies are better able to cope with challenges and achieve higher levels of well-being. For example, a study by Barrett and Reardon (2000) found that in rural Ethiopia, households that diversify their income sources were less likely to fall into poverty during times of hardship. Furthermore, portfolio theory can also be applied to the allocation of time and labor within households. Just as investors allocate their time and resources across different assets (Elton *et al.*, 2014), households can allocate their time and labor across different activities to maximize their well-being. For example, a household may decide to allocate more time to farming during the planting and harvesting seasons, and more time to off-farm wage labor during the lean months.

In addition to diversification, portfolio theory also emphasizes the importance of asset allocation (Elton *et al.*, 2014). This means that households should carefully allocate their resources across different assets such as land, labor, human capital, and financial capital to achieve their livelihood goals. For instance, a household may choose to invest in education and skill development to enhance their human capital, as well as invest in productive assets such as land or livestock to generate income.

In conclusion, the implications of portfolio theory for household livelihood strategy choices are significant. By applying the principles of diversification and asset allocation, households can improve their resilience, reduce their vulnerability to risks, and enhance their overall well-being. Understanding these implications is crucial for policymakers and development practitioners seeking to design effective interventions to support household livelihoods in the study area and the country, of Ethiopia.

Forms of portfolio diversification

Ellis (1998, 2000) has identified three forms of diversification related to agricultural production. His work was focused on farmers' form of agricultural diversification assuming the opportunities and constraints provided in farming conditions.

The first and the most common type is diversification across products. This is a strategy derived from portfolio theory developed in the stock market. This strategy can be applied by any farmer with some knowledge of how to cultivate more than one crop, including farmers with small and/or contiguous parcels of land. The goal of this type of diversification is to reduce variance in sale revenues by participating in more than one product market. To be successful, the product markets must have low or negative levels of correlation in their prices.

The second type of diversification, across locations, has also been well known for some time (Goland 1993) but practiced less often because it requires operating two or more parcels that are geographically separated, a requirement which could be infeasible for some farmers (Nartea and Bany 1994). Under this spatial diversification, a farmer must scatter crop production across locations sufficiently far apart to have low levels of correlation in their weather extremes. Thus, because the focus is on reducing yield variance, this strategy can be applied by farmers specialized in growing one single crop.

Finally, cultivar diversity is a form of temporal diversification, but it incorporates aspects of each of the other two-diversification strategies. The common goal of cultivar diversity is to have portions of total acreage (either contiguous or scattered) reach the harvest stage at different times of the year (Park and Florkowski 2003). By selecting cultivars of a single crop that are not highly correlated in their growth schedules, farmers can both:

- a) Reduce average yield variability by reducing weather risk exposure (a feature of geographical diversification), and
- b) Raise the average price received and/or lower price variance by being able to sell output in more than one market season (similar to product diversification).

The practice of crop diversification complicates both production and marketing but it can increase profits. Diversification is a favorite risk-management tool of many farmers.

In general, the portfolio theory works in mean-variance principles. The expected returns and variances are useful ways to quantify the uncertainty about the portfolio return to specify the probability associated with each possible future return. Each outcome has a probability, and the average return is referred to as an expected return. An expected value is an average or mean of possible future outcomes. Expected returns can be calculated as a weighted average of the possible returns. Each possible return is multiplied (weighted) by its probability of occurrence.

The expected return would be:

$$E(R) = \bar{R} = (P_{r_1} \times R_1) + (P_{r_2} \times R_2) + (P_{r_3} \times R_3) \dots + (P_{r_T} \times R_T) = \sum_{i=1}^T P_i R_i$$

Where T is the number of possible states of the economy, P_r's are probabilities of the respective states, and R's are the possible rates of return.

To calculate the variance of the data representing future possible rates of return, we have to determine the squared deviations from the expected return. Each possible squared deviation is multiplied by its probability of occurrence. These are added; the sum is the variance. The standard variance is simply the square root of the variance, or to say:

$$Var(R) = \delta^2 = [P_{r_1} \times (R_1 - \bar{R})^2] + [P_{r_2} \times (R_2 - \bar{R})^2] + \dots [P_{r_T} \times (R_T - \bar{R})^2] = \sum_{i=1}^T P_i (R_i - \bar{R})^2$$

Return and Return Volatility would be used to explain the relationship between expected return and return volatility, and to show why it is important to consider more than just expected returns when selecting assets for inclusion in a portfolio. Expected Return is the return expected on an investment (an asset or a portfolio) based on a probability distribution, taking into account all possible return scenarios. Return Volatility represents the variability or uncertainty of the return of an asset; it is measured by a value called standard deviation. Essentially, return volatility (or standard deviation) tells us how much an asset's actual return is likely to deviate above or below its expected return.

1.9.8.2. *Concepts of the theory of entitlements*

The theory of entitlement states, “Each person, no matter how poor, has some endowments.” This theory assumes that they may consist of personal attributes like age, sex, race, height, weight, and more elusive personal qualities charm, beauty, etc... (Desai, 1984). The economic view of this theory tries to measure entitlement as every person has at least the capacity to work labor power unless too young or too old or infirm or severely handicapped. In addition to physical capability, the theory also added endowments like land, money, durable goods, financial assets, and so on as indicators of poverty assessment. Therefore, according to this theory, the poor are those who lack both capability and endowments.

Implication of the entitlement theory to household livelihood strategy choices

Entitlement theory, as proposed by economist Amartya Sen, is a fundamental concept in understanding household livelihood strategy choices. This theory posits that an individual’s access to resources and their ability to convert these resources into valued outcomes is determined by their entitlements, which can be influenced by various factors such as market conditions, government policies, and social norms Sen (1981).

In the context of household livelihood strategy choices, entitlement theory suggests that the choices made by households in terms of how they allocate their resources and pursue different livelihood strategies are heavily influenced by their entitlements. These entitlements can include access to land, education, employment opportunities, social welfare programs, and other forms of social and economic support. The availability and quality of these entitlements can significantly influence the well-being and status of households, leading them to make strategic decisions to maximize their resources and outcomes.

In Ethiopia, where agriculture is a vital component of the economy and a significant source of livelihood for many households, entitlement theory can be applied to understand how households make choices regarding their agricultural production and other livelihood strategies. For example, a household with secure land tenure rights and access to irrigation resources may be more inclined to invest in agricultural production, while a household without these entitlements

may diversify their livelihood strategies to include non-agricultural activities such as small business (e.g. petty trading) ventures or wage labor.

Research conducted by experts in the field supports the implications of entitlement theory on household livelihood strategy choices. For instance, a study published in the “Journal of Development Studies” found that in rural Ethiopia, households with better access to government safety nets and social support programs were more likely to invest in agricultural production and improve their overall livelihoods compared to households without such entitlements.

Furthermore, the Ethiopian government’s policies and programs aimed at improving entitlements for rural households, such as land redistribution and social welfare initiatives, have shown positive impacts on household livelihood strategy choices. For example, a case study conducted in the Amhara region demonstrated that households who received support through land redistribution programs were able to enhance their agricultural production and income, leading to improved livelihoods for their families.

In conclusion, entitlement theory plays a crucial role in shaping household livelihood strategy choices, particularly in the context of agriculture-dependent economies like Ethiopia. By examining the entitlements available to households and how they influence decision-making, policymakers, and development practitioners can design more effective interventions to improve livelihood and reduce poverty in these communities. Understanding the implications of entitlement theory can provide valuable insights into addressing the multidimensional challenges facing households in pursuing sustainable livelihood strategies.

Human Capital Theory

The human capital theory is a theory of earnings, one of the major determinants of poverty. First developed by Becker (1975), this theory explains both individuals’ decisions to invest in human capital (education and training) and the pattern of individuals’ lifetime earnings. Individuals’ different levels of investment in education and training are explained in terms of their expected returns from the investment. Investments in education and training entail costs both in the form of direct expenses (e.g., tuition) and foregone earnings during the investment period, so only

those individuals who will be compensated by sufficiently higher lifetime earnings will choose to invest. People who expect to work less in the labor market and have fewer labor market opportunities, such as women or minorities, are less likely to invest in human capital. As a result, these women and minorities may have lower earnings and may be more likely to be in poverty.

The human capital theory also explains the pattern of individuals' lifetime earnings. In general, the pattern of individuals' earnings is such that they start low (when the individual is young) and increase with age (Becker, 1975), although earnings tend to fall somewhat as individuals near retirement. The human capital theory states that earnings start low when people are young because younger people are more likely to invest in human capital and will have to forego earnings as they invest. Younger people are more likely to invest in human capital than older people because they have a longer remaining work-life to benefit from their investment and their foregone wages so the costs of investing are lower. Earnings then increase rapidly with age as new skills are acquired. Finally, as workers grow older, the pace of human capital investment and thus productivity slows, leading to slower earnings growth. At the end of a person's working life, skills may have depreciated, because of a lack of continuous human capital investment and the aging process. This depreciation contributes to the downturn in average earnings near retirement age (Ehrenberg and Smith 1991).

1.9.8.3. *Theories related to child poverty*

Child poverty is a multidimensional issue that affects millions of children worldwide, including Ethiopia. Theories on child poverty aim to understand its causes and consequences, as well as to develop effective interventions. One prominent theory is the “cycle of poverty,” which suggests that children born into poverty are more likely to remain in poverty due to limited access to education, healthcare, and opportunities. Another theory is the “economic deprivation” perspective, which emphasizes the lack of economic resources as the primary cause of child poverty. Additionally, the “social exclusion” theory highlights the importance of social and cultural factors in perpetuating child poverty. In the end, relative deprivation theory was used to explain how children compare their own social and economic status to that of their peers. A brief explanation of each theory is given as follows.

Theory of the cycle of poverty

Understanding the cycle of poverty theory and its effect on child poverty is crucial for addressing the systemic issues that perpetuate poverty and hinder the well-being of children. The cycle of poverty theory posits that individuals who are born into poverty are more likely to remain in poverty throughout their lives, and this cycle continues across generations. This theory is rooted in the idea that poverty is not simply a result of individual shortcomings, but rather a complex web of societal and structural factors that perpetuate and reproduce poverty.

One significant factor in the cycle of poverty is the lack of access to quality education. Children growing up in poverty are often unable to access the same educational opportunities as their more affluent peers. This can be due to a variety of reasons, such as underfunded schools in low-income areas, lack of resources at home to support learning, or the need for children to work to help support their families. Research has shown that children living in poverty are at a higher risk of dropping out of school, which perpetuates the cycle of poverty for the next generation.

Another critical factor in the cycle of poverty is limited access to healthcare. Families living in poverty often struggle to afford basic healthcare services, leading to higher rates of illness and chronic health conditions. This not only directly affects the well-being of children but also their educational attainment and prospects. According to the World Bank, children in the poorest households are almost twice as likely to die before the age of five compared to children in the richest households.

Furthermore, the cycle of poverty is perpetuated by limited access to economic opportunities. Parents or caregivers in poverty may struggle to secure stable employment with a livable wage, which can perpetuate the cycle of poverty for their children. This lack of economic stability can lead to food insecurity, inadequate housing, and limited access to other basic necessities, all of which have detrimental effects on the well-being of children.

To illustrate this, a study published in the *Journal of Children and Poverty* found that children living in poverty are more likely to experience developmental delays, educational difficulties, and emotional and behavioral problems. Additionally, a report by UNICEF highlighted that

children living in poverty are more likely to have poor access to education, nutrition, and healthcare, as well as to be exposed to violence and discrimination.

In Ethiopia, where poverty rates remain high, the impact of the cycle of poverty on child poverty is particularly pronounced. According to the World Bank, over 20% of Ethiopians live below the national poverty line, and children are disproportionately affected by poverty. The lack of access to education, healthcare, and economic opportunities perpetuates the cycle of poverty, trapping children in a cycle of disadvantage.

Addressing child poverty within the framework of the cycle of poverty requires a comprehensive approach that addresses the systemic issues that perpetuate poverty. This includes investing in quality education for all children, expanding access to healthcare services, and creating economic opportunities for families living in poverty. Additionally, social protection programs, such as cash transfer programs, are effective in breaking the cycle of poverty by improving the well-being of children and their families.

In conclusion, the cycle of poverty theory has significant implications for child poverty, as it perpetuates a cycle of disadvantage across generations. By understanding the root causes of poverty and the mechanisms through which it affects children, policymakers and practitioners can work towards breaking the cycle of poverty and improving the well-being of children in Ethiopia and beyond.

The theory of economic deprivation perspective

The theory of economic deprivation focuses on how economic inequality and deprivation affect individuals and societies. It explores the relationship between economic disadvantage and its social and psychological consequences. In the context of Ethiopia, a country with a history of economic challenges and poverty, the theory of economic deprivation perspective can offer valuable insights into the effect of economic inequality on its people. This perspective suggests that individuals and communities that experience economic deprivation are more likely to face a range of social and psychological issues, including lower life satisfaction, higher levels of stress, and increased risk of mental health problems.

Research on the theory of economic deprivation perspective has found that individuals living in poverty or experiencing economic hardship often have limited access to resources such as education, healthcare, and employment opportunities. This can perpetuate a cycle of deprivation that affects not only the current generation but also future ones. According to a study published in the Journal of Economic Psychology, individuals living in economically deprived conditions are more likely to experience feelings of justice and perceive themselves as being excluded from the benefits of society. This can lead to a range of negative outcomes, including reduced levels of trust in institutions, higher levels of social unrest, and decreased community cohesion.

The implication of the theory of economic deprivation perspective for child poverty

The economic deprivation theory addresses the impact of poverty on children's well-being and development. This theory suggests that economic deprivation has significant implications for child poverty assessment, as it affects various aspects of a child's life, including their access to basic necessities, education, and overall quality of life. Research studies have shown that children growing up in poverty-stricken households are more likely to experience malnutrition, and lack of access to proper healthcare, and face barriers to obtaining quality education. According to a study published in the Journal of Children and Poverty, children living in poverty are at a higher risk of developmental delays, behavioral problems, and poor academic performance.

Furthermore, the economic deprivation theory emphasizes the intergenerational cycle of poverty, where children born into impoverished families are more likely to continue living in poverty as adults. This perpetuates the cycle of economic deprivation, creating long-term negative impacts on individuals, families, and communities. In addition, experts argue that traditional poverty assessments often overlook the specific needs and challenges faced by children. For example, the United Nations Children's Fund (UNICEF, 2018) highlights the importance of incorporating child-specific indicators, such as access to quality early childhood development programs, nutrition, and a safe living environment.

Statistics from the World Bank indicate that in Ethiopia, about 23% of the population lives below the national poverty line, with rural areas experiencing higher levels of poverty compared to

urban areas. This has direct implications for children, as access to essential services such as healthcare and education is limited in these areas. Children living in rural areas may face challenges accessing proper nutrition, healthcare, and education, ultimately affecting their overall well-being and future opportunities. Without addressing the implications of economic deprivation on child poverty assessment, such children are at risk of being left behind and perpetuating the cycle of poverty in their communities.

In conclusion, the economic deprivation theory sheds light on the multi-faceted implications of poverty on children, emphasizing the need for comprehensive assessments that consider the specific needs and address the root causes of economic deprivation, policymakers and organizations can work towards breaking the cycle of poverty and improving the well-being of children in Ethiopia and beyond.

Theory of Social Exclusion

Social exclusion refers to the process by which individuals or groups are systematically blocked from fully participating in various social, economic, and political activities within their society. This exclusion can take many forms, including being denied access to education, employment, healthcare, and social services, as well as being marginalized and stigmatized by society.

One important aspect of the theory of social exclusion is the concept of multidimensional poverty, which is the idea that poverty is not just about lacking material resources, but also includes social and political dimensions. This means that individuals or groups who are socially excluded are not only deprived of basic needs, but also face discrimination, isolation, and a lack of agency within their communities.

In the context of Ethiopia, social exclusion is a significant issue, particularly for marginalized ethnic groups, women, people with disabilities, and those living in rural areas. According to a report by the World Bank, Ethiopia has made significant progress in reducing poverty in recent years, but many people still face social exclusion due to factors such as ethnicity, gender, and geographical location.

Research has shown that social exclusion can have a range of negative impacts on individuals and communities. For example, individuals who are socially excluded are more likely to experience poor physical and mental health, lower educational attainment, and higher levels of unemployment. This can create a cycle of exclusion and poverty that is difficult to break.

Implications of social exclusion theory to child poverty

Social exclusion theory examines the processes through which individuals or groups are systematically disadvantaged in society. When applied to child poverty assessment, this theory provides valuable insights into the multidimensional and complex nature of poverty among children.

One implication of social exclusion theory for child poverty assessment is the recognition of the interconnectedness of various factors that contribute to children's experiences of poverty. Traditional measures of poverty often focus solely on income levels, failing to capture the full extent of deprivation and exclusion that children may face. By incorporating social exclusion theory into poverty assessment, we can consider additional dimensions such as access to quality education, healthcare, housing, and social support networks. Research has shown that children growing up in poverty often experience multiple simultaneous deprivations, which can have long-term detrimental effects on their well-being and future life outcomes (Bradshaw and Hoelscher, 2007).

Moreover, social exclusion theory emphasizes the importance of understanding the structural and systemic barriers that perpetuate child poverty. This includes considering the impact of discrimination, unequal power dynamics, and institutionalized inequalities on children's experiences of poverty. For example, marginalized communities in Ethiopia, such as rural or ethnic minority groups, may face disproportionate levels of social exclusion, resulting in higher rates of child poverty within these populations (Woldehanna and Ambaye, 2016). By adopting a social exclusion lean, child poverty assessment can uncover these underlying factors and inform targeted interventions to address systemic injustices. Incorporating social exclusion theory into child poverty assessment also highlights the need for participatory and holistic approaches that center the voices and experiences of children and their families. This means going beyond

quantitative indicators and actively engaging with communities to understand their lived realities and aspirations. By doing so, assessments can capture the nuanced ways in which children experience poverty and identify locally relevant solutions that promote empowerment and inclusion (Luttrell, 2009).

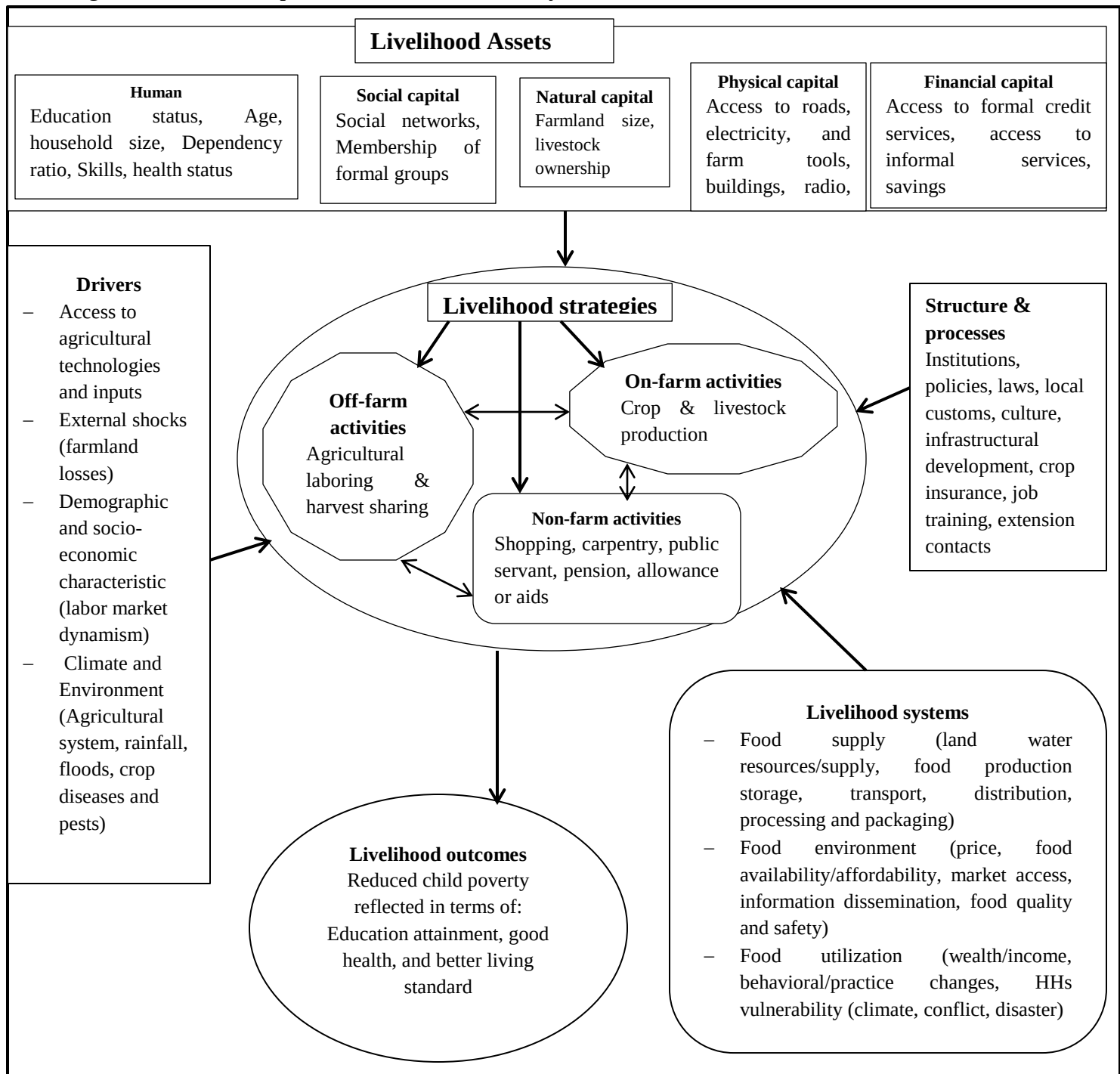
In conclusion, the implications of social exclusion theory for child poverty assessment are significant in expanding our understanding of poverty beyond income-based measures. By considering the multidimensional nature of poverty, acknowledging systemic barriers, and centering the experiences of children, assessments can better inform targeted interventions and policies that address the root causes of child poverty in Ethiopia and globally.

1.9.9. Conceptual framework of the study

The conceptual framework below indicates the relationships between household livelihood diversification and child poverty.

The below figure 1.2 depicts the basic premises of this framework of the study to understand the association between household livelihood diversification and child poverty. Livelihood diversification refers to the process by which households and individuals engage in multiple income-generating activities to reduce their dependency on a single source of income. Child poverty, on the other hand, refers to the lack of basic necessities and opportunities for children to thrive and develop.

Figure 1.2: The conceptual framework of the study



Source: Adopted from DFID, 1999.

In many developing countries, including Ethiopia, child poverty and livelihood diversification are closely linked. Empirical evidence revealed that households with limited economic

opportunities often resort to engaging their children in various income-generating activities, which can have detrimental effects on children's well-being and hinder their overall development. Several studies have explored the relationship between livelihood diversification and child poverty in Ethiopia. households in Ethiopia often turn to child labor as a means of coping with economic hardship resulting from limited livelihood options. This not only leads to the exploitation of children but also hinders their access to education and perpetuates the cycle of poverty.

The conceptual framework for understanding the linkage between livelihood diversification and child poverty takes into account various factors such as income levels, access to social services, access to various assets, various livelihood contexts, development policies and processes, and the impact of economic shocks on livelihood strategies. In rural Ethiopia, households often rely on a mix of farming, non-farming, and remittances to sustain their livelihoods. However, when faced with economic shocks such as crop failure or loss of employment, households may resort to sending their children to work to make ends meet. Therefore, the conceptual framework of this study tried to understand the linkage between livelihood diversification and child poverty in the study area is complex and multifaceted. Through deep research, we can gain valuable insights into the challenges faced by households and children in the context of livelihood diversification and work towards developing effective interventions to break the cycle of poverty and support the holistic development of children.

CHAPTER TWO: AN OVERVIEW OF HOUSEHOLD LIVELIHOOD DIVERSIFICATION STATUS

Abstract

This study was aimed at the assessment of major livelihood diversification strategies in the study area. Using a multistage sampling procedure, we randomly selected 401 respondents from four kebeles based on probability proportional to size. Data were analyzed using simple descriptive statistics such as mean and percentages to assess the major livelihood diversification strategies pursued by the households in the study area. Tables and graphs were also used to present results. Results from descriptive analysis showed that the majority of households (56%) in the study area were engaged in highly diversified livelihood activities, indicating a significant reliance on multiple income sources. About 25% of households were moderately diversified, suggesting a balance between agricultural and non-agricultural income sources. Small percentages (14.5%) of households were undiversified, relying primarily on a single income source, likely agricultural activities. Only a small proportion of households were classified as less diversified (3.2%) or very highly diversified (1.2%). Maize is the most important cereal crop, accounting for about 34% of crop production in the study area. Other major crops include wheat (31%), teff (22%), barley (3%), and sorghum (1%) respectively. Livestock production is a significant livelihood activity, with an average of 4.3 tropical livestock units (TLU) per household. Cattle are the dominant livestock, followed by oxen, donkeys, and small ruminants. The findings demonstrate that the majority of households engage in highly diversified livelihood activities, drawing income from a combination of on-farm, off-farm, and non-farm sources. This diversification strategy helps households manage risks, enhance their resilience, and improve their overall well-being. However, the study also highlights the challenges and trade-offs associated with livelihood diversification, such as access to resources, market opportunities, and the potential for a lack of specialization. Promoting sustainable and inclusive livelihood diversification will be crucial for Ethiopia's rural development and poverty reduction efforts as the country continues to face environmental and economic changes.

2.1. Background and justification

This section of the study addresses the nature of livelihood diversification in the study area. Rural households are continuously engaged in diverse sources of livelihood activities to generate the means of household survival. Several studies showed that different sources of livelihood activities contribute a significant income share for rural households. While the set of livelihood activities can be categorized as on-farm, off-farm, and non-farm, the share of income from each activity is significantly important for household survival and poverty reduction. In sub-Saharan

Africa, a range of 30–50 percent reliance on non-farm income sources is common; but it may attain 80–90 percent in southern Africa (Ellis, 1999). Other empirical evidence showed that non-farm activities have an average share of 42 percent of household income in Africa, 40 percent in Latin America, and 32 percent in Asia (Reardon *et al.*, 1998).

Households in sub-Saharan Africa seek to diversify their income and livelihood strategies both to manage or reduce their risks and to expand or take advantage of synergies across different income generation activities (Barrett *et al.*, 2001). While livelihood strategies of the poorest often still depend primarily on agricultural activities, several studies show non-farm income activities to correlate with greater overall household wealth (Persha and Farrell, 2017).

Several empirical pieces of evidence appreciated that livelihood studies should cover all income sources pursued by households. This is because very few people collect all their income from any one source, hold all their wealth in the form of any single asset, or use their assets in just one activity (Barrett *et al.*, 2001). Multiple motives prompt households and individuals to diversify assets, incomes, and activities. The first set of motives comprises what is traditionally termed as “push factors”; such as risk reduction, response to diminishing factor returns in any given use, like family labor supply in the presence of land constraints driven by population pressure and landholdings fragmentation, reaction to a crisis or liquidity constraints, high transactions costs that induce households to self-provision in several goods and services, etc... The second set of motives comprises “pull factors”: realization of strategic complementarities between activities, such as crop-livestock integration or milling and hog production, specialization according to comparative advantage accorded by superior technologies, skills, or endowments, etc.

Raising smallholder productivity constitutes the basis for moving away from agriculture, as households diversify initially within and eventually out of agriculture (Andersson *et al.*, 2018). Many rural livelihoods combine incomes from the farm and non-farm sectors, mainly through rural non-farm employment (RNFE). The rural growth linkages literature, in general, postulates complementarities between the farm and non-farm sectors (Haggblade *et al.*, 1989; Delgado *et al.*, 1994; Delgado, 1998; Haggblade *et al.*, 2007). In Ethiopia, agriculture is still the highest component of the economy, employing 77 percent of labor (Fantu, 2015). However, there is growing evidence that non-farm and off-farm activities are contributing a significant share in

households' livelihoods. Moreover, the growth of other sectors is becoming a means of agricultural transformation in Ethiopia. According to von Braun and Feder (2007), and Reardon *et al.* (2007), increased diversification of rural households into the rural nonfarm economy and high-value goods and services production is an important contributor to agricultural transformation and vice versa. Additionally, growth in the rural nonfarm sector is expected to have important implications for employment growth and the welfare of women and poor households given its small scale, low capital requirement, and amenability to home-based activity (Reardon *et al.* 2007).

Thus, this study tries to examine the household livelihood diversification status in the study area. In this regard, different types of livelihood activities are described and the share of each activity to overall household livelihoods is addressed.

2.2. Statements of the problem

Livelihood diversification refers to the strategies of households to manage risk and improve their well-being by engaging in multiple and varied income-generating activities (Ellis, 1998). It is a common practice in rural areas, where communities often rely on agriculture as their primary source of income, but are increasingly seeking alternative sources of livelihood to reduce vulnerability to shocks such as climate change, market downturns, or natural disasters.

In Ethiopia, livelihood diversification is particularly relevant due to the country's heavy reliance on agriculture and the increasing frequency of extreme weather events, which have a significant impact on rural communities. According to a study published in the "Journal of Development Studies," the 2015/2016 drought in Ethiopia led to a 50% reduction in agricultural production, highlighting the vulnerability of households dependent solely on farming. This has driven many to seek alternative income-generating activities to supplement their livelihoods and improve resilience.

One common form of livelihood diversification in Ethiopia is off-farm employment and non-farm where households engage in non-agricultural activities such as small businesses, informal trade, or wage labor. According to Haggblade *et al.* (2007), off-farm income accounts for 30-

40% of rural household income in Ethiopia, demonstrating its significance in diversifying livelihoods and reducing dependence on agriculture.

Livelihood diversification can also take the form of diversifying agricultural practices, such as integrating livestock rearing with crop production or cultivating high-value crops for market sale. This approach has been shown to enhance household income and food security, as well as build resilience to climate-related shocks.

However, while livelihood diversification offers several potential benefits, it also comes with its own set of challenges. One study published in the “World Development” journal identified that access to resources, market opportunities, and social networks are crucial factors influencing the success of livelihood diversification strategies. Additionally, some scholars argue that excessive diversification can lead to a lack of focus and specialization, potentially undermining overall income generation.

Livelihood diversification is a critical strategy for Ethiopian rural households to improve their resilience and well-being in the face of various challenges. While it offers opportunities to reduce vulnerability and enhance income, careful consideration of specific contexts, opportunities, and potential trade-offs is necessary to effectively implement diversification strategies. As Ethiopia continues to experience environmental and economic changes, promoting sustainable and inclusive livelihood diversification will be vital for the country’s rural development and poverty reduction efforts.

2.3. Materials and methods

2.3.1. Data sources and methods of data collection

The cross-sectional survey method was utilized to collect data from sampled households. Interview schedules were developed and well-trained enumerators were employed to gather data from the respondents. To collect the necessary data for this study, the researchers used a survey administered to a sample of respondents. The survey was conducted by trained enumerators who were selected based on their prior experience in data collection and their familiarity with the research areas. The enumerators were provided with the necessary training on the interview

schedules before they were given the task of administering them to the sample respondents. The researchers closely supervised the enumerators throughout the survey to ensure that the data collected was of high quality and met the study's requirements.

2.3.2. Sampling Techniques and Sample Size Determination

The sampling strategy for this study involved two stages. In the first stage, the Arsi Negele *woreda* in the West Arsi zone was purposefully selected based on convenience and the researcher's experience in accessing relevant data. In the second stage, stratified random sampling was used. *Kebeles* were stratified based on the nature of the dominant livelihood activities (diversification options). Simple random sampling was used to select sample households from each stratum. Finally, purposive sampling was used to select households with children from within the stratified *kebeles*. The sample size was determined using Yamane's formula (Yamane, 1967), expressed as follows:

$$n = \frac{N}{1+N(e)^2} \dots\dots\dots (1)$$

Where **N** is the population size and **e** is the level of precision. In 2022, the population of the *woreda* is 398,551, which consists of 196,321 males (49.3%), and 202,230 females (50.7%). Taking the "e" the level of precision to be 5%, the total sample size is around 398. However, in our study, the sample size is 401. Three more questionnaires were distributed to an enumerator, and since the minimum representative sample as per the calculation was 398, and three additional samples would not have a significant effect on estimation, we did not drop them from the sample.

2.3.3. Methods of data analysis

Livelihood diversification can be measured using different indices, such as the Simpson index, Herfindahl index, Ogive index, Entropy index, Modified Entropy index, and Composite Entropy index (Khatun *et al.*, 2012; Datta *et al.*, 2011). Several studies have used the Simpson Index to measure livelihood diversification (Saha *et al.*, 2010; Babatunde *et al.*, 2009; Joshi *et al.*, 2004). This study also used the Simpson's diversity index because of its computational simplicity, robustness, and wider applicability. The extent of livelihood diversification was determined

based on some empirical evidence. Various researchers classify the extent of livelihood diversification as not diversified, low-level diversification, medium-level diversification, high-level diversification, and very high-level diversification (Sherf-Ul-Alam *et al.*, 2017; Ahmed *et al.*, 2018). The index value used to classify the extent of livelihood diversification was specified as $SID \leq 0.01$: undiversified; $0.01 < SID \leq 0.25$ = less diversified; $0.26 \leq SID \leq 0.50$ = moderately diversified; $0.51 \leq SID \leq 0.74$ = highly diversified, and $SID \geq 0.75$ = very highly diversified. The current study has used this empirical research to determine the cutoff index and classify the extent of livelihood diversification accordingly. The Simpson's diversification index is one of the most commonly used types of indexes to measure livelihood diversification (Saha *et al.*, 2010; Babatunde *et al.*, 2009; Joshi *et al.*, 2003; Hill, 1973). The index is specified as follows:

$$\text{Diversity Index (DI)} = 1 - \sum_{i=1}^S \left(\frac{n_i}{N}\right)^2 \dots \dots \dots (3)$$

Where S is the number of income sources or activities that are present; n_i (for $i = 1$ to S) is the income value of individuals in the i -th income sources and $N (= \sum n_i)$ is the total income of all income sources. The value of SID ranges from 0 to 1 and, for a household with no diversity (i.e., having only a single income source or activity so that $S = 1$ and $n_1 = N$), DI is zero, and as income diversity increases, DI approaches unity. The unit of analysis for this study is the household level, considering their adoption of different livelihood strategies.

2.4. Results and discussion

2.4.1. Households' demographic characteristics

This section shows the demographic structure of sample households in the study area. The sex of a household head is one demographic factor assumed to affect the livelihoods of households in this study. According to the survey results, the majority of respondents were from male-headed households in the study area. The descriptive result showed that 87% of sampled respondents were male-headed household heads while nearly 13% were female-headed households (Table 2.1).

Table 2.1: The demographic characteristics of sample households

Variables		Frequency	Percent
Sex of household head	Male	350	87.3
	Female	51	12.7
Education status of household head	Illiterate	83	20.7
	Literate	318	79.3
Marital status of household head	Married	351	87.5
	Unmarried	50	12.5
	Excellent	101	25.2
	Very good	132	32.9
Health status of household head	Good	129	32.2
	Poor	39	9.7
Total		401	100

Source: Own Survey, 2020

The education status of a household is also another factor assessed in this study. In this study of livelihood diversification and child poverty, education has an important role in diversifying livelihoods and translating livelihood outcomes to child poverty reduction. Empirical evidence has revealed that education is the best tool for achieving transformative change within and outside of the agricultural sector (UNCDF, 2007). In this study, education is categorized as literate if a household head attended formal education and is otherwise illiterate. The descriptive results show that the majority of respondents in this study have attended formal schooling. The above Table 2.1 shows that 79% of sampled respondents reported that they have attended formal schooling.

Marriage is a biological and social engagement to support each other both socially and economically. The marital status of the household head is very important in this regard, and it increases the probability of household members engaging in diverse sources of livelihood activities. The descriptive statistics result shows that the majority of households are married. Other marital status types such as single, divorced, and widowed are rarely reported in this study. The following Table (2.1) shows the observed state of marital status.

The health status of the household head is also another demographic characteristic assessed in this study. The health status of an individual was assessed through the different patterns of health conditions. These are excellent health conditions, very good health conditions; good health conditions, fair health conditions, and poor health conditions (see Table 2.1). Information related to this pattern of health conditions was gathered by interviewing a respondent following their feeling about how they can categorize their health condition. Accordingly, poor health condition was rarely reported, and it is not a serious problem of livelihood diversification in the study area.

The age of respondents in this study is treated as a continuous variable measured in terms of years. The maximum age of respondents is 70 while the minimum is 22. The average and the standard deviation of the respondents' age are 41.2 and 9.7 respectively. Another variable assessed in this study is the household size of the sample respondents. Household size is measured as adult equivalent. Accordingly, the maximum household size in terms of adult equivalent is 11.2 with a minimum of 1 per household. The mean and standard deviation are 4.43 and 1.62 respectively.

Households were also assessed about their children's information. In this regard, data on children were collected based on different age categories. In this study, a child is any human being who does not attain the age of 18 years regardless of his/her sex category. Because poverty indicators of children differ across age groups, data were separately recorded based on age category. The first category is based on children under the age of five, while the second category covers children aged above 5 and less than 18 years. The maximum and the minimum number of children under age 5 as measured by adult equivalent is one and zero respectively. The mean and standard deviation are also 0.68 and 0.47 respectively. On the other hand, the maximum and the minimum number of children aged between 6 and 18 years are one and zero respectively. The mean and standard deviation are also 0.9 and 0.32 respectively.

The dependency ratio measures the ratio of economically inactive household members to economically active ones. In this study, age dependency considers a household member whose age is below 15 and above 65. This age group is considered economically dependent on their household members whose ages range from 15-64 ages. The minimum dependency ratio is 0 and the maximum is 15 with 1.65 mean and 1.15 standard deviations. On the other hand,

economically active household members are 1 for the minimum and 8.7 for the maximum in terms of the adult equivalent scale.

Table 2.2: Family members and characteristics

Variables	Minimum	Maximum	Mean	Std. Dv
Age of household head	22.00	70.00	41.22	9.68
Household size	1.00	11.20	4.43	1.62
Number of children under_5 age	.00	1.00	.68	.47
Number of children aged between 6_18 years	.00	1.00	.89	.32
Age dependency ratio	.00	15.00	1.65	1.15
Number of economically active household members	1.00	8.70	2.99	1.36

Source: Own Survey, 2020

2.4.2. Analyzing the extent of livelihood diversification

Livelihood diversification is defined as “attempts by individuals and households to find new ways to raise incomes and reduce environmental risk, which differ sharply by the degree of freedom of choice (to diversify or not), and the reversibility of the outcome” (Hussein and Nelson, 1999). Therefore, livelihood diversification in this case is broadening income-earning options through rational choices. Various techniques can be applied to measure the extent of livelihood diversification. The most commonly used diversification indexes are the Hirschman-Herfindahl index, Shannon's diversity index, and Simpson's diversity index. In this study, the Simpson Diversity Index was used to determine the extent of livelihood diversification in the study area.

Table 2.3: Extent of Livelihood Diversification

The extent of livelihood diversification	Frequency	Percent
Undiversified	58	14.5
Less diversified	13	3.2
Moderately diversified	101	25.2
Highly diversified	224	55.9
Very highly diversified	5	1.2
Total	401	100.0

The percentage distribution for the extent of livelihood diversification indicates that the majority of households (56%) in the study area are engaged in highly diversified livelihood activities.

2.4.3. Status of on-farm activities

The following figure shows the percentage contribution of each common crop to household crop production in the study area.

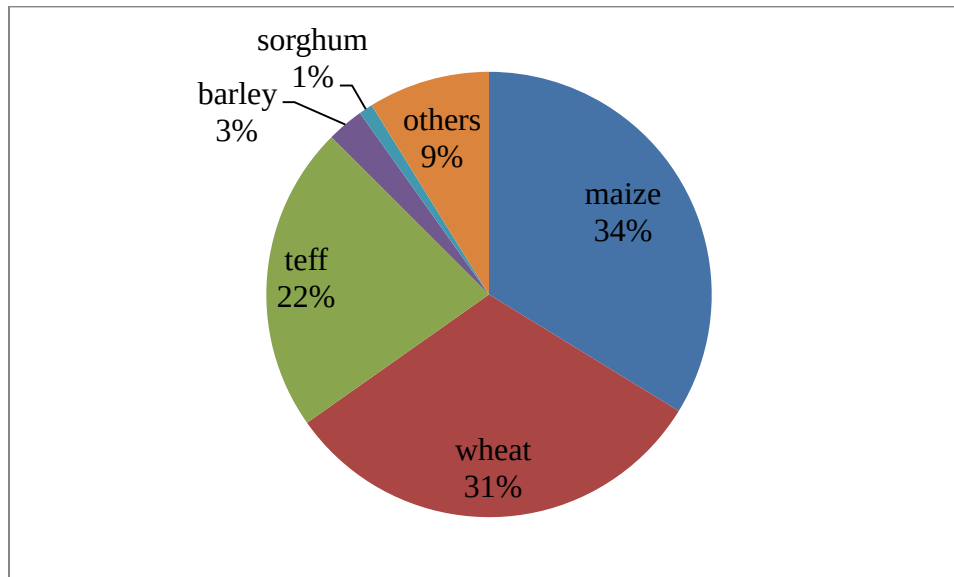


Figure 2.1: Major Crops cultivated

Maize is the most important cereal crop accounting for about 34% of crop production. Other major cereal crops such as wheat, *teff*, barley, and sorghum also account for 31%, 22%, 3%, and 1% respectively. All other crops such as millet, beans, and peas account for about 9% of overall crop production in the study area.

Livestock production

The following table illustrates the features of livestock production in the study area. Livelihood diversification comprises both crop production and livestock rearing. The term crop diversification denotes the broadening of cropping patterns to additional types of crops-while agricultural diversification refers to the inclusion also of livestock-based production (Andresson *et al.*, 2018). Livestock production is one of the major livelihood activities in the study area. Rural households produce different types of livestock for various purposes, as was understood

from the survey responses. Cattle are mainly reared for milk; oxen serve as draft power for the farming communities, while sheep, goats, and poultry are used for immediate household utilities like selling to fulfill food consumption and purchase agricultural inputs such as chemical fertilizers, agricultural seeds, and student's exercise books. Horses and donkeys are used as a means of transportation. All livestock were converted to Tropical Livestock Unit (TLU) scale. Cattle are the major livestock produced in the study. The maximum number of cattle in TLU is 17.5, while the minimum is zero. On average, households own 2.30 cattle. Poultry is the least produced type of livestock followed by horses.

Table 2.4: Types and number of livestock production in the study area

Variable	Mean	Std. Dev.	Min	Max
Cattle	2.295511	2.838394	0	17.5
Oxen	1.173566	1.054063	0	4.9
Sheep	.1117207	.2024532	0	1.2
Goats	.1927182	.3928522	0	3.1
Poultry	.0359352	.0603547	0	.6
Horse	.0179551	.1186457	0	.8
Donkey	.4650873	.523238	0	3.5
Total (TLU)	4.281845	4.367336	0	19.66

Source: Own Survey, 2020

The average oxen, sheep, goats, poultry, horses, and donkey produced is 1.2, 0.11, 0.19, 0.04, 0.018, and 0.47 TLU respectively. Overall, the average livestock is 4.3 TLU with a standard deviation of ± 4.4 . The result implies that households in the study area produce on average 4.3 livestock regardless of the type of livestock.

Livestock production in general provides multiple utilities to households. Some research results showed that livestock ownership is useful as a buffer stock to protect against consumption fluctuations during climate extremes (Li *et al.*, 2017). Livestock complements crop production as a household economic activity (Esubalew and Daniel, 2019). However, other findings showed that livestock production hinders households' participation in multiple livelihood activities such as off-farm and non-farm activities (Yishak *et al.*, 2014).

2.4.4. Livelihood strategies and household income

The following figure shows the mean total income by the livelihood strategies. The result clearly shows that there is a significant contribution of livelihood strategies to the household. The mean total annual income for on-farm-only is 40,616.67 (Figure 2.2) Ethiopia birr. The lowest total annual income was generated from the on-farm and off-farm combinations (37,456.17-birr, figure 2.2). On-farm-only livelihood activities share about 19% of the average annual household income (Figure 2.3). On-farm and off-farm combinations share 18% of annual household income. On-farm and non-farm combinations are the contributors to household income in the study area. The average contribution is 34%; followed by on-farm, off-farm, and non-farm combinations (29%, Figure 2.3). Even though non-farm alone is not practiced as the main source of income in the study area, evidence from other developing countries showed that it contributes more than 50% of income in rural farming communities (IFAD, 2010).

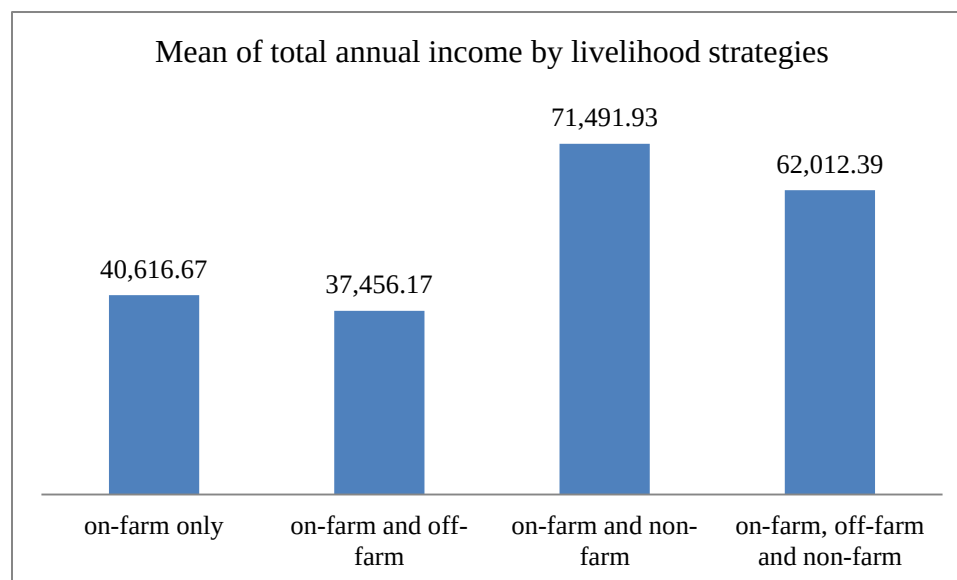


Figure 2.2: The mean of total annual income by livelihood strategies

The variation between the mean total annual incomes of on-farm only and on-farm and off-farm strategies is minimal. Empirical literature shows that the share of non-farm and off-farm income is high in some African and Latin American countries. According to Reardon, *et al.* (1997), the average share of non-farm income in the total rural household income in Africa is 42 percent, 40 percent in Latin America, and 32 percent in Asia. Another study also highlighted that the

contribution of non-farm activities to household income is substantial. According to Haggblade *et al.* (2007), non-farming income contributes between 30 to 40 % of rural household income in the developing world. Even though livelihood in the rural developing world is dominated by agricultural activities such as crop and livestock production, rural households also engage in other income-generating activities to augment their main source of income (Adepoju and Obayelu, 2013). In the study area, there are no households solely dependent on off-farm and non-farm activities, however, a significant number of households depend on on-farm-only activities. Therefore, we categorize livelihoods as a combination of different strategies rather than classify them as on-farm only, off-farm-only, and non-farm-only. The following figure illustrates the percentage contribution of each livelihood strategy to household income.

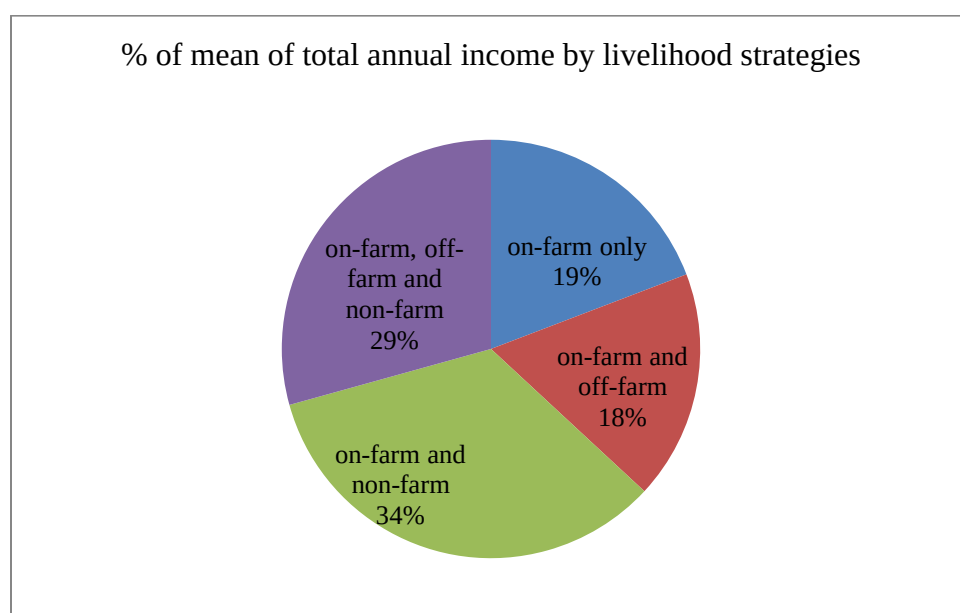


Figure 2.3: Percentage of the mean of total annual income by livelihood strategies

The percentage of mean total annual income indicates that combined on-farm and non-farm activities contribute the largest share (34%) of household income. On-farm, off-farm, and non-farm activities are the second largest (29%) contributor, while on-farm-only, and combined on-farm and off-farm activities contribute nearly the equal percentage of mean total annual income.

2.5.Conclusion

This study provides valuable insights into the household livelihood diversification status in a rural area of Ethiopia. The findings demonstrate the widespread adoption of diversified livelihood strategies, with the majority of households engaged in a range of on-farm, off-farm, and non-farm activities. The significant contribution of non-farm and diversified income sources to overall household well-being highlights the importance of supporting the development of the rural non-farm economy.

The study examined the contribution of different livelihood strategies to household income. The results show that the combination of on-farm and non-farm activities is the largest contributor, accounting for 34% of total household income. On-farm, off-farm, and non-farm activities together contribute 29% of income, while on-farm-only and on-farm and off-farm activities contribute 19% and 18%, respectively.

2.6.Recommendations

The findings of this study highlight the importance of livelihood diversification for rural households in the study area. The high degree of diversification observed, with the majority of households engaged in a range of on-farm, off-farm, and non-farm activities, suggests that households are actively seeking to manage risks and expand their income sources.

The significant contribution of non-farm and diversified activities to household income underscores the need to support the development of the rural non-farm economy, which can provide important employment and income opportunities, particularly for women and the poor. Policies and interventions that facilitate access to education, skills training, and financial services can help strengthen rural households' ability to diversify their livelihoods and improve their overall well-being.

The study's recommendations for policies and interventions that enable rural households further to diversify their livelihoods can help strengthen the resilience and prosperity of these communities. By understanding, the complex and dynamic nature of rural livelihoods,

policymakers, and development practitioners can design effective strategies to promote sustainable rural development and poverty reduction.

In general:

- ✓ There is a need to strengthen the Rural Non-farm Sector by investing in the development of the rural non-farm economy to provide more diverse income opportunities for rural households.
- ✓ Improving access to education and skills to enhance access to education, vocational training, and extension services to enable rural households to diversify their livelihood activities is also needed.
- ✓ Facilitating access to finance is highly needed to improve access to financial services, such as credit and savings, to support rural households in investing in diversified livelihood strategies.

By implementing these recommendations, policymakers and development practitioners can help rural households in the study area further diversify their livelihoods, manage risks more effectively, and improve their overall well-being and resilience.

CHAPTER THREE: HOUSEHOLD LIVELIHOOD STRATEGIES AND ITS DETERMINANTS

Abstract

This study is intended to measure livelihood diversification and identify the determinants of livelihood strategy choices in the study area. Multistage sampling methods were used to select 401 respondents from four kebeles based on probability proportional to size. Data were analyzed using descriptive statistics and a multinomial logistic model. The status of livelihood diversification was measured using the Simpson Diversity Index. Accordingly, about 62% of households did not diversify their livelihoods while the remaining 38% of households were engaging in multiple livelihood activities. A multinomial logistic regression model was employed to analyze factors affecting a household's livelihood choices. Among variables included in the model, sex of household head, age of household head, dependency ratio, frequency to extension contact, distance to agricultural input market, number of livestock reared, transportation costs, total annual income, and expected livelihood income were found to affect livelihood strategy choices at different significance level either positively or negatively. There should be intervention to promote females' livelihoods; similarly, an agricultural input supply system has to be established for farmers at remote locations to enhance access to agricultural inputs.

Keywords: Livelihood diversification, Simpson Diversity Index, livelihood strategy choices, multinomial logistic model

3.1. Background and justification

Livelihood diversification can be defined as an attempt by individuals and households to find new ways to raise income and reduce environmental risk, which differ sharply by the degree of freedom of choice (to diversify or not), and the reversibility of the outcome (Hussein and Nelson, 1999). Ellis (1997) also defined livelihood diversification as 'the process by which rural families construct a diverse portfolio of activities and social support capabilities in their struggle for survival and to improve their standards of living.' Ellis pointed out rightly that, livelihood diversification is not necessarily synonymous with income diversification; rather it is the broadening of the range of on-farm activities (for example, adding value to products by processing or semi-processing) and pursuing off-farm activities.

In modern-day studies, there is increased attention paid to livelihoods in both research and policies following a wide recognition that few rural or urban households, especially poor households in middle- and low-income countries rely on a single income-generating activity to support their living. For Chambers and Conway (1992), a livelihood comprises ‘the capabilities, assets (including both material and social resources) and activities required for a means of living.

Two forces namely “push” and “pull”, motivate livelihood diversification. According to these perspectives, a household diversifies either to reduce risks related to livelihoods or to enhance returns from livelihoods. The “push” factors include family labor supply in the presence of land constraints driven by population pressure and landholdings fragmentation, reaction to a crisis or liquidity constraints, and high transaction costs that induce households to self-provision several goods and services (Barrett *et al.* 2001). Poverty is also among the push factors leading to livelihood diversification. Different works of literature agree that livelihood strategies can help to improve the standards of living of the poor, marginalized, and unemployed (Alemu, 2012; United Nations Food and Agricultural Organization (UN-FAO, 2013).

The nature of rural livelihoods, especially in developing countries, is complex and diversified. Evidence shows that very few people obtain their livelihoods from single sources (Barrett *et al.* 2001; Ellis, 2000). Several studies classified livelihood strategies into three main pillars. These are on-farm activities, off-farm activities, and non-farm activities (Mishi *et al.*, 2020; Ogueri *et al.*, 2018; Fang *et al.*, 2014). Rural households rarely rely on the single livelihood strategies above mentioned. In most cases, large proportions of households are engaged in diversified combinations of livelihood strategies. Hence, understanding and analyzing livelihood diversification needs theoretical and practical grounds. Various authors (DFID, 2007; Ellis 2000 and Scoones, 2009) focused on a sustainable livelihood approach to understanding the patterns of livelihood diversification. Considering the ability to pursue different livelihood strategies depends on basic livelihood assets including tangible and intangible, various studies focused on the determinant of livelihood diversification.

Although the livelihood of the poor is diverse, agriculture is still the dominant livelihood source in Africa. It employs about 54.2% of the economically active population in Africa in general and

74.4 percent of the economically active population in East Africa in particular (Gollin, 2010). Agriculture plays a multidimensional role in the development process, which includes eliciting economic growth, generating employment opportunities, contributing to value chains, reducing poverty, lowering income disparities, ensuring food security, delivering environmental services, and providing foreign exchange earnings; however, about 75 percent of world poverty is concentrated in rural (World Bank, 2008; Byerlee, de Janvry, and Sadoulet, 2009). On the other hand, there are growing pieces of evidence that the non-farm sector is contributing a significant benefit to household livelihoods. According to FAO (2012), out of 3 billion people living in rural areas globally, about 2.5 billion people derive their livelihoods from non-farm activities.

The ways of income acquisition include all on-farm activities, non-farm and off-farm activities. On-farm activities include all activities such as crop production and livestock rearing undertaken on own account farm Bryceson (2005) and can be termed as agricultural activities. Livelihood diversification strategies based on agriculture have two important dimensions as stated by FAO (2005); these are either agricultural intensification or agricultural expansion. Agricultural intensification is challenged by input market constraints such as lack of timely input supply, rising agricultural input prices, lack of irrigation practices in several areas, and skill and knowledge gaps. On the other hand, continuously shrinking land holdings followed by high population pressure constrain agricultural extensification. Therefore, agriculture alone is no longer supporting livelihoods. In Ethiopia, both national and regional development policies have prioritized agriculture and exerted maximum effort to improve the agricultural sector; however, non-farm sectors did not attain similar attention.

Several studies have revealed in developing countries that the off-farm sector share of household livelihoods is significantly increasing (Ogueri *et al.*, 2018; Ruben and van den Berg, 2001; de Janvry and Sadoulet, 2002; Haggblade *et al.*, 2007). Similarly, non-farm activities are also contributing substantial income to household livelihoods. Some empirical pieces of evidence showed that rural households' income in sub-Saharan Africa is generated from engagement in non-farm activities and transfer from urban areas or abroad, with remittance and pension payments being the chief categories of such transfer (Ogueri *et al.*, 2018; Ellis 2000; Ellis & Freeman, 2004). Although several studies have revealed the importance of livelihood

diversification in sub-Saharan Africa in general and in Ethiopia in particular, there is no study conducted on livelihood diversification in the study area. This study is intended to measure livelihood diversification and identify the determinants of livelihood strategy choices in the study area.

3.2. Materials and Methods

3.2.1. Data sources and methods of data collection

Primary data needed for this study was collected from sample respondents using interview schedules. The interview schedules were administered by enumerators and supervised by the researcher. Enumerators were selected based on their experiences in data collection and their familiarity with the research areas. After training on interview schedules, all enumerators were supplied with schedules, and data was gathered by interviewing the sample respondents.

3.2.2. Sampling Techniques and Sample Size Determination

In the first stage, the Arsi Negele woreda among woredas at the West Arsi zone was selected purposively based on convenience to access relevant data and the researcher's experience; in the second stage, stratified random sampling techniques were employed. *Kebeles* were stratified based on the nature of dominant livelihood activities (diversification options). From each stratum, sample households were selected through simple random sampling techniques. Finally, within the stratified *kebeles*, only households that have children were selected using purposive sampling techniques. The sample size is determined based on Yamane's formula of sample size determination (Yamane, 1967). The formula can be written as;

$$n = \frac{N}{1+N(e)^2} \dots \dots \dots (1)$$

Where N is the population size and e is the level of precision. In 2022, the population of the *woreda* is 398,551, which consists of 196,321 males (49.3%), and 202,230 females (50.7%). Taking the "e" the level of precision to be 5%, the total sample size is around 398. However, in our study, the sample size is 401. Three more questionnaires were distributed to an enumerator, and since the minimum representative sample as per the calculation was 398, and three

additional samples would not have a significant effect on estimation, we did not drop them from the sample.

3.2.3. Methods of data analysis

Different techniques were employed to analyze data. Descriptive statistical methods such as mean and percentage were used to describe the demographic characteristics of sample respondents. Inferential statistics were also used to see the significance of the association between dependents and independent variables. The status of livelihood diversification was measured using the Simpson Diversity Index (SID). Following Ellis (2000) assumption of livelihood strategies, possible livelihood activities were assessed and specified as on-farm activities, off-farm activities, and non-farm activities. These three basic livelihood activities are basic livelihood strategies that are operationally differentiated by definitions (see section 1.8.7). The rural households did not solely rely on single livelihood strategies; rather, they practiced multiple livelihood activities based on expected risks and returns. Household's livelihood diversification is calculated as follows:

$$\text{Diversity Index (DI)} = 1 - \sum_{i=1}^S \left(\frac{n_i}{N}\right)^2 \dots \dots \dots (2)$$

Where S is the number of income sources or activities that are present; n_i (for $i = 1$ to S) is the income value of individuals in the i -th income sources and $N (= \sum n_i)$ is the total income of all income sources. The value of SID ranges from 0 to 1 and, for a household with no diversity (i.e., having only a single income source or activity so that $S = 1$ and $n_1 = N$), DI is zero, and as income diversity increases, DI approaches unity.

Empirical model Specification

A multinomial logistic regression model was used to determine factors affecting livelihood strategy choices. Following Green (2018), unordered choice models can be motivated by a random utility model. For the i^{th} household faced with J choices suppose that the utility of choice j is

$$U_{ij} = z'_{ij}\theta + \varepsilon_{ij} \dots \dots \dots (2)$$

If the household makes choice j in particular, then we assume that U_{ij} is the maximum among the J utilities. Hence, the statistical model is driven by the probability that choice j is made, which is

$$\text{Prob}(U_{ij} > U_{ik}) \text{ for all other } k \neq j \dots \dots \dots (3)$$

Where; U_{ij} is the utility to the i^{th} household from livelihood strategy j , and U_{ik} is the utility to the i^{th} household from livelihood strategy k . Thus, the i^{th} household's decision can be modeled as maximizing the expected utility by choosing the j^{th} livelihood strategy among J discrete livelihood strategies, that is:

$$\text{Max}_j = E(U_{ij}) = f_j(x_i) + \varepsilon_{ij}, j = 0, \dots, J \dots \dots \dots (4)$$

In general, for an outcome variable with J categories, let the j^{th} livelihood strategy that the i^{th} household chooses to maximize its utility take the value 1 if the i^{th} household chooses the j^{th} livelihood strategy and 0 otherwise. The probability that a household with characteristics x chooses livelihood strategy j , P_{ij} is modeled as:

$$Pr(Y_{i=j}) = \frac{\exp(X_i\beta_j)}{\sum_{j=0}^J \exp(X_i\beta_j)}, j=0-4 \dots \dots \dots (5)$$

Where: P_{ij} = probability representing the i^{th} respondent's chance of falling into category j

X = Predictors of response probabilities

β_j = Covariate effects are specific to the j^{th} response category with the first category as the reference.

Let Y_i be a random variable (livelihood strategy) that indicates the choice made. Then the livelihood strategies can be (Y_i): 0= on-farm only, 1=on-farm and off-farm only, and 2=on-farm and non-farm only, and 3= on-farm and off-farm and non-farm. Y_0 is the reference case.

Variables Definition and Hypotheses

Household livelihood diversifications depend on demographic, socioeconomic, farm attributes, and institutional factors. The dependent variable is livelihood strategies. Independent variables include sex, age, education status, household size, age dependency ratio, marital status, health status, land size, number of plots of land, irrigation practice, frequency of extension contact, livestock production, number of livestock owned, access to credit, proportion of total income to household size, and costs of agricultural outputs transportation. The list of explanatory variables used in the multinomial logit model and their expected signs are summarized in Table 3.1

Table 3.1: Summary of explanatory variables used in the multinomial logit model

Variable codes	Description and measurement	Expected sign
LIVSTRGY	Livelihood strategies (On-farm, off-farm, non-farm)	
SEX	Sex of household head (Male =0; Female = 1)	+/-
AGCAT	Age category of household head (categorical)	-
EDU	Education status of household head (Illiterate =0; Literate =1)	+
HHSZE	Household size in adult equivalent (Number)	-
AGDEP	Age dependency ratio (Number)	-
MRSTAT	Marital status of household head (Unmarried =0; Married =1)	+
HLTHSTAT	Health status of household head (categorical)	-/+
LNDSTZ	Total land holding in hectares (Number)	+
PLOTS	Number of plot lands owned at different locations (Number)	+
IRRG	Irrigation practice (Yes =1; No=0)	-/+
FRXCONT	Frequency of extension contact per month (number)	+
LVSOCK	Livestock rearing (Yes =1; No =0)	+
TLU	Total number of livestock in tropical livestock unit (Number)	+
CREDIT	Access to credit services (Yes = 1; No = 0)	+
PROPINC	Proportion of total annual income to household size (Number)	+
TRNSCOST	Costs of agricultural outputs transportation in /birr/ (Number)	-

3.3. Results and discussion

3.3.1. The demographic structure of sample respondents and patterns of livelihood diversification

This section deals with the analysis of major livelihoods practiced by sample households in the study area. The sex of the household head is one of the important factors in assessments of determinants of livelihood diversification. The analysis result showed that male-headed households are more likely to engage in diversified livelihood activities compared to female-headed households. In all of the livelihood activities, male-headed household engagement in diversified livelihood activities is by far higher than that of female-headed household engagements. Rural livelihoods are dominated by agriculture and the majority of agricultural activities are controlled by a male. Moreover, the lack of sufficient non-farm opportunities and the burden of reproductive activities limit females' opportunities to engage in a variety of livelihood activities. The result of the chi-square test showed that livelihood diversification has a significant ($\chi^2 = 7.945$) association with the sex of the household head.

Table 3.2: The descriptive result of factors affecting livelihood diversification

		The extent of livelihood diversification					Total (%)	χ^2 -value
Variable		Undiversified	Less diversified	Moderately diversified	Highly diversified	Very highly diversified		
Sex of household head	Male	7 (87.5)	36 (75)	76 (83.36)	44 (91.67)	187 (89)	87.3	7.945*
	Female	1 (12.5)	12 (25)	11 (12.64)	4 (8.33)	23 (11)	12.7	
Education	Illiterate	-	19 (39.60)	8 (9.20)	6 (12.5)	50 (23.8)	20.7	22.735***
	Literate	8 (100)	29 (60.40)	79 (90.8)	42 (87.5)	160 (76.2)	79.3	
Health status of household head	Excellent	-	2 (4.2)	6 (6.90)	5 (10.42)	88 (41.90)	25.2	114.864***
	Very good	-	8 (16.67)	33 (37.93)	16 (33.33)	75 (35.71)	32.9	
	Good	4 (50)	28 (58.3)	39 (44.83)	23 (47.92)	35 (16.67)	32.2	
	Poor	4 (50)	10 (20.83)	9 (10.34)	4 (8.33)	12 (5.71)	9.72	
Irrigation practice	No	8 (100)	47 (97.9)	78 (89.7)	45 (93.75)	192 (91.4)	92.3	4.006
	Yes	-	1 (2.1)	9 (10.3)	3 (6.25)	18 (8.6)	7.7	
Livestock rearing	No	8 (100)	25 (52)	3 (3.4)	-	-	9	218.958***
	Yes	-	23 (48)	84 (96.6)	48 (100)	210 (100)	91	
Access to credit	No	8 (100)	41 (85.42)	73 (83.9)	42 (87.5)	170 (80.95)	83.3	3.221
	Yes	-	7 (14.58)	14 (16.1)	6 (12.5)	40 (19.05)	16.7	
Age of the household head	22-35	6 (75)	22 (45.83)	28 (32.2)	21 (43.75)	24 (11.43)	25.2	58.844***
	36-55	2 (25)	24 (50)	55 (63.2)	26 (54.17)	158 (75.24)	66.1	
	>=56	-	2 (4.17)	4 (4.6)	1 (2.08)	28 (13.33)	8.7	
Marital status	Unmarried	-	8 (16.67)	5 (5.75)	5 (10.42)	32 (15.24)	12.5	7.177
	Married	8 (100)	40 (83.33)	82 (94.25)	43 (89.58)	178 (84.76)	87.5	
Total		8 (2)	48 (11.97)	87 (21.7)	48 (11.97)	210 (52.4)	100	

Source: Own Survey, 2020

Education is one of the important factors that can affect livelihood choices. It is assumed that educated individuals are more likely to adopt diverse livelihood strategies than uneducated individuals. In this study, the education status of respondents was assessed as if an individual has attended formal education or not. The analysis result revealed that the percentages of literate households engaged in diversified livelihood activities are higher than illiterate. The descriptive result showed that no illiterate household heads are observed under the undiversified livelihood category. The majority (79.3%) of them had attended formal education and only nearly, 20.7% of them did not attend formal education (Table 3.2). In general, school attendance is higher implying the majority of households in the study area can read, write, and understand the textual information relevant to their livelihood diversification. The chi-squared test result also shows that there is statistically a significant ($\chi^2 = 22.735$) association between the household head's education status and livelihood diversification in the study area. Various studies reported the importance of education for livelihood diversification. For example, Blein (2013) and Mishi & Mudziwapasi (2014) identified that lack of education hinders livelihood diversification. According to Gebreyesus (2016) and Mathewos and Nigatu (2016), education has a significant contribution to livelihood diversification. Similarly, Yizengaw *et al.* (2015) found that educated households are more likely to engage in diversified livelihood activities. Asfaw *et al.* (2016) also identified that formal education enhances household knowledge needed to engage in diversified sources of livelihood activities like entrepreneurship and the adoption of modern agricultural practices.

Health is an important household asset that can affect livelihood choices. It is assumed that healthy individuals are relatively engaged in multiple livelihood sources. When the breadwinner is a single individual in the household, the health condition extremely affects the overall well-being of the household. This study has identified that the health status of a household head and livelihood choice are strongly linked. The descriptive result shows that very few health problems were reported in this study. The health status of respondents was categorized as excellent health condition, very good health condition, good health condition, fair health condition, and poor health condition. The result shows that respondents with poor conditions engaged relative in limited livelihood activities. They highly relied on undiversified livelihood activities. On the other hand, respondents with excellent, very good, and good health conditions engaged in

multiple livelihood activities in general. The chi-squared value ($\chi^2 = 114.864$) also shows that there is a significant association between the extent of livelihood diversification and the health status of respondents in the study area.

Livestock production is one dimension of on-farm activities that is dominantly practiced in the study area. The *woreda* is familiar for its dairy cattle production as well as other livestock too. Most commonly reared livestock are cattle, poultry, shoats, horses, donkeys, and oxen. Pack animals like horses and donkeys are commonly used as means of transportation, while oxen are used for plowing purposes. Livestock production complements all livelihood strategies and most respondents observed that they are practicing livestock production at varying scales. At least a household practices poultry production if not cattle. Livelihood diversification and livestock production are significantly associated at a 1% probability level ($\chi^2 = 218.958$). In this study, age was specified as a categorical variable. The majority of sample households fall in 36 to 55 comprising more than 66% of the sample households. The chi-square result ($\chi^2 = 58.844$) showed that there is a significant association between livelihood diversification and the age of household heads.

Contribution of each activity to household livelihood strategies

The following pie chart gives us information on how livelihood strategies in the study area are composed according to the percentage of each livelihood activity contributed to the overall household livelihood portfolio. The value of 41.9 shows us that the percentage of on-farm activities is the biggest contributor to livelihood activities in the study area. Combined on-farm and non-farm activities are the second biggest livelihood sources. While on-farm and off-farm combinations are also third-placed livelihood options, the combination of on-farm, off-farm, and non-farm activities is the least.

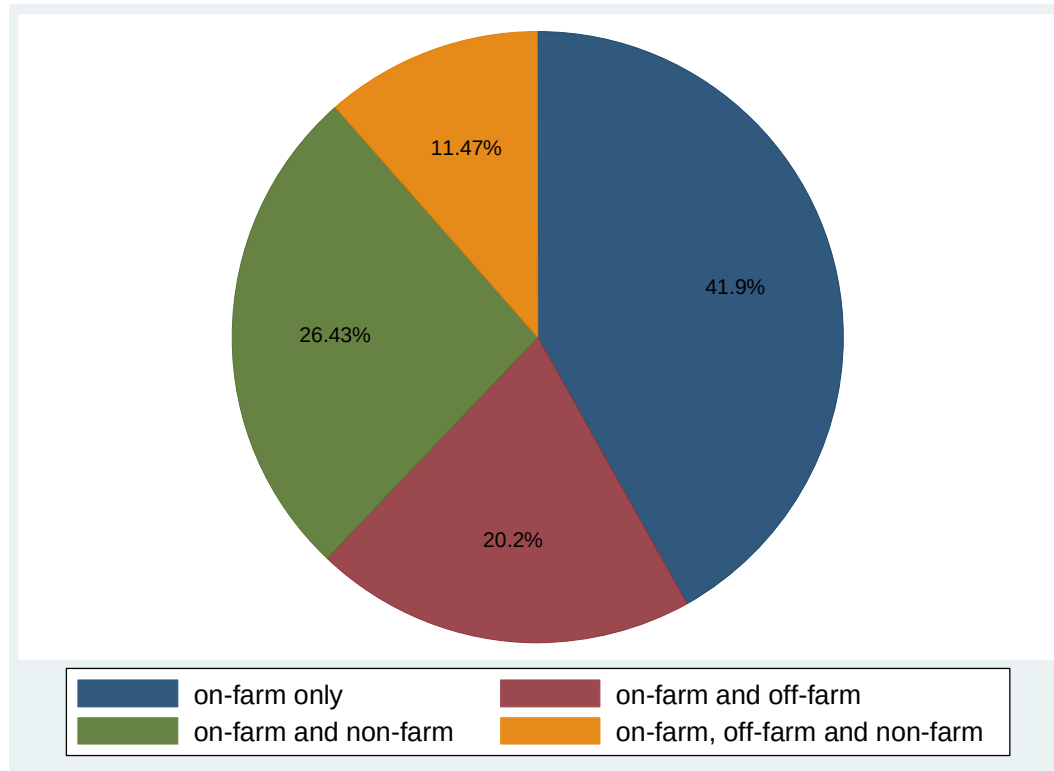


Figure 3.1: Figure Contribution of each activity to household livelihood strategies

Several studies classified livelihood strategies into different categories. The most frequent classification is as on-farm only, on-farm and non-farm, and non-farm only, (Pichón, 1997; Browder *et al.*, 2004; Jansen *et al.*, 2006; Brown *et al.*, 2006; Alemu, 2012). Similarly, Abimbola *et al.* (2014) also classified rural livelihoods as the combination of off-farm and non-farm, and on-farm and off-farm activities. Accordingly, Abimbola *et al.* (2014) identified that nearly 50 % of respondents in their study were engaging in a combination of on-farm and non-farm activities while around 14.3% and 40% of respondents engaged only in on-farm and non-farm activities respectively. The above table shows the possible combination of livelihood strategies being practiced in the study area. According to the descriptive results, on-farm alone contributed the highest (42%) share of livelihoods to households in the study area. On-farm and off-farm combinations contribute about 20.2%, while the on-farm and non-farm combinations contribute 26.43% of livelihoods. Relatively, a few households engaged in three activities at the same time. The descriptive result shows that a combination of on-farm, off-farm, and non-farm contributes only 11.43% of households' livelihoods. The cumulative percentage of 62% represents overall

agricultural activities. In the current study, we conceptualized both on-farm and off-farm activities like agricultural activities with location differences only. While on-farm activities represent all agricultural activities (crop cultivation and livestock rearing) undertaken on own account farm, off-farm activities are activities undertaken on another person's farm either for harvest share or as wage employment (agricultural laboring). Therefore, we can understand that agriculture is the highest contributor to rural livelihoods in the study area.

On the other hand, non-farm activities in this study refer to all livelihood activities that are not primarily agricultural production. It can include the trading of agricultural products as petty trading, however, agricultural activities like crop production and livestock rearing are excluded from the definition. Broadly, non-farm activities include petty trading, charcoal production, and selling, carpentry, and firewood selling. The result showed that, except for on-farm activities, both off-farm and non-farm activities are not solely practiced in the study area.

Mean comparison of continuous variables by the extent of livelihood diversification

The following table shows the mean difference comparison among the extent of livelihood diversification. The level of diversification is determined based on the Simpson diversity index (SDI) value as undiversified (UD); less diversified (LD), moderately diversified (MD), highly diversified (HD), and very highly diversified (VHD). The analysis of variance (ANOVA) is used to compare the “multiple means” values of the data set and visualize whether there exists any significant difference between multiple samples' means. The F-statistic determines whether the variation between sample means is significant or not.

The household size of respondents has a significant association with livelihood diversification ($F = 15.082$). The One-way NOVA result showed that there is statistically a significant mean difference in household size across the extent of livelihood diversification. The mean household size increases from undiversified to very highly diversified livelihoods.

Table 3.3: Summary statistics of continuous variables by the extent of livelihood strategies

Variables	The extent of livelihood diversification (mean)					Total mean	F value
	UD	LD	MD	HD	VHD		
Household size	3.4250	3.5208	3.9184	4.0667	4.9705	4.4297	15.082***

Dependency ratio	1.6250	1.4271	1.5172	1.8021	1.7262	1.6521	1.178
Total land holding	.6250	.6927	1.0584	1.1536	2.1060	1.5660	37.898***
Number of plot lands	1.0000	1.2292	1.5747	1.6458	2.1524	1.8329	22.980***
Frequency of extension contact	1.1250	1.6250	1.8276	1.9375	3.0095	2.4214	27.170***
Total number of livestock in TLU	.0000	.3667	2.1761	2.6558	6.5839	4.2818	48.481***
Average household income	2595.0	3275.15	7471.10	7957.30	16412.85	11612.50	35.143***
Transportation costs	246.90	554.50	710.53	830.96	1218.25	962.91	12.791***

Source: Own Survey, 2020

= ***, **, * implies it is significant at 1%, 5%, and 10% respectively.

The mean total land holding is 1.56 indicating households in the study area have an average of above one hectare of land. The result from the above table shows that there is a significant mean difference in land holdings across the extent of livelihood diversification. Households engaged in very highly diversified strategies have the highest average land holding (2.11 ha). Similarly, the number of plots of land owned at different locations also has a significant ($F = 22.980$) mean difference across the extent of livelihood diversification. The total mean of plots of land indicates that on average households in the study area have nearly two plots of land at different locations. The One-way NOVA results also revealed that there is statistically a significant mean difference in the extent of livelihood diversification concerning the number of plots of land owned at different locations. Having frequent contact with extension workers would provide farmers with the information required pertinent to resources, inputs, markets, and prices. Currently extension services are more than agricultural input provisions and technical advice. Extension workers are currently serving as sources of market information, and sources of weather conditions information (as reported by the development agents during the key informant interview with DAs). These create awareness for farmers in the study area to engage in multiple livelihood activities. The One-way NOVA results from the above table showed that there is a significant association ($F = 27.170$) between the frequencies of extension contact and the extent of livelihood diversification. Livestock holding of the households is aggregated by a standard measure using TLU (tropical livestock unit), which is considered a continuous variable. Livestock, as a measure of wealth, may serve as insurance during the production risk, as an indicator of wealth or prestige. The One-way NOVA result showed that there is a significant mean difference in the extent of livelihood diversification concerning livestock holding. Similarly, there are statistically significant differences in average household income among the

extent of livelihood diversification. A very highly diversified livelihood strategy has the highest average household income while an undiversified livelihood strategy offers the lowest household income. At the same time, households engaged in very highly diversified livelihood strategies also expend the highest costs for transporting agricultural inputs and outputs.

3.3.2. Determinants of livelihood diversification

To identify factors affecting households' decisions to diversify their livelihoods, a multinomial logistic regression model was selected. The multinomial logistic regression model is commonly used when there is a dependent categorical variable. The regressors are the same across all choices for each observation. The multinomial logistic model is an extension of generalized linear models allowing for an estimation of an unordered categorical response. Unlike the ordinal model, unordered categorical response values have no order.

The likelihood ratio chi-square of 178.50 with a p-value < 0.001 indicates that the model as a whole fits significantly. The value of R^2 for the multinomial logistic regression analysis is 17.28 percent. The output in Table 3.7 has four parts, labeled with the categories of the outcome variable; the livelihood strategies in this study are specified as on-farm only; on-farm + off-farm; on-farm + non-farm; and on-farm + off-farm + non-farm combination activities.

We tested the independent variables for the presence of multicollinearity before we estimated the econometrics model. , the independent variables were tested for the presence of multicollinearity. The contingency coefficient value ranges between 0 and 1, and as a rule of thumb variable with a contingency coefficient below 0.75 shows a weak association and the value above it indicates a strong association of variables. The contingency coefficient for the dummy and categorical variables included in the model was less than 0.75 indicating that no multicollinearity is a serious concern as indicated in Table (3.4). As a rule of thumb continuous variables having a variance inflation factor of less than 10 are believed to have no multicollinearity and those with a VIF of above 10 are subjected to the problem and should be excluded from the model. The computational results of the variance inflation factor in Table (3.5) confirmed the nonexistence of association between the variables and were included in the model. Moreover, a property of the multinomial logit model is the “independence of irrelevant alternatives” (IIA), i.e., the relative

probability of someone choosing between two options is independent of any additional alternatives in the choice set. The IIA assumption requires that the inclusion or exclusion of categories does not affect the relative risks associated with the regressors in the remaining categories. The test for IIA showed that for all categories of livelihood strategies is less the 0.05, i.e., $P > \chi^2$ is < 0.05 , indicating the IIA assumption is not violated. The categories of livelihood strategies were coded as ONF (on-farm only), ONF&OFF (on-farm and off-farm), ONF&NONF (on-farm and non-farm), and ONF, OFF, and NONF (on-farm, off-farm, and non-farm).

Table 3.4: Contingency coefficient

Variables	Contingency coefficient
Sex of household head	0.139
Education status of household head	0.232
Health status of household head	0.477
Irrigation practice	0.099
Livestock rearing	0.594
Access to credit	0.089
Age category of household head	0.358
The marital status of the household head	0.133

Source: Calculated from own Survey data, 2020

Table 3.5: Variance inflation factors

Variables	Collinearity Statistics	
	Tolerance	VIF
Household size	0.472	2.119
Dependency ratio	0.709	1.41
Total land holding in hectares	0.371	2.694
Number of plot lands owned at different locations	0.671	1.49
Frequency of extension contact per month	0.775	1.291
Total number of livestock in TLU	0.388	2.575
Proportion of total annual income to household size	0.513	1.949
Costs to transport agricultural outputs in terms of birr	0.589	1.697

Source: Calculated from own Survey data, 2020

Table 3.6: Independence of Irrelevant Alternatives (IIA)

Categories tested	chi2	df	P>chi2
ONF- ONF&OFF	29.516	16	0.021
ONF-ONF&NONF	50.285	16	0.000
ONF-ONF, OFF & NONF	53.863	16	0.000
ONF&OFF-ONF&NONF	47.969	16	0.000
ONF&OFF-ONF, OFF & NONF	50.815	16	0.000
ONF&NONF-ONF, OFF & NONF	27.749	16	0.034

Source: Calculated from own Survey data, 2020

The results from the multinomial logistic regression showed that the age of the household head has a significant effect on the choice of livelihood strategies in the study area. An increase in the age of household heads by one year leads to a significant ($p < 0.001$) increase in the probability of a household head remaining in only on-farm activities by 1.4% while it decreases participation in a combination of on-farm + off-farm strategies by approximately 0.6%. The decrease in on-farm + off-farm participation is significant at 0.4%, holding all other things constant. The result conforms to Geremew (2017), which justified that when a farmer gets older, he/she lacks the physical capability to engage in diversified livelihood activities. This implies that, when an individual gets older, he/she prefers to concentrate on on-farm activities only.

Table 3.7: The multinomial logit model results in the determinants of livelihood strategy choices

Variables	ONF		ONF&OFF		ONF&NONF		ONF, OFF, and NONF	
	dy/dx	Std. Err.	dy/dx	Std. Err.	dy/dx	Std. Err.	dy/dx	Std. Err.
SEX	0.012	0.099	0.009	0.074	0.018	0.090	-0.039	0.043
AGE	0.014	0.004***	-0.006	0.003**	-0.003	0.004	-0.004	0.002**
EDU	0.104	0.084	-0.040	0.060	-0.025	0.074	-0.039	0.032
HHSIZE	-0.069	0.023***	0.012	0.017	0.039	0.020**	0.018	0.009**
AGDEP	0.080	0.053	0.003	0.035	-0.031	0.046	-0.052	0.027**
MRSTAT	-0.193	0.106*	0.278	0.110**	-0.099	0.086	0.014	0.039

HLTHSTAT	0.009	0.035	0.016	0.025	-0.008	0.031	-0.017	0.012
LNDSE	0.140	0.046***	-0.105	0.042**	0.010	0.037	-0.044	0.020**
PLOTS	-0.055	0.043	0.107	0.030***	-0.049	0.039	-0.003	0.017
IRRG	0.176	0.116	0.121	0.072*	-0.297	0.130**	0.000	0.036
FRXCONT	-0.009	0.026	-0.006	0.019	0.006	0.023	0.010	0.008
LVSOCK	-0.140	0.118	-0.073	0.070	0.162	0.131	0.051	0.061
TLU	-0.036	0.012***	-0.007	0.009	0.028	0.010***	0.015	0.005***
CREDIT	0.116	0.082	-0.069	0.061	-0.087	0.078	0.040	0.024
PROPINCM	-1.49 ⁻⁷	4.6 ⁻⁶ ***	2.53 ⁻⁷	3.38 ⁻⁶	1.07 ⁻⁷	3.5 ⁻⁶ ***	3.97 ⁻⁶	4.3 ⁻⁶ ***
TRNSCOST	1.9 ⁻⁷	4.7 ⁻⁷ ***	5.04 ⁻⁷	3.4 ⁻⁶	-1.258 ⁻⁷	4.28 ⁻⁷ ***	-1.143 ⁻⁷	2.53 ⁻⁷ ***
Number of obs	=	401	LR chi2(48)	=	178.50	Pseudo R2	=	0.1728
Prob > chi2	=	0.0000	Log-likelihood	=	-427.10865			

Source: Own Survey, 2020; = ***, **, * implies it is significant at 1%, 5%, and 10% respectively.

The analysis revealed that household size has a significant effect on the choice of livelihood strategies. A unit increase in the number of household members decreases the probability of a household head's participation in on-farm only by 6.9%. On the other hand, with an increase in the number of household members by one unit, the probability of a household head participation in a combination of on-farm + non-farm strategies as well as on-farm + off-farm + non-farm activities participation increases by 3.9%, and 1.8% respectively, holding other factors constant. This implies that households with more family members are more likely to share activities and engage in diverse livelihood activities. On the other hand, a unit increase in the age dependency ratio leads to a significant decrease in the probability of household engagement in on-farm, off-farm, and non-farm activities by 2.7%, with other factors remaining constant.

The total landholding owned per hectare significantly ($p < 0.01$) and positively affects household participation in on-farm-only activities. A unit increase in landholding in hectares increases the probability of household participation in on-farm-only activities by nearly 14%. Contrary to this, an increase in land size significantly ($p < 0.05$) decreases the probability of household participation in on-farm and off-farm, as well as the combination of on-farm + off-farm + non-farm participation by 10.5%, and 4.4% respectively. This may be due to households with large

farmland preferred spending their time on their account farm, assuming it is sufficient to satisfy household needs. Moreover, the probability of exiting farming activities decreases when farming activities provide promising livelihood options.

The number of plots of land owned at different locations is one of the important factors affecting livelihood diversification strategies. Rural households minimize farm-based risks by diversifying their farming at different locations. Owning some plots of land, especially in different agroecology and topography, helps farming communities minimize natural hazards like land sliding and flooding. The result from the analysis showed that a unit increase in the number of plots of land at a different location increases the probability of on-farm + off-farm activity diversification by 10.7%, with all other variables held constant. The result implies that when the number of plots of land increases, a household also produces diversified products to benefit from livelihood activities.

Irrigation practice is significantly associated with livelihood strategy choices in the study area. The result indicates that being an irrigation adopter increases the probability of combined on-farm and off-farm activities participation by 12.1%, while it decreases participation in combined on-farm, off-farm, and non-farm activities by 29.7%. A household practicing irrigation is less likely to engage in on-farm + non-farm activities. Since irrigation needs intensified activities while non-farm activities are specifically not primarily farming, a household adopting irrigation prefers to stay in on-farm activities rather than engage in non-farm livelihood activities.

Livestock is one of the major livelihood activities in the study area. Most households rear livestock for various purposes. For example, oxen have been used for plowing purposes, while donkeys and horses are used for transportation. Goats and cows serve as milk sources. It is determined that most of the sampled households at least rear hens, if not cattle and other types of livestock. The number of livestock produced was converted to Tropical Livestock Units (TLU). The result from the analysis showed that a one-unit increase in the number of livestock in terms of TLU decreases the probability of on-farm-only activities participation by 3.6%, while it increases the probability of a household head's participation in a combination of on-farm and non-farm activities as well as on-farm, off-farm and non-farm activities by 2.8%, and 1.5%

respectively. This implies that livestock production in the study area is among the factors pulling toward livelihood diversification.

The proportion of total annual income to household size is the expected amount of income share that a household member has from income generated from all livelihood activities. In the study area, many households were engaged in diversified livelihood activities. Income generated is assumed to be the pull factor for livelihood diversification. Hence, its effect would be positive for livelihood diversification. The regression results showed that the average annual income to household size significantly and negatively affects on-farm-only diversification; implying an increase in the share of income from other livelihood activities other on-farm alone motivates households to reduce reliance on on-farm-only to add more activities to their livelihood portfolio. A unit increase in the proportion of total annual income in terms of birr results in a significant ($p < 0.05$) decrease in the probability of a household head participating in on-farm-only, while it increases the probability of participation in on-farm and non-farm activities by less than 0.005%. Similarly, if a unit increase in the proportion of total annual income increases the probability of a household head's participation in on-farm, off-farm + non-farm activities by less than 0.001%, other factors remain constant.

Transportation costs were one of the factors significantly affecting livelihood diversification in the study area. Transportation costs in this study were all costs incurred by the households to take their agricultural production to market, farm inputs from the input market to the farm, as well as agricultural production from the farm to their home. It also includes costs for getting agricultural inputs like crop seeds, chemical fertilizers, herbicides, pesticides, and other costs of transporting goods for shopping. The regression results show that a unit increase in transportation costs results in a decrease in the probability of a household head diversification in the combination of on-farm and non-farm activities, and on-farm, off-farm, and non-farm diversification by less than 1.258⁻⁷%, and 1.143⁻⁷% respectively, while other factors remain constant. The result also shows that as transportation costs significantly increase households prefer to remain on-farm-only activities. This implies that increasing transportation costs negatively affect livelihood diversification in the study area.

3.4. Conclusion

This study is aimed at measuring livelihood diversification and analyzes the determinants of livelihood diversification at Arsi Negelle Woreda, Oromiya Regional State. Different statistical techniques were employed to analyze the data. The descriptive statistics result showed that on-farm activity is the major livelihood strategy in the study area contributing nearly 42% of households' livelihoods, while on-farm + off-farm, on-farm + non-farm, and on-farm + off-farm + non-farm also contributed 20%, 26%, and 11% of households' livelihoods, respectively.

Among the independent variables analyzed to see the association with the dependent variables (livelihood strategies), the age of household head, household size, dependency ratio, land holding size, irrigation practices, number of plots of land, number of livestock owned, transportation costs, and proportion of total income to household size were found to significantly affecting livelihood strategy choices in the study area.

The regression results also showed that various factors affect the livelihood strategy choices among sampled respondents. The age of the household head is a significant factor affecting livelihood strategy choices in the study area. The highest number of livelihood strategies adopted by sampled households was found for those aged between 33 to 51 years, while the lowest livelihood activities were practiced by those aged above 65 years. Family size was also found to affect livelihood strategy choices positively and significantly. Large families tend to participate in diversified livelihood activities compared to small family size.

The land size of households was found to affect livelihood diversification negatively. Households owning large land sizes are not engaging in diversified activities. Therefore, an increase in land size decreases the probability of a household head's participation in diversified livelihood activities. On the other hand, a household owning some plots of land at different locations practices diversified agricultural activities. This increases on-farm diversification, implying a household would produce multiple agricultural products on his/her land. The result also showed irrigation practice has a significant and negative effect on livelihood diversification. The irrigation practice demands intensive labor utilization, and this limits a household's

participation in various livelihood activities. Moreover, irrigation increases the rate of production, which attracts on-farm concentration.

An increase in income earned from livelihood diversification also increases the probability of a household's participation in diversified activities. The result from the analysis shows that an increase in livelihood income is one of the pull factors for various livelihood strategies and practices.

CHAPTER FOUR: CHILD POVERTY AND ITS DETERMINANTS

Abstract

Child poverty is widespread and anticipated to endure in the future, particularly in developing countries. By 2030, it is predicted that a considerable number of children will be living in poverty. As a result, addressing child poverty is a top priority for researchers and politicians today. The objective of this study is to examine and measure the factors that contribute to child poverty in the Negele Arsi woreda, West Arsi Zone, Oromia Regional State. Based on probability proportionate to size, multistage sampling procedures were employed to pick 401 respondents from four kebeles. The data for this study was gathered using enumerator-administered interview schedules. The data were analyzed using descriptive statistical techniques, and the causes of child poverty were analyzed using a probit regression model. The multidimensional poverty assessment method was utilized to assess child poverty based on several indicators. As a result, the total multidimensional child poverty analysis found that around 85 percent of children in the study area were multidimensionally poor. Multidimensional poverty was found to be highly affected by factors such as household socioeconomic status, the age of the household head, and household wealth status. Similarly, nutrition, education, information, shelter, income, and fuel are all intimately tied to children's requirements.

Keywords: child poverty, household wealth status, multiple overlapping deprivation analysis, probit model, multidimensional

4.1. Background and justification

Child poverty is a significant issue that affects a considerable number of children globally. According to the African Charter on the Rights and Welfare of the Child (1990), the Convention on the Rights of the Child 1989, and Ethiopia Revised Family Code 2002, a child is defined as "every human being below the age of 18 years." In Ethiopia, children constitute approximately 52% of the population, yet they face several challenges in accessing better standards of life due to discrimination based on sex, language, religion, social origin, or social and property status (Getnet, 2009).

To address this issue, the Ethiopian government has ratified international human rights instruments protecting children's rights, including the Convention on the Rights of the Child and the African Charter on the Rights and Welfare of the Child (UNICEF, 2018). However, child

poverty remains persistent in Ethiopia, and it is estimated that 304.7 million sub-Saharan African children (aged 0–19) will be living in extreme poverty in 2030 (UNICEF, 2009). These children will account for 55% of world poverty in 2030, compared with 43% in 2018 and over three times the share in 2000 (Watkins and Quattri, 2016).

Multiple factors affect child poverty, including education, health, shelter, food, safe drinking water, sanitation facilities, information, and access to services. Household income is also among the significant factors affecting child poverty. Several theories have been advanced for why income might influence the development and later outcomes of children, such as 'Investment' theories, "Parental stress theories", and the 'role-model' theory. However, Mayer (1997) argued that parental income is not important to children's outcomes, but the parental willingness to pay for children's needs like skills, diligence, honesty, good health, and reliability determines the children's future outcomes.

Studies on child poverty show that severe or extreme poverty can cause children permanent damage physically and mentally, stunt and distort their development, and destroy opportunities for fulfillment, including the roles they are expected to play successively as they get older in family, community, and society (Gordon et al., 2003). Similarly, some other scholars have also argued that poor children are more likely to have worse adult outcomes than non-poor children (Duncan *et al.*, 1998; Oshio *et al.*, 2009; Ratcliffe and McKernan, 2010). Child poverty has long-term effects, which can lower success in the labor market compared to non-poor children (Gregg and Machin, 1998). Therefore, assessing, identifying, and addressing the potential causes of child poverty and investing in child poverty reduction would result in tackling intergenerational poverty.

In Ethiopia, poverty remains a pervasive issue, particularly child poverty, which is unacceptably high. The majority of children in Ethiopia are multidimensionally poor, as empirical evidence suggests. According to CSA *et al.* (2015), child monetary poverty on the equivalent scale is 32.4%, while the multidimensional child poverty rate is 87.5% (UNDP and OPHI, 2019). These rates are higher than the corresponding rates at the household level, which are 23.5% and 83.5%, respectively (NPC, 2017; UNDP and OPHI, 2019; as cited in Getachew, 2022). In Oromia, child poverty rates are particularly high, with approximately 2.1 million children under the age of five

stunted, 1.2 million underweight, and half a million wasted (National Nutrition Programme, 2015, as cited in Desta, 2020). A study conducted in a neighboring district to the current study also found that indicators of child poverty, such as stunting and wasting, were higher (Desta, 2020).

Although there is a global agreement on the reduction of child poverty, there is no recorded evidence on the state and causes of child poverty in the Negele Arsi woreda, West Arsi Zone, Oromia Region State. Therefore, this study aims to investigate and measure the factors that contribute to child poverty in this specific area. The study will provide important insights into the state of child poverty in the Negele Arsi woreda and contribute to the development of effective policies and interventions to reduce child poverty in the region.

Child poverty has serious and far-reaching consequences, both for the children themselves and for society as a whole. Children who grow up in poverty are at a higher risk of poor health outcomes, including malnutrition, stunted growth, and infectious diseases. They are also more likely to drop out of school, experience social exclusion, and become trapped in a cycle of poverty that can last for generations. Therefore, it is crucial to understand the state and causes of child poverty in specific areas like the Negele Arsi woreda to design effective policies and interventions to combat child poverty. By conducting this study, we can identify the factors that contribute to child poverty in the area and develop targeted strategies to reduce child poverty rates, improve children's health and well-being, and promote their long-term development.

4.2. Materials and methods

4.2.1. Data sources

Data needed to analyze child poverty was collected from sampled households based on multidimensional poverty indicators. Accordingly, the indicators used for this study are education, information, health, nutrition, housing (shelter), water, sanitation, fuel and energy, and household income. Sample households were interviewed about their children based on the indicators developed to assess child poverty.

4.2.2. Sampling techniques and sample size determination.

A multistage sampling technique was used to select sample respondents. In the first stage, the Arsi Negele woreda among woredas in the West Arsi zone was selected purposively based on convenience to access relevant data and the researcher's experience; in the second stage, stratified random sampling techniques were used to select *kebeles*. *Kebeles* were stratified based on the nature of livelihood activities (diversification options). Finally, from each stratified *kebeles* sample households were randomly selected. The sample size is determined based on Yamane's formula of sample size determination (Yamane, 1967). The formula can be written as;

$$n = \frac{N}{1 + N(e)^2}$$

Where **N** is the population size and **e** is the level of precision. In 2022, the population of the *woreda* is 398,551, which consists of 196,321 males (49.3%), and 202,230 females (50.7%). Taking the "e" the level of precision to be 5%, the total sample size is around 398. However, in our study, the sample size is 401. Three more questionnaires were distributed to an enumerator, and since the minimum representative sample as per the calculation was 398, and three additional samples would not have a significant effect on estimation, we did not drop them from the sample.

4.2.3. Methods of data analysis

The multidimensional poverty measurement approach was used to analyze child poverty. Using a multidimensional deprivation headcount ratio, we measured the number of children deprived. In doing so, we used the chosen cut-off point to identify the deprived. Accordingly, a child *i* is designated as deprived if the number of dimensions in which he/she is deprived (D_i) is equal to or greater than the cut-off points *K*. This can be specified as follows:

$$y_k = 1 \text{ if } D_i \geq k, y_k = 0 \text{ if } D_i < k \dots \dots \dots (1)$$

The multidimensional child deprivation headcount ratio is calculated as follows:

$$H = \frac{q_k}{n}, \text{ with } q_k = \sum_{i=1}^n y_k \dots \dots \dots (2)$$

Where,

q_k = number of children affected by at least K deprivations;

n = total number of children included in the analysis;

y_k = deprivation status of a child i depending on the cut-off point K ;

D_i = number of deprivations each child i experiences;

K = cut-off point.

Accordingly, the child poverty status was represented as 1 if a child was deprived of multiple indicators and 0 otherwise.

In this study, about eight dimensions with some indicators were used to estimate multidimensional child poverty. These dimensions are nutrition, health, education, information, shelter, water and sanitation, fuel and energy, and income. The deprivation index was constructed for each dimension using selected indicators (see Annex Table 1 for indicators and possible explanations). The number of dimensions for which each child suffers from deprivation is then summarized in a “deprivation count”. Atkinson (2003) labeled the “counting approach” to multidimensional deprivation as the analysis of the distribution of the “deprivation count” across the population. Accordingly, multidimensional child poverty was specified following the Oxford Poverty and Human Development Initiative (2017). A child is identified as multidimensionally poor if he/she is deprived in at least one-third of the weighted indicators; in other words, the cutoff for poverty (k) is 33%.

The multiple overlapping deprivation analysis (MODA) method with a life-stage approach was used to capture child poverty across age groups. MODA has various approaches to multidimensional child poverty assessments. These are the child-centered approach, life-stage approach, deprivation overlaps approach, combined deprivation and monetary poverty analysis approach, flexible methodologies approach, and child deprivation profiles approach. In the current study, we focus on the life-stage approach, which is commonly used when the aim is to capture child age-specific needs as indicators to assess child poverty (UNICEF Ethiopia and Central Statistical Agency of Ethiopia, 2016). Child poverty is complex and difficult to measure with a similar approach to adult poverty. According to the right-based approach, child poverty is

defined as the non-fulfillment of children's rights to survival, development, protection, and participation as anchored in the Convention on the Rights of the Child (UNICEF, 2014). While the child's needs vary across ages, disaggregating and capturing poverty, and status across age groups is very crucial. To address this concern, the multiple overlapping deprivation analysis (MODA) technique is the relevant approach. Therefore, this study adopted the MODA approach to analyze child poverty. According to the multidimensional poverty measurement approach, child poverty indicators include nutrition, health, education, information, shelter, water, and sanitation. Additionally, income is also included as one of the child poverty indicators in this study.

Child poverty indicators were described using descriptive statistics such as mean, standard deviation, and percentage. A Probit regression model was used to analyze the determinants of child poverty. The model is specified in detail as follows:

In the linear probability model, which is one of the qualitative preference models with qualitative variables that can take two values, the most obvious problem is that the predicted probability values fall outside the range of "0" and "1". Therefore, the probit model is used to solve this problem. A probit model is a nonlinear model in terms of coefficients that allow the probabilities to remain between "0" and "1". When the dependent variable y_i is binary, P_i is expressed:

$$P_i = (y = 1|x_i) = \phi(x_i\beta)$$

Here ϕ is the cumulative distribution function and β maximum likelihood coefficients of the standard normal distribution. The probit model assumes that the basic dependent variable is normally distributed, whereas the y dependent variable assumes that the variable is based on the logistic curve. Therefore, the tail regions of the logit cumulative distribution function of these two models are wider than those of the probit model. Although these two models give similar results, it is not possible to directly compare the predicted main mass coefficients of the two models.

4.3. Research Results

4.3.1. Status of child poverty

Multidimensional child poverty status

Child poverty is measured using the counting approach to deprivation. Accordingly, the number of dimensions in which children were deprived was counted, and the child poverty status was coded as 1 if a child was multidimensionally poor, and otherwise 0. Following Alkire and Foster (2015), the number of dimensions children were deprived of was counted, and using a poverty threshold of two, it was discovered that children from 85% of sampled households were multidimensionally poor (Poor). On the other hand, about 15% of sample households' children were multidimensionally non-poor (Non-Poor) (see Table 4.1 below). Multidimensional child poverty is significantly high in Ethiopia. A jointly conducted study with relevant government partners like CSA, UNICEF, and OPM in 2015, revealed that 88 percent or 36.2 million children are multidimensionally poor in Ethiopia, defined as a headcount of children deprived in at least three or more dimensions in the fulfillment of their rights or needs for basic food or services (UNICEF and CSA, 2018).

Table 4.1: Multidimensional Child Poverty Status

Multidimensional child poverty status	Frequency	Percent
Non-poor	59	14.7
Poor	342	85.3
Total	401	100

Source: Computed from own survey data, 2020

To capture child poverty across age categories, multiple overlapping deprivation indexes were computed. This approach was selected because indicators of children under age five and children between 6 and 18 partly differ and are partly the same. Accordingly, indicators like shelter, water, sanitation, and income are common for all age categories of children. Nutrition and health indicators are specific to children under the age of five while education and information are only applicable to children aged between 6 and 18 ages. In this study, it is defined that children are

human beings under the age of 18 regardless of their sex. The following sections give detailed descriptions of factors related to child poverty and the analytical results.

In this study, we classified factors affecting child poverty into two categories. The first category is about factors related to the household head (parent); while the second category covers all factors directly related to children's needs. Household-related factors are the age of the household head, sex of the household head, livelihood strategies of the household head, marital status, education status, health status of the household head, and household income. On the other hand, factors directly related to children's needs were identified following the human rights-based approach as reported by (Minujín *et al.*, 2006). Accordingly, about seven indicators related to child needs were taken to assess child poverty in the study area. These are nutrition, health, education, information water and sanitation, shelter, and energy.

4.3.2. The descriptive results of child poverty determinants

4.3.2.1. *Child poverty by household socio-economic and demographic characteristics*

Some scholars have reported that parental socioeconomic and demographic characteristics have an imperative relationship with child poverty (Bradbury and Jantti, 2001; Chen and Corak, 2008; Gornick and Jantti, 2012). The sex of the household head is one of the important demographic factors determining child poverty in the study area. From the survey assessment, it is identified that the majority of household heads are males. Of the 401 sampled households, 350 households are male-headed. Comparing child poverty across household headships, we can understand that child poverty is higher in male-headed than female-headed households. At the same time, the percentage of non-poor children is also higher in male-headed households. The descriptive result showed that about 86.8% of multidimensionally poor and 89.8% of multidimensionally non-poor children are from male-headed households respectively. However, the chi-squared result did not show statistically a significant association between child poverty and the sex of household heads in the study area. This result has a similarity to Birhanu *et al.* (2017), which identified that multidimensionally poor children are higher in male-headed households than in female-headed households.

Moreover, the sex of a household head is taken as one of the important factors assumed to affect child poverty in the study area for different reasons. It is assumed that female-headed households may lack some basic resources to sustain their households. The descriptive statistics results from the below table also revealed that child poverty is more concentrated in female-headed households than male-headed households.

Table 4.2: Household head demographic characteristics and child poverty

Variable	Response	Child poverty status		χ^2 - value	p-value
		Non-poor	Poor		
Sex of household head	Male	53 (89.8)	297 (86.8)	0.405	0.525
	Female	6 (10.2)	45 (13.2)		
Education status of household head	Illiterate	10 (17)	73 (21.3)	0.592	0.441
	Literate	49 (83)	269 (78.7)		
	Excellent	17 (28.8)	84 (24.6)		
Health status of household head	Very good	18 (30.5)	114 (33.33)	0.557	0.906
	Good	18 (30.5)	111 (32.5)		
	Poor	6 (10.2)	33 (9.6)		
Marital status of the household head	Unmarried	9 (15.25)	41 (12)	0.492	0.483
	Married	50 (84.74)	301 (88)		
Participation on off-farm for harvest share	No	46 (78)	256 (74.8)	0.262	0.609
	Yes	13 (22)	86 (25.2)		
Laboring on other's farm	No	58 (98.3)	300 (87.7)	5.89	0.015**
	Yes	1 (1.7)	42 (12.3)		
Total		59 (15)	342 (85)		

Source: Computed from own survey data, 2020

Household education is among the important factors determining child poverty in the study area. Education plays a significant role in household welfare (Awan, Malik, Sarwar, and Waqas, 2011). Educated household heads are more likely to invest in family welfare than illiterate household heads. Accordingly, the education of household heads was assessed in this study to identify its contribution to child poverty. The multidimensional child poverty is relatively higher for illiterate household heads compared to literate household heads. However, the chi-squared

test result ($p = 0.441$) does not show a significant relationship between child poverty and household head education status.

The marital status for this study was assessed as married, and unmarried. The majority of sampled households are married. The chi-squared result ($p = 0.580$) shows that there is no significant association between child poverty and the marital status of the household head.

As can be seen from the above table, children have attained little attention, and most families are less likely to invest in their children. Lack of proper care for children will affect their future healthy growth of children. Various reasons are identified to affect child well-being. According to the study conducted by Ma *et al.* (2009), factors like family resources refer to the amount of time spent with family; actual household income and the efficacy of financial management; human capital such as parents' educational attainment; psychological factors such as stress coping efficacy of parents; and social capital such as social support from friends and relatives affect child healthy growth.

The health status is categorized on a self-reported 1-5 scale: the excellent, very good, good, fair, and poor following (Wu, 2003) to understand the health condition of the household head through the question “*How could you state your health status?*” Following Drever *et al.* (2001), “people are good judges of their state of health”; we raised the question to each respondent to report their health condition. Poor health of household heads is found to be a critical determinant of child poverty. The results from the descriptive analysis showed that the incidence of child poverty varies across the health condition of household heads. The highest multidimensional child poverty was observed for the household heads with very good health conditions (see Table 4.2).

From the above table, we can see that the majority of household heads are in very good health condition. It is acceptable that household head health is very important for household welfare in general. The households where the head is the only breadwinner, any health problem is considered a vulnerable condition for all household members. Children are among the most vulnerable groups in households and need proper care. The result from the chi-squared test ($p = 0.109$) however did not show a significant association between household head health and child poverty in the study area.

Households in the study area are engaged in multiple livelihood activities to generate income. The fact is here that numerous studies have recorded that off-farm activities increase household income, consumption, nutrition, and food security (Gautam & Andersen, 2016; Khatiwada *et al.*, 2017; Loison, 2015; and Helmy, 2020). However, in the study area, it was found that households' participation in off-farm activities is very low. The contribution made by off-farm activities to overall household income is low; the chi-squared result ($\chi^2 = 0.262$; $p = 0.609$) also shows that there is no significant association between household off-farm participation and child poverty.

The majority of households whose children are multidimensionally poor participate in agricultural laboring compared to those households whose children are multidimensionally non-poor (Table 4.2). On the other hand, households with more multidimensionally non-poor children are less likely to participate in agricultural laboring. The chi-squared test result (5.89) revealed that there is a significant ($p = 0.015$) association between agricultural laboring and child poverty in the study area. Several studies show that off-farm activities have a significant contribution to household poverty reduction. According to some studies (Davis *et al.*, 2017; Hagglblade *et al.*, 2010; Yeboah and Jayne, 2018), off-farm activities contribute about 35 percent of household income in sub-Saharan Africa.

While off-farm activities are potential strategies for poverty reduction and consumption smoothening, this study finds that household participation in such activities is very low in the study area. A study by Yenesew, Eric, and Fekadu, (2015) has also found that the level of rural household participation in off-farm activities is low, and only 36.5% of the sampled households participated in off-farm activities in their study area. The same study also reported that the overall income generated from off-farm activities is the lowest compared to on-farm and non-farm income. This suggests that off-farm opportunity is minimal in the country. This might be due to the majority of rural households in Ethiopia being engaged in agricultural activities. Other empirical evidence also reported that off-farm growth is slow in Sub-Saharan Africa and could not enable policymakers to easily attain poverty reduction goals. It is argued that policymakers have also to target off-farm activities for job creation and poverty reduction (ILO, 2008).

Household Socioeconomic and demographic determinants of child poverty

The following table shows us the household-related factors affecting child poverty in the study area. The mean age of household heads whose children are multidimensionally non-poor is 40.95, while the mean age of household heads whose children are multidimensionally poor is 41.2 respectively. The t-test result shows that there is no significant ($p = 0.852$) association between the age of household heads and multidimensional child poverty in the study area. The mean age difference of the household heads whose children are multidimensionally non-poor and poor, respectively, is ± 1.42 . The result implies that the age of the household head has no significant effect on multidimensional child poverty in the study area.

Household size is one of the demographic factors that vary across households. In a poverty study, assessing household size is crucial because the level of household expenditure is defined by the level of household well-being. It is argued that household composition is an important problem in measuring poverty. Therefore, converting the number of household members into adult equivalents gives a clear understanding of household well-being. Accordingly, household size was converted based on the age and sex of household members. The mean household size for households whose children are multidimensionally non-poor is 5.2559, while the mean household size for households whose children are multidimensionally poor is 4.5038. The t-test result shows that there is a significant mean difference in household size to multidimensional child poverty.

The land is an important asset to farming households, especially in rural contexts. Since agriculture dominates the livelihoods of rural areas, landholding is a crucial determinant of livelihood diversification. Research pointed out that small landholdings are a push factor for livelihood diversification, while large landholdings are a pull factor. For example, Hart (1994) found that larger landowners diversify to accumulate, while the landless and near landless diversify to survive. Hiremath, (2007) has also argued that small landholdings cannot satisfy households' needs; hence, rural households tend to look for alternative livelihood opportunities. According to Davis (2003) and Haggblade (2007), small and poor land quality (poor fertility) is the push factor for rural households toward livelihood diversification. In this study, the total

landholding is a continuous variable and is measured in hectares (ha). The total landholding affects livelihood diversification, which in turn affects child poverty in the study area. From the t-test result ($t = 3.839$) we can understand that there is a significant ($p < 0.001$) mean difference (± 0.5886) in landholding among households whose children are multidimensionally poor and non-poor.

The number of plots of land owned at different locations is one of the important factors affecting on-farm diversification strategies. Rural households minimize farm-based risks by diversifying their farming at different locations. Owning some plots of land, especially in different agroecology and topography, helps farming communities minimize natural hazards like land sliding and flooding. In addition to diversifying risks, it provides opportunities to produce several crops, which necessarily improve household dietary requirements and market participation. The t-test result showed that there is statistically a significant ($p = 0.085$) mean difference (± 0.2) in plots of land owned at a different location about multidimensional child poverty.

Table 4.3: Household Socioeconomic and demographic determinants of child poverty

Variable	Multidimensional poverty	Mean	Std. Deviation	t-value	p-value
Age of household head	Non-poor	40.95	9.462	-0.187	0.852
	Poor	41.2	9.41		
Household size in adult equivalent scale	Non-poor	5.2559	1.90772	2.974	.003***
	Poor	4.5038	1.77419		
Total land holding in hectares	Non-poor	2.068	1.6639	3.839	.000***
	Poor	1.4794	0.95566		
Total livestock in TLU	Non-poor	5.6534	5.05001	2.631	.009***
	Poor	4.0452	4.20172		
Number of plot lands	Non-poor	1.66	0.801	-1.726	.085*
	Poor	1.86	0.833		
Average annual income	Non-poor	10,630.1	8,973.59	-0.888	0.377
	Poor	11,781.9	10,430.1		

Source: Computed from own survey data, 2020

Livestock production is one of the on-farm activities practiced in the study area. Livestock production is highly diversified, and the majority of sampled households practiced livestock

rearing. The diversity ranges from large ruminants like cattle production to poultry production. It was identified that a household at least practices smallholder poultry production if not cattle rearing. Livestock production serves different purposes for rural households in the study area. For example, most households produce oxen for draft power, a cow for milk (home consumption and marketing), sheep, and goats as liquid assets and marketing, poultry for household consumption, and marketing, and donkeys and horses for transportation purposes. The inferential test result ($t = 2.631$; $p = 0.009$) showed that there is statistically a significant mean difference (± 0.334) in livestock holding between households of multidimensionally non-poor and poor children. Household income can play a significant role in alleviating child poverty. However, Mayer (1997) argued that parental income is not important to children's outcomes. This is because the parental willingness to pay for children's needs like skills, diligence, honesty, good health, and reliability determines the children's future outcomes. Likewise, in the current study, we found that there is no significant mean difference in average household income between multidimensionally poor and non-poor children in the study area.

From some empirical evidence, we can understand that the income approach is not attractive to assess child poverty for several reasons. According to UNICEF Ethiopia and Central Statistical Agency (2016) income approach has several shortcomings considering that children do not have control over households' financial resources; that access to financial resources does not always translate into improvements in children's well-being; and that there may be intra-household inequalities in resource allocation.

4.3.2.2. *Factors related to children's needs*

Child poverty is a global challenge that all countries in the world face today. It is not limited only to developing countries but is also a problem in developed countries. Different studies show that child poverty is not happening only in third-world countries but also in developed countries (Gordon *et al*, 2003; UNICEF, 2005). Moreover, indicators of child poverty are multiple, and it is difficult to assess as well as measure. Poverty, in general, can be measured using either monetary or multidimensional approaches. In this study, we adopted the multidimensional approach to measure child poverty. Multiple indicators included in assessing child poverty are nutrition, education, information, housing, water and sanitation, energy, and income.

Accordingly, an index was developed for each indicator, and child poverty was identified. The following section presents detailed explanations of each indicator based on analysis results.

Deprivation overlaps dimensions for children below 5 years and 5-18 years

This section summarizes results for the proportion of children deprived in any six dimensions at a time. While all combinations of dimensions were analyzed, only the most telling results are presented here. Deprivation analysis was done for both age groups separately as it is presented in Venn diagrams. Figure 5 represents dimensions for children below the age of five. Dimensions considered are nutrition, health, shelter (housing condition), water, sanitation, and fuel and energy. The overall deprivation for fuel and energy is the highest for shelter and sanitation respectively.

The Venn diagram of the deprivations in the sanitation, fuel, and energy dimensions has the largest proportion of overlap of all possible combinations of two (25.4%). Similarly, the percentage of children under the age of five years depriving nutrition and health simultaneously is 16.2%, the fuel energy and health is 12.2%, and the percentage of overlapping deprivation between health and 11.5, while water and shelter overlapping deprivation is only 2.2%. The percentage of children deprived in multiple indicators more than two is very low. The highest deprivation for three indicators was observed among energy, nutrition, and health with 9.2% of children are depriving in the study area. Similarly, the percentage of children simultaneously deprived of nutrition, health, and shelter is 8.5.

The above Multiple Overlapping Deprivation Analysis (MODA), for children aged between 5 and 18 years showed that education is the highest contributor to deprivation with 55.4% of children in this age deprived. Water, shelter, and sanitation contribute 52.4, 41.4, and 33.2% of deprivation respectively. The percentage of children aged between 6 and 18 years deprived of information only is 18.2. Fuel energy and shelter overlapping deprivation is the highest for children aged between 5 and 18 years, with 24.2% being deprived simultaneously. The second largest overlapping deprivation was observed between sanitation and education with 12.5% of children being deprived, while education and information overlapping deprivation is 10.2. Similarly, about 9.2% of children are deprived of both information and shelter simultaneously. Water only overlaps with fuel and energy with only 4% of children being deprived of both indicators simultaneously.

Multidimensional poverty status of children under age 5

The following table presents the summary results of the dietary diversity assessment for child nutrition. Nutrition is among the indicators of child poverty assessment for children under five years of age. Child nutrition assessment can be done through four methods. These are anthropometric, biochemical (laboratory), clinical, and dietary diversity methods.

The anthropometry method is used to assess child growth by applying several measurements, including length, height, weight; head circumference, mid-arm circumference, skin-fold thickness, head/chest ratio, and hip/waist ratio can be used. Height and weight measurements are essential in children to evaluate physical growth. The biochemical or laboratory methods of assessment include measuring a nutrient or its metabolite in the blood, feces, urine, or other tissues that have a relationship with the nutrient. In addition to the anthropometric assessments, a clinical method can be used to assess child nutrition, which can indicate a potential specific nutrient deficiency. Special attention is given to organs such as skin, eyes, tongue, ears, mouth, hair, nails, and gums. Clinical methods of assessing nutritional status also involve checking for signs of deficiency at specific places on the body or asking the patient whether they have any symptoms that might suggest nutrient deficiency. In the end, dietary methods can be used to assess child nutrition, which includes looking at past or current intakes of nutrients from the food by individuals or a group to determine their nutritional status.

This study adopted the dietary diversity method to assess child poverty. Several methods can be employed to assess child nutrition information. These are the 24-hour recall method, the food frequency method, the food intake record, and the observation of food consumed. In this study, we employed the seven-day recall method to get information on children's dietary consumption.

Nutrition Attainment and Multidimensional Child Poverty

Dietary diversity is a qualitative measure of food consumption that reflects household access to a variety of foods and is a proxy for the nutrient adequacy of the diet of individuals (FAO, 2013). Increased dietary diversity correlates with increased intake of micronutrients such as calcium, vitamin A, and iron with greater consumption of animal-source foods, fruits and vegetables, and dairy (Wiesmann *et al.*, 2006; Kennedy *et al.*, 2010). Gains in dietary diversity are associated with several improved health outcomes, including birth weight and child anthropometric status (Swindale and Bilinsky, 2006). The current study identified that grain, as a source of food, is one of the most common food sources relied on by most households in the study area. Hence, both multidimensionally non-poor and poor children are obtaining the majority of their food from this source. Grain and cereal food sources support more than 70% of children's food needs. The chi-square test result ($\chi^2 = 0.472$; $p = 0.492$) showed that there is no significant association between multidimensional child poverty and food consumed from cereal sources in the study area. Another food type assessed to see child nutrition quality is the vitamin A-rich food group. The highest Vitamin A food supply deficiency was observed for multidimensionally poor children. About 88.6% of multidimensionally poor children were not getting food from vitamin A sources. On the other hand, about 20.4% of multidimensionally non-poor children had vitamin A during the survey period. The chi-squared test result ($\chi^2 = 5.998$; $p = 0.014$) also showed that there is a significant association between Vitamin A-rich fruits and vegetable consumption and child poverty in the study area.

Other fruits and vegetables are among the food groups that can provide carbohydrates. For the human body to properly function, carbohydrate-containing foods are crucial. Therefore, fruits and vegetables are highly preferred sources of energy. The percentage of children consuming other fruits and vegetables is higher for multidimensionally non-poor children than for the

multidimensionally poor. The result indicates that other fruits and vegetables significantly contribute to child poverty reduction. The association between multidimensional child poverty and other fruits and vegetables is statistically significant ($\chi^2 = 14.749$; $p < 0.001$) at 1% probability. The result of this study has similarities with Kuche *et al.*'s (2019) finding that other fruits and vegetables have a positive association with household dietary diversity.

In the dietary diversity assessment, food sources like meat, poultry, and fish were also included to address the quality and adequacy of food consumed by children during the period of the survey. It was identified that meat, poultry, and fish food sources are the least accessed by children in the study area. A few (16.1%) multidimensionally poor children are getting their diets from these food sources, while a relatively higher proportion of multidimensionally non-poor children are getting their diets from the same food sources (see Table 4.4). Another food source used by sample households to feed their children is eggs. As the descriptive result shows, the majority (62.7%) of multidimensionally non-poor children were getting eggs, while only about 40% of multidimensionally poor children were getting eggs in their diet. The chi-squared result ($\chi^2 = 10.23$) also revealed that there is statistically a significant ($p = 0.001$) association between egg consumption and multidimensional child poverty. Pulses, legumes, and nuts are among the least consumed food groups by rural households in the study area. The overall percentage of the diet composed of pulses, legumes, and nuts is 22.4%, which is very low in the study area. From the chi-squared result, we can understand that there is statistically a significant association between pulses, legumes, and nuts dietary consumption and multidimensional child poverty in the study area. The chi-squared result ($\chi^2 = 13.214$; $p < 0.001$) also revealed that there is a significant association between multidimensional child poverty and pulses, legumes, and nut consumption.

Table 4.4: Child Dietary Intake Status

Variable		Response	Child poverty status		Total	χ^2 - value	p-value
			Non-poor	Poor			
Grain/cereal		No	15 (25.4)	102 (29.8)	117 (29.2)	0.472	0.492
		Yes	44 (74.6)	240 (70.2)	284 (70.8)		
Vitamin	A-rich	No	29 (49.2)	225 (65.8)	254 (63.3)	5.998	0.014**

fruits & vegetables	Yes	30 (50.8)	117 (34.2)	147 (36.7)		
Other fruits and vegetables	No	11 (18.6)	129 (37.7)	140 (35)	8.057	0.005****
	Yes	48 (81.4)	213 (62.3)	261 (65)		
Meat, poultry, fish	No	36 (61)	287 (83.9)	323 (80.5)	16.844	0.000****
foods	Yes	23 (29)	55 (16.1)	78 (19.5)		
Eggs	No	22 (37.3)	204 (59.6)	226 (56.4)	10.23	0.001**
	Yes	37 (62.7)	138 (40.4)	175 (43.6)		
Pulse/legume/nuts	No	35 (59.3)	276 (80.7)	311 (77.6)	13.214	0.000****
	Yes	24 (40.7)	66 (19.3)	90 (22.4)		
Milk and milk products	No	13 (22)	150 (43.9)	163 (40.6)	9.936	0.002****
	Yes	46 (78)	192 (56.1)	238 (59.4)		
Oil used in cooking food	No	3 (5.1)	62 (18.13)	65 (16.2)	6.304	0.012**
	Yes	56 (94.9)	280 (81.87)	336 (83.8)		
Total		59 (15)	342 (85)	401 (100)		

Source: Computed from own survey data, 2020

Dietary diversity is the first indicator of diet quality and nutrient adequacy (Ruel, 2002), while the percentage of food energy acquired from staples and the number of individual foods consumed are placed in the second and third-order diet quality indicators, respectively (Smith and Ali, 2007). Milk and milk products are among the most recommended food groups for children. Both multidimensionally non-poor and poor children are acquiring better food supply from milk and milk products in the study area. The percentage of diet acquired from milk and milk products is higher (78%) for multidimensionally non-poor than for multidimensionally poor children (56.1%). The chi-squared test result ($\chi^2 = 9.936$; $p = 0.002$) indicates that there is a significant association between multidimensional child poverty and milk and milk product diet acquisition.

The percentage of oil consumption for cooking food is very high in the study area. It was found that households with multidimensionally non-poor and poor children are high-level consumers of oil. The overall oil consumption in cooking food is about 84%. The percentage of oil consumption for households with multidimensionally non-poor is nearly 95% and 82% for

households whose children are multidimensionally poor. The chi-squared test result ($\chi^2 = 6.304$; $p = 0.012$) revealed that there is a significant association between cooking oil utilization while preparing meals and multidimensional poverty.

Child health indicators and multidimensional child poverty

Health is the most affecting factor in a child's future. Poor health, even when not resulting in chronic conditions, can have long-term consequences, and impacts children's ability to play and learn (UNICEF, 2017). Health interventions (such as vaccination programs) are the most important factor in reducing child mortality and improving health outcomes (Cockburn *et al.*, 2009). This study considered factors like skilled health attendants and vaccinations to assess the health aspects of child poverty. The overall mother's attendance at antenatal care is above 75%. Mother attendance at antenatal care for multidimensionally non-poor is 100% while it is 71% for multidimensionally poor children in the study area. The variation between multidimensionally non-poor and poor children in getting skilled birth is significantly high. The chi-squared test result ($\chi^2 = 22.678$; $p < 0.001$) also revealed a significant relationship between mothers' attendance at antenatal care and multidimensional child poverty.

Child immunization is significantly higher for multidimensionally non-poor children compared to multidimensionally poor. In general, most children have been vaccinated in the study of both measles and BCG vaccines. The overall measles vaccination indicated that above 74% of children were vaccinated. Similarly, above 73% of children are vaccinated by BCG. The chi-squared results ($\chi^2 = 25.177$; $p < 0.001$) for two types of vaccinations indicated that there is a significant association between child immunization and multidimensional poverty in the study area.

Table 4.5: Health-related indicators of child poverty

Variable	Response	Child poverty status		Total	χ^2 -value	p-value
		Non-poor	Poor			
Mother's attendance at antenatal care	No	-	99 (29)	99 (24.7)	22.678	0.000***
	Yes	59 (100)	243 (71)	302 (75.3)		

Measles immunization	No	-	103 (30.1)	103 (25.7)	23.911	0.000***
	Yes	59 (100)	239 (69.9)	298 (74.3)		
BCG immunization	No	-	107 (31.3)	107 (26.7)	25.177	0.000***
	Yes	59 (100)	235 (69.7)	294 (73.3)		
Total		59 (15)	342 (85)	401 (100)		

Source: Computed from own survey data, 2020

A relatively low level of child deprivation is observed concerning health aspects in the study area. This is mainly because the health care provider has improved dramatically with the health extension service and the development of community-based health insurance (Alula *et al.*, 2018). Interventions on community health have had a significant impact on child health in the country in general and in the study area in particular. However, there is still a large gap in access to vaccination among multidimensionally poor children. At the same time, numerous children were born to unskilled health attendants.

Multidimensional poverty among children ages 6-18 years

The following section describes the multidimensional poverty of children aged between 6-18 years in detail. Two broad indicators, namely education and information were taken to assess child deprivation. For most indicators, there is a significant variation in deprivation between multidimensionally non-poor and poor children in the study area. Education was assessed in terms of attendance and completion of primary schooling for children aged between 5-14 years of age. Overall, primary education attendance is about 32.4% in the study area, and about 67.6% of children from sampled households are not attending primary education. By differentiating the school attendance into non-poor and poor children, we can see that multidimensionally non-poor children are more likely to attend primary school than poor children are; the chi-squared result also showed that there is statistically a significant ($\chi^2 = 75.617$; $p < 0.001$) association between school attendance and multidimensional child poverty. The overall year of schooling is very low with only 17.7% of children in the study having completed primary education at their right age. Multidimensionally non-poor children have better achievement in this indicator with 54.2% of them completing primary school at the age of 14 is significant, while only 11.4% of multidimensionally poor children complete. The chi-squared test result ($\chi^2 = 63.361$; $p < 0.001$)

also revealed that there is statistically a significant association between years of schooling and multidimensional child poverty.

Radio is one of the potential sources of information for the rural community, especially in locations where there is access to electricity. It is also easy to operate with minimum skill and can be accessed for a low price. Relevant agricultural information, market information, and weather condition information, which are highly demanded by the agrarian community, can be accessed from a radio. For children, radio can transmit some educational programs, which can improve their knowledge. By attending question-and-answer contest programs, some students update their knowledge, which would widen their education understanding. Therefore, accessing the radio is of significant importance to children at the age of schooling. In the study area, it was found that the overall access to radio is nearly 74% implying accessing radio is relatively easier. About 79.7% of multidimensionally non-poor children have access to the radio while 73.8% of multidimensionally poor children have access to the radio in the study area. The chi-squared test result showed that there is no statistically significant ($\chi^2 = 1.223$; $p = 0.269$) association between child poverty and access to radio services.

In the study area, about 28.8% of multidimensionally non-poor and 16.4% of multidimensionally poor children have access to television. The overall access to television indicated that only 18% of children have access to television in the study area. There is poor access to television as an information source for children aged between 6-18 years. Access to television showed significant variation between multidimensionally non-poor and poor children. The chi-squared result ($\chi^2 = 5.229$; $p < 0.022$) indicated that access to television has a significant association with multidimensional child poverty. Multidimensionally non-poor children are more likely to have access to television than multidimensionally poor children.

There is a big difference in access to mobile phone services between multidimensionally non-poor and poor children in the study area. The majority (67.8%) of multidimensionally non-poor children have access to mobile phones compared to multidimensionally poor children. About 51.8% of multidimensionally poor children have no access to mobile phones. Mobile phones can bring multiple utilities as means of communication, and sources of information (FM radios,

internet services, social Media connectivity). Those children who have access to a mobile phone are relatively getting a lot of information relevant to their needs. Overall, 49% of children aged between 6-18 years are deprived of information from mobile phone sources. The chi-square result ($\chi^2 = 7.698$; $p = 0.006$) showed that there is statistically a significant association between access to mobile phones and multidimensional child poverty in the study area. In Ethiopia, deprivation of information is identified to be very high. CSA and UNICEF Ethiopia (2018) have identified that the overall deprivation of information and participation for children aged 5-17 years is 66%.

Table 4.6: Multidimensional poverty status of children aged between 6-18 years

Variable	Response	Child poverty status		Total	χ^2 -value	p-value
		Non-poor	Poor			
School attendance	No	11 (18.6)	260 (76)	271 (67.6)	75.617	0.000***
	Yes	48 (81.4)	82 (24)	130 (32.4)		
Years of schooling	No	27 (45.8)	303 (88.6)	330 (82.3)	63.361	0.000***
	Yes	32 (54.2)	39 (11.4)	71 (17.7)		
Access to radio	No	12 (20.3)	93 (27.2)	105 (26.2)	1.223	0.269
	Yes	47 (79.7)	249 (72.8)	296 (73.8)		
Access to television	No	42 (71.2)	286 (83.6)	328 (81.8)	5.229	0.022**
	Yes	17 (28.8)	56 (16.4)	73 (18.2)		
Access to telephone	No	19 (32.2)	177 (51.8)	196 (49)	7.698	0.006***
	Yes	40 (67.8)	165 (48.2)	205 (51)		
Access to computer	No	57 (96.6)	337 (98.5)	394 (98.3)	1.09	0.296
	Yes	2 (3.4)	5 (1.5)	7 (1.7)		
Total		59 (15)	342 (85)	401 (100)		

Source: Computed from own survey data, 2020

Lack of access to a computer as a source of information is common for both multidimensionally non-poor and multidimensionally poor children in the study area. Very few children currently have access to computer services to get relevant information. The overall lack of access to a computer as the source of information is about 98%, implying that this amount of children are

deprived of the lack of access to information from computers and internet services. The result showed us that there is only a slight difference between multidimensionally non-poor and multidimensionally poor children accessing information from computer centers, implying it is a common problem.

Multidimensional child poverty indicators for all age groups

The multiple overlapping deprivation analysis (MODA) gives us clear indicators applied to children of all age groups. Some of the indicators that are relevant to all age groups are access to improved water, access to flush toilets, access to electricity, and the types of materials used to build a house. These are also called the indicators of living standards that indicate the well-being of children and households in general. Moreover, MODA enables us to select a child, rather than the household, as a unit of analysis, since poverty may affect children and adults differently.

The following table shows us the deprivation status of children in each indicator. According to WHO (2008), improved water sources include public standpipes, boreholes, protected dug wells, protected springs, and rainwater collections. In the study area, the public standpipes are the most common and available in all *kebeles* of the study area. The overall access to improved water sources is high and nearly 85%. By disaggregating this to multidimensionally child poverty status, we can see that there is statistically a significant ($\chi^2 = 10.03$; $p = 0.002$) association between access to improved water sources and multidimensional child poverty in the study area. Looking into access to flush toilets, about 33% of children in the study area are deprived. Comparing multidimensionally non-poor children with multidimensionally poor children, we can see from the result that multidimensionally non-poor children are less likely deprived of access to flush toilets than multidimensionally poor children are. However, the chi-squared result showed that there is no statistically significant ($\chi^2 = 0.221$; $p = 0.639$) association between access to flush toilets and multidimensional child poverty in the study area.

Table 4.7: Multidimensional child poverty indicators for all age groups

Variable	Response	Child poverty status		Total	χ^2 -value	p-value
		Non-poor	Poor			

Materials used to build a house	Mud' wood	31 (52.5)	241 (70.5)	272 (67.8)	7.41	0.006***
	Iron sheet	28 (47.5)	101 (29.5)	129 (32.2)		
Access to protected water	No	1 (1.7)	61 (17.8)	62 (15.5)	10.03	0.002***
	Yes	58 (98.3)	281 (82.2)	339 (84.5)		
Access to flush toilet	No	18 (35.5)	115 (33.6)	133 (33.2)	0.221	0.639
	Yes	41 (69.5)	227 (66.4)	268 (66.8)		
Access to electricity	No	17 (28.8)	193 (56.4)	210 (52.4)	15.388	0.000***
	Yes	42 (71.2)	149 (43.6)	191 (47.6)		
Fuel used for cooking meal	Charcoal	12 (20.3)	46 (13.5)	58 (14.5)		
	Wood	45 (76.3)	288 (84.2)	333 (83)	2.863	0.413
	Dung	1 (1.7)	6 (1.8)	7 (1.7)		
	Stove	1 (1.7)	2 (0.60)	3 (0.75)		
Total		59 (15)	342 (85)	401 (100)		

Source: Computed from own survey data, 2020

Accessing electricity is a critical problem in the study area. The overall access to electricity is nearly 48% for sampled households in the area. About 56.4% of multidimensionally poor children have no access to electricity, while nearly 29% of multidimensionally non-poor children also have no access to electricity. Even though there is considerable positive progress in reducing multidimensional poverty indicators in Ethiopia, Alula *et al.* (2018) reported that access to electricity in rural sites lags considerably behind. The chi-squared test result also showed that there is a significant ($\chi^2 = 15.388$; $p < 0.0001$) association between access to electricity and multidimensional child poverty. Children's deprivation in housing conditions is relatively low. The percentage of multidimensionally poor children living in a house built of mud and wood is 70.5%, while it is 52.5% for multidimensionally non-poor children. There is a significant difference in living conditions between multidimensionally non-poor and multidimensionally poor children. The chi-squared test result also confirmed that there is a significant ($\chi^2 = 7.41$; $p = 0.006$) association between living in better housing conditions and multidimensional child poverty.

A child is to be deprived of cooking fuel if the household cooks or prepares meals with dung, wood, or charcoal. Accordingly, the analysis results showed that the majority of children were deprived of cooking fuel. Wood is the most common cooking fuel, contributing about 83% of the total cooking energy demand. Almost all children are deprived of cooking fuel in the area. However, the chi-squared result showed that there is no statistically significant ($\chi^2 = 2.863$; $p = 0.413$) association between cooking fuel energy needs and multidimensional poverty.

In addition to the materials used to construct a house, the availability of sufficient rooms for household members is also an indicator of housing conditions. On average, about 4 multidimensionally poor children share a room, while about 3 multidimensionally non-poor children share a room on average. The t-test result ($t = -3.034$; $p = 0.003$) indicates that there is a significant mean difference ($\bar{X} \pm 0.583$; $sd \pm 0.0204$) in the number of children sharing rooms between multidimensionally non-poor and multidimensionally poor children in the study area (Table 4.8).

In rural areas, the proportion of housing units having access to safe drinking water has increased from 25.2% in 2004 to 66.54% in 2012/2013 (FDRE, 2000). However, UNICEF's (2018) report showed that low rates of access to improved water and sanitation sources impede efforts to achieve goals such as reducing wasting, stunting, and child mortality in Ethiopia. As it was reported by focus group discussion members, children and women are among the responsible household members collecting water mainly in rural Ethiopia. Since safe drinking water sources are not available adjacent, they have to travel long distances for long minutes to collect water. In the study area, multidimensionally non-poor children traveled on average 17 minutes single tripe while multidimensionally poor children traveled 19 minutes on average respectively to get water in a single tripe. Considering the amount of time that can be consumed to get drinking water including the time that they spend in ordinary waiting, we can understand that getting water in the study area is an exhaustive task. The t-test result ($t = -3.377$; $p = 0.001$) also indicates that there is statistically a significant mean difference ($\bar{X} \pm 1.28$; $sd \pm 1.284$) in travel minutes between multidimensionally non-poor and multidimensionally poor children to collect drinking water in the study area.

Table 4.8: Housing condition and access to protected water

Variable	Child poverty status	Mean	Std. Deviation	t- value	p-value
Overcrowding	Non-poor	3.4576	1.38118	-3.034	0.003***
	Poor	4.0409	1.36077		
Distance to get protected water in minutes	Non-poor	13.7966	12.47864	-3.377	0.001***
	Poor	19.2193	11.19496		

Source: Computed from own survey data, 2020

4.3.2.3. *The share of each indicator to child poverty*

The following pie chart gives us information on how much child poverty is in the study area according to the MPI index. The values of 18.07 and 17.83, respectively, show us the percentage of children's deprivation index of children in fuel and energy, and the education index. Accordingly, fuel energy, and education are the major causes of multidimensional child poverty in the study area. While multidimensional child poverty has three large domains, namely health, education, and standard of living, it can be disaggregated into sub-indicators such as nutrition, child health, school attendance, years of schooling, cooking fuel, water, sanitation, housing conditions, and information. In this study, we have added the income aspect as one of the important indicators of multidimensional poverty in the study area. Following this assumption, if we aggregate the indicators of child poverty from the pie chart below, we can understand that standard of living is the biggest cause of multidimensional poverty contributing to about 67% of child poverty in the study area. Education is the second-ranked cause of child poverty contributing about 17.83% of multidimensional poverty while health contributes to 6% of multidimensional child poverty. Water deprivation is the lowest while income alone contributes about 6.3% to child poverty deprivation. From this, we can notice that the standard of living is the highest cause of multidimensional poverty while total income is the least in the study area.

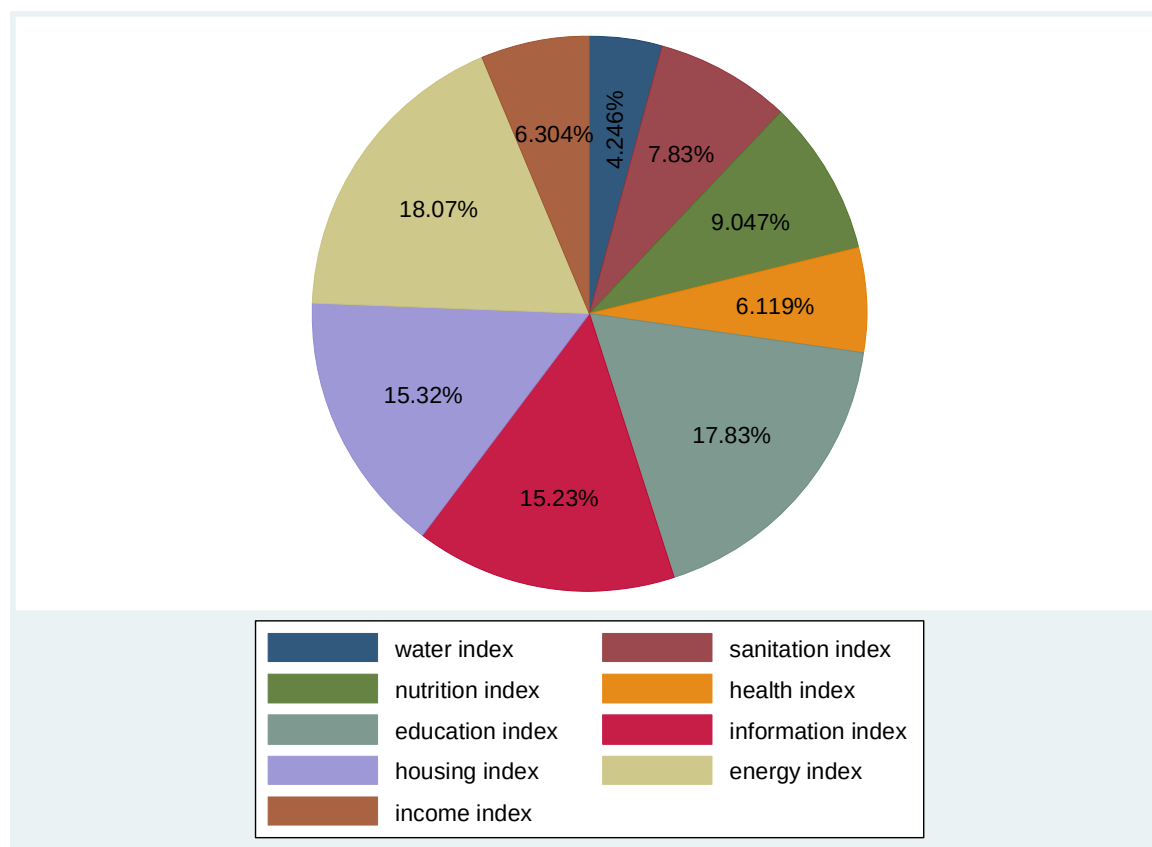


Figure 4.3: Status of children's deprivation index across indicators

Descriptive statistics were used to describe the deprivation status of children from the sampled households. The result of the analysis showed that the incidence (headcount ratio) of multidimensional poverty (H) is 0.85; implying that 85% of children in the study area are multidimensionally poor. The intensity of multidimensional poverty (A) is 0.456; indicating, on average, multidimensionally poor children are deprived in 45.6% of poverty dimensions. Child poverty for different age groups was also measured. Among the sampled households, about 130 households do not have children under the age of five, while 271 households have children under the age of five. As the descriptive result shows, 66% of underage five were found to be multidimensionally poor. On the other hand, 46 sample households do not have children aged between 6-18 years, while 355 households have children aged between 6-18 ages. Among these, about 89% of children aged between 6-18 years are multidimensionally poor. Comparing child poverty among age groups, we can find that children between 6-18 ages are poorer than children under the age of five years. This is mainly due to child-based interventions being highly focused

on children under the age of five. For example, nutrition interventions, and health interventions are primarily focused on children under the age of five. Child development interventions like education and skill-based training are still lagging in eradicating child poverty, especially for children aged between 6 to 18 years. In the rural area, most children are not motivated to go to school, especially in poor households that are not capable of sending their children to school. There are no strong education-based interventions in the study area, which trace children left behind the school. Lack of education does not affect only the present lives of children; it also affects their future well-being.

4.3.3. Determinants of child poverty

Probit regression model results: determinants of child poverty

This section analyzes the probability of children being in multidimensional poverty using various indicators. We assess whether or not a child is in poverty by using the MPI (Multidimensional Poverty Index) and construct the binary dependent variable of the probit model that takes the value of 1 if the MPI score cutoff point (C_i) ≥ 0.33 and the value of zero otherwise. Factors affecting child poverty are analyzed using the probit model. The dependent variable, in this case, is multidimensional child poverty, which is a dummy taking 1 value if a child is deprived of multiple indicators and 0 otherwise. The descriptive result indicated that about 85% of children were identified to be multidimensionally poor, while 15% of children were multidimensionally non-poor. Among 15 variables entered into STATA version 16 for analysis, 10 variables were found to be significantly affecting multidimensional child poverty. The likelihood ratio chi-square of -116.64735 with a p-value of <0.0001 tells us that our model as a whole is statistically significant.

We tested the relationship among independent variables for the presence of multicollinearity before we ran the econometric model. The contingency coefficient value ranges between 0 and 1, and as a rule of thumb variable with a contingency coefficient below 0.75 shows a weak association and the value above it indicates a strong association of variables. The contingency coefficient for the dummy and categorical variables included in the model was less than 0.75 indicating that no multicollinearity is a serious concern as indicated in the Table (4.9). As a rule

of thumb continuous variables having a variance inflation factor of less than 10 are believed to have no multicollinearity and those with a VIF of above 10 are subjected to the problem and should be excluded from the model. The computational results of the variance inflation factor in Table (4.10) confirmed the nonexistence of association between the variables and were included in the model.

Total land holding was measured as the sum of the land area owned in hectares and farmed by the household at the time of the survey. Land is a crucial asset, especially in rural areas where the majority of livelihood activities are dominated by farming activities. The total land holding has a negative influence on multidimensional child poverty implying, that for a unit increase in land holding in terms of hectare, the probability of children being in multidimensional poverty decreases by 7.4%, holding other factors constant. This might be due to most households practicing diversified farming activities such as multiple cropping, and livestock rearing. This will allow households to feed diversified diets to their children. Moreover, income generated from farm diversification can enable rural households to satisfy some basic children's needs such as schooling, clothing, medication, and nutrition. This is consistent with that of (Danso-Abbeam *et al.*, 2021) who found that land size is a crucial factor in combating poverty and achieving food security. Similarly, the number of plots of farmland owned by a household at different locations has positive and a significant effect on multidimensional child poverty. For most rural households, children play key roles in day-to-day activities. Young children are especially responsible for undertaking some farming activities, which may have a negative effect on some indicators of children's development like education, information, and so on. The result from regression analysis showed that for a unit increase in the number of plots of farmland, the probability of children falling into multidimensional poverty increases approximately by 7.8%, with other factors remaining constant.

Table 4.9: Contingency coefficient

Variables	Contingency coefficient
Sex of household head	0.032
Education status of household head	0.038
Age category of household head	0.022

Irrigation practice	0.090
Access to credit	0.128
Petty trading	0.170
Minimum meal frequency	0.007
Minimum dietary diversity	0.181
Minimum acceptable diet	0.065
Incidence of household poverty	0.054
Meal cooking fuel	0.084
Housing condition	0.135

Source: Calculated from own Survey data, 2020

Table 4.10: Variance Inflation Factors

Variables	Collinearity Statistics	
	Tolerance	VIF
Total land holding in hectares	0.647	1.546
Number of plot lands owned	0.761	1.314
Average household income	0.738	1.356

Source: Calculated from own Survey data, 2020

Irrigation practices are not common in the study area. Most agricultural production is rain-fed, and only a few households were practicing irrigation. However, it is found that irrigation plays a major role in reducing child poverty. It enables crop diversification, which might improve the household food supply. The regression result showed that irrigation practice reduces the probability of multidimensional child poverty approximately by 17.2%, holding all other factors constant.

Table 4.11: The Probit regression model on the determinants of child poverty

Variable	Mrg.eff	Std. Err.	P>z
sex of household head	-.0601812	.0539911	0.265
Education status of household head	-.070444	.0475179	0.138
Age of the household head	-.0342129	.0293298	0.243

Total land holding	-.0739272	.0161209	0.000***
Number of plots of land	.0780174	.023755	0.001***
Irrigation practice	-.1715673	.0540004	0.001***
Access to credit	.1114038	.0592801	0.060*
Petty trade	-.2163789	.0579369	0.000***
Average household income	5.12e-06	2.35e-06	0.029**
Minimum meal frequency	.0457702	.0456094	0.316
Dietary diversity score	-.0649065	.0116705	0.000***
Minimum acceptable diet	.0238485	.0559717	0.670
Incidence of household poverty	-.1542753	.0430026	0.000***
Meal cooking fuel	.0732916	.0330161	0.026**
Housing condition	-.0682224	.0316886	0.031**
Log likelihood = -116.64735 Pseudo R2 = 0.3036			
Prob > chi2 = 0.0000 LR chi2(15) = 101.70			

Source: Computed from own survey data, 2020

*, **, *** represents the 10%, 5% and 1% significance level, respectively

Financial services have significant importance to rural households; for example, they ease credit constraints for households. Some empirical studies argued that it could offset the adverse effect of uncertainty on household consumption and lead to a smaller reaction of household savings to uncertainty (Karaman and Yildirim-Karaman, 2019; Ma and Hao, 2022). In the current study, the regression results showed a contradicting outcome to the aforementioned arguments. For a unit increase in household access to credit services, multidimensional child poverty increased by 11%, while other factors remained constant. Petty trading is one of the most common livelihood activities in developing countries. Most of the time, people engage in petty trading activities as a coping mechanism during the difficult season for livelihood security. Michèle (2010) argued that petty trading and street vending activities are critical coping strategies used in times of larger food/livelihood security crises. In the study area, it was found that a few households engaged in petty trading as one of their livelihood strategies. The regression analysis result showed that petty trading affects multidimensional poverty at a 1% probability level. The result showed that a

unit increase in petty trading activities results in a 21.6% decrease in the probability of multidimensional child poverty.

Household income affects various aspects of children's needs such as diets, health, education, and so on. Arimond and Ruel (2004) argued that families with greater incomes and resources tend to have more diverse diets, but they are also likely to have better access to health care and better environmental conditions. However, there are also conditions under which household income does not fully realize children's needs depending on the households' willingness to pay for children's needs. In the current study, the regression result showed that household income significantly affects child poverty at a 5% probability level. The result implies that income generated from different livelihood activities is less likely used to satisfy children's needs. Dietary diversity has significant effects on indicators of child poverty. Dietary diversity (DD) is positively associated with child nutrition outcomes (Ruel and Menon 2002; Arimond and Ruel 2004). Adequate nutrient intake can reduce child mortality (Kumar *et al.*, 2016). Child nutrition was assessed using dietary diversity methods. This method includes looking at past or current intakes of nutrients from the food by individuals or a group to determine their nutritional status. Accordingly, dietary information was gathered from each household using the 24-hour recall method. The analysis result showed that there is a significant association between nutrition and multidimensional child poverty. The minimum dietary diversity has a significant effect on child poverty. For a unit increase in dietary diversity score, multidimensional child poverty decreases by 6.5%, with other factors remaining constant.

Family wealth is also among the important determinants of child poverty identified in the study area. Poor households cannot sufficiently provide basic child needs. Some studies also stress the linkage of household wealth status with multidimensional child poverty. For example, Cockburn and Kabubo-Mariara (2010) mentioned that the inclusion of non-monetary measures in multidimensional poverty analysis helps to reveal complexities and ambiguities in the distribution of well-being that income-based poverty analysis cannot capture. The current study also finds that overall income deprivation is low and only 24% of children from sampled households are deprived. Even though children do not have access to income, a lack of household income can affect children's lives by negatively influencing the level of deprivation in

education, health, and other dimensions. Similarly, children from poor households might not have access to a balanced diet, access to health care, or access to information. A study on child poverty indicated that family income is a very important determinant of child poverty. For example, Chen and Croak (2005) mentioned that children from families with a higher income had fewer chances of being deprived in different dimensions. The result from the regression model in the current study revealed that household wealth (being non-poor in income) decreases the probability of children falling into multidimensional poverty by 15.4%, while other factors are held constant.

Children deprived of multiple dimensions usually have problems with their cognitive ability and physical growth. Deprivations of various needs may lead children to despair in the short term and hinder their development in the long term. Using nutrition, drinking water, sanitation, health, housing, education, and information criteria, Gordon *et al.* (2003) estimated the level of children's deprivation from data across the 46 countries included in the Demographic and Health Surveys. The results of this study show that about 62% of sub-Saharan African children live in absolute poverty while 82% are severely deprived of at least one basic need (Djoke *et al.*, 2010). The result from the regression analysis in the current study also revealed that an increase in house quality and room quality led to an increased probability of children being multidimensionally non-poor by 6.8%, with other factors remaining constant.

Cooking fuel is one of the indicators that most children in the study area are deprived of. The most common fuel used to cook food in the study area is firewood, followed by charcoal. Since the majority of sampled households rely on firewood as a source of energy for cooking food, women and children are responsible for collecting wood. Therefore, it consumes their time, leaving children out of school. Moreover, smoke from firewood and charcoal is harming their health. A study from abroad also showed that children's deprivation of cooking fuel is very high, at around 82% in Meghalaya, India (Hegde *et al.*, 2019). In this study, the level of cooking fuel deprivation was around 52%. The percentage of multidimensionally poor children being deprived is nearly 62%, while about 32% of multidimensionally non-poor children are also deprived of cooking fuel. The regression results also showed that there is a significant effect of cooking energy deprivation on multidimensional child poverty at a 1% probability level. An

increase in the utilization of poor-quality cooking fuel increases the probability of children being in multidimensional poverty by 100 %, other factors remain constant.

The significance and the policy implication of the study

By adopting a multidimensional approach to assessing child poverty and identifying its key determinants, this study provides valuable insights for policymakers and stakeholders to develop effective strategies to address the persistent challenge of child poverty in the Negele Arsi woreda and similar contexts. A comprehensive, multi-faceted approach targeting both household-level and child-specific factors is essential to achieve sustainable child poverty reduction and ensure a brighter future for all children.

The results of this study have significantly improved contributions to the academic setting. To evaluate child poverty, a multidimensional method was applied to the study. This method enables a thorough investigation of the causes of child poverty. It also makes it easier for a researcher to distinguish between the child poverty indicators that are most prevalent across age and sex groups of children in the study area. Profiling research results based on the characteristics of children and their households helps in identifying the most disadvantaged children so that the necessary policy recommendations may be made to reduce child poverty in the country.

Reduced poverty has significant positive effects on children's well-being. Inequalities in health, nutrition, educational attainment, and employment opportunities are common among Ethiopian children who grow up in poverty. Consequently, early research and action will significantly aid in the fight against intergenerational poverty in the nation.

The findings highlight the need for a holistic, multidimensional approach to address child poverty in the study area. Targeted interventions and policies should focus on improving access to diverse and nutrient-rich foods, healthcare, education, and basic services to enhance children's well-being. At the same time, empowering households through asset-building and income-generating activities can also contribute to sustainable child poverty reduction.

4.4. Conclusion

The study's adoption of a multidimensional approach to assess child poverty allowed for a comprehensive understanding of the factors contributing to child poverty in the Negele Arsi *woreda*. The multidimensional poverty index results revealed that approximately 85% of children were multidimensionally poor. It was also found that the poverty levels were slightly higher for children between the ages of 6-18 than for those under the age of five years. This result highlights the importance of considering children's needs and age categories when analyzing poverty levels.

The study also identified two categories of factors that contribute to child poverty: household factors and child-specific factors. Socioeconomic factors, such as the sex, age, education status, health, and marital status of the household head, as well as livelihood strategies, total landholding in hectares, household annual income, number of plots of land, and livestock production, were identified as household-related factors. The study found that laboring on other people's farms; household size, total landholding in hectares, annual on-farm income, annual non-farm income, and some livestock significantly affect multidimensional poverty.

Furthermore, factors directly related to children's needs, including nutrition, education, information, housing, income, fuel, and energy, were identified as important contributors to multidimensional poverty. Inadequate dietary diversity, particularly the lack of access to vitamin A-rich foods and other fruits and vegetables, was a significant contributor to child poverty. Similarly, lack of access to skilled birth attendants and essential vaccinations, such as measles and BCG, were found to be the major health-related factors affecting under the age of five-child poverty. Poor school attendance, low educational attainment, and limited access to information sources like radio, television, and mobile phones were key factors contributing to child poverty aged between 6 to 18 years. Deprivation in living conditions, such as poor housing, lack of access to improved water sources, and limited access to electricity, were also significant determinants of child poverty. Fuel and energy were also among the major contributors to child poverty in this area.

The study also found a significant difference in deprivation levels between multidimensionally poor and non-poor children regarding various indicators. This result suggests that policies and programs that address the needs of children living in poverty should be designed with a focus on addressing the specific challenges that multidimensionally poor children face.

Regression analysis was conducted further to examine the relationship between poverty and various indicators. The analysis revealed that the age of the household head, livelihood diversification, nutrition, education, information, housing, energy (cooking fuel), and household income had a significant impact on multidimensional poverty in the study area. These findings highlight the need for policies and programs that address the socioeconomic factors that contribute to child poverty, such as income and livelihood strategies, as well as the need for programs that improve access to education, information, and housing.

In conclusion, the study highlights the complex nature of child poverty and the importance of addressing multiple factors effectively to combat it. The findings suggest that policies and programs should be designed to address the specific needs of children living in poverty, with a focus on education, energy access, and socioeconomic factors. By taking a comprehensive approach, policymakers and stakeholders can work towards reducing child poverty and improving the well-being of vulnerable children.

The findings of this study have several policy implications for reducing child poverty and improving the well-being of vulnerable children. Firstly, the study highlights the need for policies that address the socioeconomic factors that contribute to child poverty, such as household income and livelihood strategies. Policymakers can explore policies that provide economic opportunities and support to low-income households, such as job training programs, microfinance programs, and social safety nets.

Secondly, the study emphasizes the critical importance of education in reducing child poverty. Policies that prioritize education access, quality, and affordability can help break the cycle of poverty and improve the well-being of children. Programs that provide scholarships, school supplies, and other support to children living in poverty can also help to reduce education-related deprivation.

Thirdly, the study highlights the need for policies that address energy access, particularly for cooking fuel. Policies that increase access to clean and affordable energy sources, such as liquefied petroleum gas (LPG), can improve the health and well-being of children living in poverty.

Finally, the study underscores the importance of taking a comprehensive approach to child poverty that considers multiple factors, including those related to nutrition, housing, and information access. Policymakers and stakeholders should prioritize policies and programs that address the specific needs of multidimensionally poor children, with a focus on addressing the challenges they face in each of these areas.

CHAPTER FIVE: LIVELIHOOD DIVERSIFICATION AND MULTIDIMENSIONAL CHILD POVERTY

Abstract

The objective of the study is to examine the relationship between household livelihood diversification and child poverty. We used a multistage sampling procedure to randomly select 401 respondents from four kebeles of the study area employing a probability proportional to size approach. We administered interview schedules using enumerators trained for this purpose. We analyzed data using a blend of descriptive methods and an econometrics model (probit model). We estimated a multidimensional poverty model to analyze child poverty taking into account several indicators involving nutrition, health, education, water, sanitation, housing conditions, information, and fuel and energy. The results from the descriptive analysis revealed that approximately 85% of children in the study area are multidimensionally poor. The result further showed that there is a significant difference in child poverty across child age and sex category, across the sex of household heads, and household socioeconomic status. We also used the Simpson diversity index to determine the extent to which households have diversified their livelihood activities. From the results, we observe that approximately 56% of households have diversified their livelihoods very highly, while a quarter of the total has moderately diversified their livelihoods. The results reveal that in situations where livelihood diversification activities have been diversified well, we observe a positive and significant effect on the level of reduction of child poverty suggesting that the relationship between the extent of household livelihood diversification and child poverty is positive. This study suggests that child age and sex-specific, as well as household sex and socioeconomic-specific interventions, are needed to tackle child poverty in the study area.

Keywords: extent of livelihood diversification, multidimensional child poverty, Probit model, dietary diversity score, household poverty status.

5.1. Background and justification

Livelihood diversification is a complex concept and is understood differently. The term diversification implies the processes of economic activities undertaken by a household to increase livelihood benefits such as increasing household income and reducing livelihood risks. Following this assumption, livelihood diversification can be defined as a process by which rural households construct a diversified portfolio of activities (Ellis, 2000). Others have also defined livelihood diversification as “attempts by individuals and households to find new ways to raise

income and to reduce income risks” (Hussein and Nelson, 1998). As a result, various studies have shown that there is a significant association between livelihood diversification and household poverty. However, very few studies have recorded the linkage between household diversification and child poverty. Dirksen and Alkire (2021) have indicated that a lack of an adult’s decent employment can affect children in a household. However, as far as child poverty is multidimensional, such an assumption can no longer be comprehensive.

Poverty remains to be conceived differently across the globe. Different people understand and define it in various ways. The most commonly utilized definition is that defined poverty is “a pronounced deprivation in well-being”. There are numerous studies linking livelihood diversification as a major strategy for household poverty reduction (Olsson *et al.*, 2014; Shanta *et al.*, 2017; Gautam and Andersen, 2016). However, there is very little evidence on the linkage of household livelihood diversification and its effect on child poverty reduction. There is no evidence on how much children’s needs are at the center of household livelihood diversification strategies as they are in overall household well-being. Some researchers (Singh and Sarkar, 2014) believe that child poverty analysis must be based on child living conditions but not on family conditions. According to Feeny and Boyden (2003), cited in Singh and Sarkar (2014), child poverty embraces three domains, namely, deprivation, exclusion, and vulnerability. Children are more likely to suffer from deprivation, exclusion, and vulnerability than adults. The child deprivation dimension assesses whether children within a household lack access to material resources that are essential for child development to their full potential. On the other hand, the exclusion dimension assesses whether a child's rights are denied, whereas the vulnerability dimension assesses whether children are at risk of exposure to environmental threats. A lack of addressing these potential children's needs will put them into difficult future conditions, such as a lack of hope, aspiration, confidence, and dependency.

Even though global poverty is declining, disparities in rates of poverty reduction across countries continue to remain a policy concern. Among all the people living in poverty, children comprise the majority. Half of the globally multidimensional poor are still children. According to Alkire *et al.* (2017), in South Asia and sub-Saharan Africa, 689 million children are living in multidimensional poverty. Most of the 689 million poor children – 87% of them – live in South

Asia (44%) or Sub-Saharan Africa (43%) – roughly equal numbers in each region. Other evidence from sub-Saharan Africa showed that approximately 47.5% of their population was living below the poverty line of USD 1.25 per day per person during 2008 (World Bank, 2012). Ethiopia is one of the African countries that have made significant strides toward poverty reduction because of impressive economic growth (Ajakaiye *et al.*, 2014). However, the outcome of economic growth did not benefit equally, especially for vulnerable groups. The report from UNICEF Ethiopia (2016) revealed that approximately 13 million children are estimated to live in poor households in Ethiopia, 2 million of who are in extreme poverty. Children account for more than half of the population living in extreme multidimensional poverty. According to UNICEF (2015) and Alkire *et al.* (2017), the highest multidimensional child deprivation rate was reported in the country, with 90% of children being multidimensionally deprived. Child deprivation in multiple indicators is very high in Ethiopia. Approximately 95 percent of children in the country are deprived of two or more indicators of multidimensional poverty (UNICEF, 2016). According to the report from CSA and UNICEF Ethiopia (2018), 88 percent of all Ethiopian children – 36.2 million – live in multidimensional poverty defined as deprivation in 3 to 6 dimensions, that is, fulfillment of rights or needs for basic goods and services. Disparities in deprivation intensity are also very high across areas and regions of residence.

Apart from adults, children understand and describe differently what poverty means to them. A review of multiple children's experiences with poverty revealed that children describe poverty differently based on their socioeconomic conditions. For example, Crowley and Vulliamy (2007), as cited in Tess (2009), have documented various pieces of evidence on how families and childhood experience poverty. They show a good understanding of what poverty means to children. For example, some children perceive that they are poor when they “lack the right clothes and right friends”, others perceive that they are poor when they are unable to get “what they want for their Christmas or birthday party”, likewise others feel poor when they have a bed but cannot have good things for their birthday, and still again others feel poor when their mother cannot pay off her gas and electricity bills. This indicates that poverty is a dynamic concept and that different people perceive it differently. Many previous studies on poverty focus on unidimensional poverty measurements mainly based on household income and expenditure indicators at a point in time (Dieden and Gustafsson, 2003). Such an approach mostly excludes

children as the key unit of analysis. Some of the other studies on child poverty treated children separately from household livelihood activities by taking key indicators. Therefore, there is little evidence linking household livelihood activities with child poverty. Moreover, the causes of child poverty are multiple, and the income approach alone cannot sufficiently address child poverty. The study examines how child poverty varies across different age groups, as children's needs and vulnerabilities may change throughout their development. The research also explores the potential gender-based differences in child poverty, as girls and boys may face distinct challenges and deprivations. Therefore, this study aims to uncover the linkages between household livelihood diversification and the multidimensional aspects of child poverty in the Negele Arsi *woreda*.

5.2. Methodology

5.2.1. Sampling techniques and sample size determination

In this research, a multistage sampling technique was employed. In the first stage, the Arsi Negele *woreda* among *woredas* at the West Arsi zone is selected purposively based on researcher experience, convenience to access relevant information, and the potential area of diversified livelihood activities; in the second stage, stratified random sampling techniques were employed. Accordingly, *kebeles* were stratified based on the nature of dominant livelihood activities (diversification options) based on the background information obtained from the *Woreda* Office of Agriculture. From each stratum, sample households were selected through simple random sampling techniques. Finally, within the stratified *kebeles*, households that have children were selected using purposive sampling techniques. The sample size is determined based on Yamane's formula of sample size determination (Yamane, 1967). The formula is written as;

$$n = \frac{N}{1 + N(e)^2} \dots \dots \dots (1)$$

Where N is the population size and e is the level of precision. In 2022, the population of the *woreda* is 398,551, which consists of 196,321 males (49.3%), and 202,230 females (50.7%). Taking the "e" the level of precision to be 5%, the total sample size is around 398. However, in our study, the sample size is 401. Three more questionnaires were distributed to an enumerator,

and since the minimum representative sample as per the calculation was 398, and three additional samples would not have a significant effect on estimation, we did not drop them from the sample.

5.2.2. Data sources and data collection methods

The primary data were collected from the sample respondents using interview schedules. Well-trained enumerators were employed to collect data from the target *kebeles*. Study area *kebeles* were selected purposively based on researcher experience. Interview schedules consisted of relevant household information in terms of livelihood activities, socio-demographic characteristics, and other factors, such as institutional and infrastructural factors were developed to collect data. Interview schedules comprising subsections with questions on food frequency and dietary diversity questionnaire-based multiple-pass 24-hour recall were used specifically to collect food consumption data on children aged 6–59 months. Similarly, some sections of the schedule comprised questions on education, information, health, shelter, water and sanitation, and household income broadly to assess child poverty indicators were included.

5.2.3. Methods of data analysis

Data was processed using STATA version 16, Microsoft Excel, and SPSS version 25. Descriptive statistics such as the mean and percentage were used to describe the socioeconomic and demographic characteristics of the sample households. The Probit model was also used to examine the contribution of livelihood diversification to multidimensional child poverty reduction.

The Simpson diversity index was applied to determine the level of livelihood diversification. In this study, the major sources of livelihood activities are on-farm activities, off-farm activities, and non-farm activities. Most rural households practice combinations of the abovementioned livelihood activities following the expected risks and returns. Therefore, every livelihood activity assessed in this study was carefully identified and categorized as on-farm activities, off-farm activities, and non-farm activities based on some empirical literature (Bryceson, 2005). The extent of livelihood diversification is determined by Simpson's diversity index and is specified as follows:

$$\text{Diversity Index (DI)} = 1 - \sum_{i=1}^S \left(\frac{n_i}{N}\right)^2 \dots \dots \dots (2)$$

where S is the number of income sources or activities that are present; n_i (for $i = 1$ to S) is the income value of individuals in the i -th income sources and $N (= \sum n_i)$ is the total income of all income sources. The value of SID ranges from 0 to 1, and for a household with no diversity (i.e., having only a single income source or activity so that $S = 1$ and $n_1 = N$), DI is zero, and as income diversity increases, DI approaches unity. The level of diversification was specified as follows: SID is less than or equal to 0.01 (undiversified), SID is equal to 0.011-0.25 (less diversified), SID is equal to 0.26–0.50 (moderately diversified), and SID is 0.51-0.74 (highly diversified), and SID is greater than or equal to 0.75 (very highly diversified).

Since the objective of this study is to ascertain the linkage between a household's livelihood diversification and child poverty, we have also measured child poverty using multidimensional poverty measurement techniques.

Multidimensional child poverty

The multidimensional poverty index (MPI) is constructed using eighteen indicators covering three dimensions. The unit of analysis in this study is children. Multidimensional child-poor poverty was determined based on these indicators set to identify child poverty. A set of indicators such as nutrition, health, education, water, sanitation, information, shelter (housing condition), fuel, and energy were used to estimate child deprivation. Average annual household income was separately used to see child deprivation in the income aspect; however, it was not included in the multidimensional child poverty estimation index.

Deprivation cutoffs: The MPI first identifies a child who is deprived in each of the 18 indicators. The indicators, cutoffs, and weights are summarized in Table 5.1 below.

Poverty Cutoff: Once it has been identified who is deprived in each indicator, the next step is to determine who is multidimensionally poor. Following Alkire *et al.* (2015), the second cutoff called the 'poverty cutoff' k (in this case 33%), is set across the weighted sum of a child's deprivations. In the case of the MPI, every child is identified as multidimensionally poor if and

only if he/she is deprived in at least one-third of the weighted indicators. That is the corresponding indicators under each dimension were multiplied by $\frac{1}{3}$. In the end, children who are jointly deprived in 33% (in this case) of dimensions namely health, education, and living standard, were determined as multidimensionally poor.

The following table (Table 5.1) shows the dimensions of multidimensional child poverty along with the indicators, deprivation conditions, and weights used in this study to determine child poverty.

Table 5.1: Dimensions of child poverty and indicators

Dimensions	Indicators	Deprived if...	Related to...	Relative weight
Health	Meal frequency	A child is feeding < 4 times per day	SDG 2	1/15
	Meal diversity	A child is feeding < 4 food groups per day	SDG 2	1/15
	Skilled birth	A mother didn't attend antenatal care before giving a newborn	SDG 3	1/15
	Measles vaccination	A child has not been vaccinated	SDG 3	1/15
Education	BCG vaccination	A child has not been vaccinated	SDG 3	1/15
	Years of schooling	A child aged above 14 years of age has not completed primary school	SDG 4	1/6
	School attendance	A child aged 5-14 not attending primary school	SDG 4	1/6
	Radio	No access to radio	SDG 1	1/33
Standard of living	Television	No access to television	SDG 1	1/33
	Phone	No access to mobile phone	SDG 1	1/33
	Computer	No access to computer services	SDG 1	1/33
	Room crowded	A child is living with ≥ 4 people in a room	SDG 11	1/33
	Flooring	A floor is made of wood, and covered by grass	SDG 11	1/33
	Access to protected water	A child has no access to protected water	SDG 6	1/33
	Distance to protected water	Child travel ≥ 30 minutes on a round trip to collect water	SDG 6	1/33
	Access to flush toilet	The sanitation facility is not improved but it is improved but shared with other households.	SDG 6	1/33

	Electricity	Has no access to electricity	SDG 7	1/33
	Cooking fuel	Households are using charcoal, wood, or dung for cooking meal	SDG 7	1/33
Household income	Average annual income	The average annual household income is <7,184 Ethiopian birr	CSA and UNICEF (2020)	

Source: Adopted from UNICEF (2020)

Multidimensional headcount ratio (H)

Following Alkire *et al.* (2015), the multidimensional deprivation headcount measures the number of children deprived depending on the chosen cutoff point to identify the deprived. A child i is considered deprived if the number of dimensions in which he/she is deprived (D_i) is equal to or larger than the cutoff point K :

$$y_k = 1 \text{ if } D_i \geq k, y_k = 0 \text{ if } D_i < k \dots \dots \dots (3)$$

The multidimensional deprivation headcount ratio is calculated as follows:

$$H = \frac{q_k}{n}, \text{ with } q_k = \sum_{i=1}^n y_k \dots \dots \dots (4)$$

where

q_k = number of children affected by at least K deprivations;

n = total number of children included in the analysis;

y_k = deprivation status of child i depending on the cutoff point K ;

D_i = number of deprivations each child i experiences;

K = cutoff point.

Average deprivation intensity among the deprived (A)

We used the sum of all deprivations among children identified as deprived to calculate the mean intensity of multidimensional deprivation based on the share of the sum of all possible deprivations among the same group of children.

$$A = \frac{\sum_1^{q_k} c_k}{q_k \times d}, \text{ with } c_k = D_i \times y_k \dots \dots \dots (5)$$

where

q_k = number of children affected by at least K deprivations;

d = total number of dimensions considered per child;

c_K = number of deprivations each multidimensionally deprived child i experiences

Adjusted multidimensional child deprivation headcount ratio (M_0)

To capture both the number of deprived children (H) and their deprivation intensity (A), we used the adjusted deprivation headcount ratio:

$$M_0 = H \times A \dots \dots \dots (6)$$

A child is defined as poor or non-poor depending on whether his/her overall deprivation score is less than the multidimensional poverty cutoff (non-poor) or meets or exceeds the cutoff (poor) by comparing his/her deprivation score to the multidimensional cutoff.

The contribution of livelihood diversification to child poverty reduction

The contribution of livelihood diversification to child poverty reduction was analyzed using the probit model. The probit models were introduced by Chester Bliss in 1934, and a fast method for computing maximum likelihood estimates (Bliss, 1935). It is used when the dependent variable is binary that is it can have only two possible outcomes which we will denote as 1 and 0. When the dependent variable y_i is binary, P_i is expressed: The following is adapted from Gujarati (2009).

$$P_i = (y = 1|xi) = \phi(xi\beta) \dots \dots \dots (7)$$

where P_i denotes probability, ϕ is the cumulative distribution function, and β maximum likelihood coefficient of the standard normal distribution. The probit model assumes that the basic dependent variable is normally distributed, whereas the y dependent variable assumes that the variable is based on the normal distribution curve.

It is also possible to motivate the probit model as a latent variable model. Suppose there exists an auxiliary random variable.

$$Y^* = X'\beta + \varepsilon, \dots \dots \dots (8)$$

Where $\varepsilon \sim N(0,1)$. Then Y can be viewed as an indicator of whether this latent variable is positive:

$$Y = 1_{\{Y^* > 0\}} = \begin{cases} 1 & \text{if } Y^* > 0 \text{ i.e. } -\varepsilon X'\beta, \\ 0 & \text{otherwise.} \end{cases} \dots \dots \dots (9)$$

The use of the standard normal distribution causes no loss of generality compared with using an arbitrary mean and standard deviation because adding a fixed amount to the mean can be compensated by subtracting the same amount from the intercept, and multiplying the standard deviation by a fixed amount can be compensated by multiplying the weights by the same amount.

The independent variables were specified as follows:

- X1 = Sex of household head (male=0, Female =1)
- X2 = Age of household head (in years)
- X3 = Education status of household head (able to read and write =1, illiterate =0)
- X4 = Household size (number of individuals in a household)
- X5 = Marital status of household head (married=1; unmarried =0)
- X6 = Health status of household head (excellent =1, very good =2, good =3, fair =4, poor =5)
- X7 = Total land holding in hectares (ha)
- X8 = Number of plot lands owned at different locations (number)
- X9 = Participation on off-farm for harvest share (yes = 1, no =0)
- X10 = Laboring on other's farm (yes = 1, no =0)
- X11 = Frequency of extension contact per month (number of extension contacts)
- X12 = Distance to the nearest market (km)
- X13 = Total number of livestock in TLU (in Tropical Livestock Unit)
- X14 = Participation in petty trading (yes = 1, no =0)

X15 = Charcoal production (yes = 1, no =0)

X16 = Incidence of household poverty (poor =1, non-poor =0)

β = vector of Probit maximum likelihood estimates

e_i = independently distributed error term

The association between child poverty and household poverty was also examined through simple statistical methods. The income approach was used to measure household poverty. The percentage of poor households in the sampled population was estimated by headcount index, and specified as:

$$P_0 = \frac{N_p}{N} \dots \dots \dots (10)$$

Where N_p is the number of poor and N is the total population (or sample). Considering a poverty line in the measurement, we can rewrite the headcount ratio as:

$$P_0 = \frac{1}{N} \sum_{i=1}^N I(y_i < Z) \dots \dots \dots (11)$$

Here, $I(\cdot)$ is an indicator function that takes on a value of 1 if the bracketed expression is true, and 0 otherwise. So, if the average annual income (y_i) is less than the poverty line (z), then $I(\cdot)$ equals 1 and the household would be counted as poor. In our case, the poverty line is 7,184.00 birr, based on CSA and UNICEF (2020). Therefore, a household is poor if the average annual income is less than 7,184.00 birr.

5.3. Results and discussion

5.3.1. The extent of livelihood diversification

Table 5.2: Summary statistics of the extent of livelihood diversification

The extent of livelihood diversification			
	Intervals	Freq.	Percent
Undiversified	≤ 0.01	58	14.46
Less diversified	0.011-0.25	13	3.24

Moderately diversified	0.26-0.50	101	25.19
Highly diversified	0.51-0.74	224	55.86
Very highly diversified	≥ 0.75	5	1.25

Source: Computed from our survey data, 2020

The extent of livelihood diversification was computed using the Simpson diversity index. The percentage distribution of the extent of income-based livelihood diversification indicates that more than half (56%) of respondents are engaged in highly diversified livelihoods. The second highest level of diversification is observed as a medium level of diversification. This implies that most households in the study area are engaging in activities providing medium to high levels of income. Similarly, the activity-based diversification index also showed that most households are practicing a diversified livelihood activity to generate income. The percentage distribution for livelihood activities shows that less than 2% of respondents are engaged in very high-level diversification of livelihood activities. Livelihood diversification is very common in the study area, which is why only 14.46% of households are not diversifying their livelihoods.

The following table shows the socio-demographic and economic characteristics of the sampled households. The sex distribution of respondents indicates that the majority of household heads in the study area are male.

5.3.2. Household socioeconomic characteristics

Table 5.3: The percentage distribution of sampled households' characteristics

Characteristics	Frequency	Percent
Sex of household head		
Male	350	87.3
Female	51	12.7
Education status		
Illiterate	83	20.7
Literate	318	79.3
Marital status		
Single	5	1.2
Married	351	87.5
Divorced	26	6.5
Widowed	19	4.7

Health status		
Excellent	101	25.2
Very good	132	32.9
Good	129	32.2
Fair	37	9.2
Poor	2	.5
Irrigation practices		
No	370	92.3
Yes	31	7.7
Laboring on other's farm		
No	358	89.3
Yes	43	10.7
Participation in off-farm for harvest share		
No	302	75.3
Yes	99	24.7
Participation in petty trading		
No	382	95.3
Yes	19	4.7
Engagement in carpentry activities		
No	390	97.3
Yes	11	2.7
Charcoal production and selling		
No	388	96.8
Yes	13	3.2

Source: Computed from our survey data, 2020

The percentage distribution of household characteristics shows that the majority of sample household heads are males. Of the sampled households, approximately 87% of respondents are male-headed. The education status of respondents in this study was conceptualized as literate and illiterate. The former stands for those all who can read and write, mostly those who attended a certain level of schooling, while the latter stands for those all who cannot read and write. The results show that approximately 79% of sample respondents are literate, showing that they can read, write, and understand written information. This is very important for easily adopting new agricultural technologies and being easily aware of available alternative livelihood activities in their locality. The descriptive results show that most of the respondents are married (nearly 88%), followed by divorced (6.5%), and widowed (4.7%). Only 1.2% of respondents are

reported to be single. The health status is categorized on a self-reported 1-5 scale: the excellent, very good, good, fair, and poor following (Wu, 2003) to understand the health condition of the household head through the question “How could you state your health status?” Following Drever *et al.* (2001) “people are good judges of their state of health”; we raised the question to each respondent to report their health condition. Most respondents are in good health conditions. The results show that only 9% of respondents said that their health condition was fair, while less than 1% of respondents reported that they were in poor health condition. Irrigation practices are not common in the study area. Most agricultural production is rain-fed, and only 8% of respondents were practicing irrigation. Agriculture is the dominant livelihood activity in the study area, and both off-farm and non-farm activities are practiced by a few households. In this study, off-farm activities include agricultural laboring and off-farm participation for harvest share. The percentages of households participating in off-farm and non-farm activities are 11% and 25%, respectively. Most households participate in other people’s farms for harvest share rather than agricultural laboring. We have defined non-farm activities as all livelihood activities other than primarily farming (plowing, weeding, harvesting or trashing, and/or keeping livestock) activities regardless of spatial difference (either on own farm or another person’s farm). However, it may include marketing agricultural products such as retailing farm products. Some of the non-farm activities included in this study are petty trading, carpentry works, and charcoal production and selling. The percentage distribution of households participating in non-farm activities shows that only 4.7%, 2.7%, and 3.2% of households participate in petty trading, carpentry works, and charcoal production and selling, respectively. The result implies that non-farm activities are the lowest contributor to households’ livelihoods in the study area.

5.3.2.1. Household assets and opportunities

Livelihood diversification is attempted by individuals and households to find new ways to raise incomes and reduce environmental risk (Hussein and Nelson, 1999). It can also be defined as ‘the process by which rural families construct a diverse portfolio of activities and social support capabilities in their struggle for survival and to improve their standards of living’. Furthermore, it is understood as a continuous process by which households or rural poor include new activities in their existing activities or jump down to others to maintain diverse and changing livelihood activities (Ellis, 1997). Usually, people diversify their livelihoods into a variety of activities,

such as on-farm activities (crop production and animal husbandry), non-farm activities (nonagricultural activities such as petty trading and remittances), and off-farm activities (agricultural labor and harvest sharing) (Ellis, 1999). The Simpson diversity index was applied to determine the level of livelihood diversification. The level of diversification is determined based on the Simpson diversity index (SDI) value as undiversified (UD); less diversified (LD), moderately diversified (MD), highly diversified (HD), and very highly diversified (VHD) (Equation 2).

Table 5.4: Summary statistics of continuous variables by the extent of livelihood diversification

Variables	The extent of livelihood diversification (mean)					Total mean	F value
	UD	LD	MD	HD	VHD		
Age of household head	40.23	35.69	38.78	42.81	45.20	41.22	4.693***
Household size	3.71	3.52	4.03	4.85	4.85	4.43	10.184***
Economically active labor	2.50	2.41	2.50	3.36	3.66	2.99	11.354***
Total land holding	.761	1.14	1.32	1.90	2.05	1.57	17.073***
Livestock owned	1.52	2.16	2.95	5.74	3.30	4.28	17.752***
Frequency of extension contact	1.41	2.23	1.76	2.97	3.40	2.42	30.923***
Farming experience in years	19.79	15.77	16.74	22.77	22.20	20.60	7.061***
Number of plot lands owned	1.53	1.46	1.62	2.01	2.60	1.83	8.268***
Distance to the nearest market	11.11	17.54	14.43	9.12	11.30	11.04	10.384***
Total annual income	12821.55	28053.85	33095.54	68220.38	111180.0	50594.12	34.202***

Source: Computed from our survey data, 2020

One-way analysis of variance (F test) was conducted to examine whether there were significant differences in the mean scores of continuous explanatory variables across the livelihood diversification groups, and the results of the post hoc test were included for multiple comparisons. The comparison of F test results showed the existence of a statistically significant mean difference between rural households falling in the five levels of livelihood diversification. Age of household head, total land holding size, household active labor, farming experiences, number of plots of land owned at different locations, livestock ownership, distance to the nearest market, frequency to extension contact, and total annual income are significant at less than 1% levels (Table 5.4). The overall mean age of the sample households is 41.22 years. Similarly, the average age of household heads falling into different extents of livelihood diversification is 40.23, 35.69, 38.78, 42.81, and 45.20 for undiversified, less diversified, moderately diversified,

highly diversified, and very highly diversified livelihoods, respectively. Studies on the association of household head age and livelihood diversification indicated that there is an inverse relationship (Abera *et al.*, 2021). In the current study, it is identified that there is a significant mean difference in the age of household heads across levels of livelihood diversification.

Household size is measured as adult equivalent. The overall mean and standard deviation are 4.43 across the extent of livelihood diversification and ± 1.61 , respectively. When household size increases, there is a tendency for household members to participate in various livelihood activities. This might be due to structural transformation in livelihood activities, especially in SSA, as some evidence has shown. For example, McMillan and Harttgen (2014) found that the share of the labor force in the agricultural sector declined by approximately 10 percentage points between 2000 and 2010. The mean of households falling in the moderately, highly, and very highly diversified livelihood diversification categories is higher than that of undiversified and less diversified households. There are various reasons why households diversify their livelihoods. For example, Aloba (2015) concludes that while the benefits of diversification into non-farm income sources mainly favor the better-off, diversification ‘still provides a safety net for the rural poor and sometimes offers a means for upward mobility’. Similarly, some studies have confirmed that shrinking farm sizes and growing landlessness are by default pushing unskilled farm labor into mainly low-return non-farm sectors (Haggblade, Hazell, & Reardon, 2007; Headey & Jayne, 2014). The argument for household size as a better ‘opportunity for livelihood diversification’ makes sense when the members of a household can participate in income-generating activities, which is what we call economically active labor. Economically active labor, which is the number of people available in the age range of 15-64 years, is higher than the age dependency ratio on average. As seen in Table (5.4), the mean of economically active labor is nearly three, implying that on average, a household has three people aged between 15 and 64 years. This implies that on average, each household has three people who can engage in income-generating activities. The results of this study revealed that a household with more economically active labor falls in the highly and very highly diversified livelihood diversification categories.

Land is one of the most needed assets, especially in the rural agrarian community. Since the majority of rural people in Ethiopia depend on agriculture for their livelihoods, land is the most

commonly demanded and crucial household asset. In the study area, on average, households own 1.57 hectares of land with ± 1.1 standard deviation (see Annex Table 2). The maximum and minimum land holdings are 9 and 0.13 hectares, respectively. In addition to land size, the number of plots of land owned by household heads in different agroecosystems is essential for farm-based livelihood diversification. Under unpredictable and uncertain agro-climatic conditions, owning more than one plot of land, especially under varying agroecological conditions, is assumed to be a risk diversion mechanism. Households in the study area on average possess nearly two plots of land with standard deviation, maximum and minimum of ± 0.83 , 4, and 1 at different locations, respectively.

The frequency of extension contact is the number of visits a farmer makes to contact extension agents per month. Farmers contact extension agents for various purposes to obtain advisory services on their production systems and to obtain market information for their production and agricultural inputs. Various studies have confirmed that extension contacts have a significant contribution to livelihood diversification. The number of extension visits per year has a significant and positive effect on income diversification (Teshome and Edriss, 2013), but other studies have shown that extension contact has an adverse effect on livelihood diversification (Tamerat, 2016; Asfir, 2016). Extension contact with a relevant message has contributed to pastoral livelihood diversification practices (Samuel, 2001; Dinku, 2018). In the current study, the mean frequency of extension contact is 2.42, implying that households in the study area contact extension agents on average more than twice per month. The minimum extension contact is zero, implying that there are households that do not contact the extension agents. The maximum is eight extension contacts per month. The results indicate that households in the study area have a good awareness of the importance of extension information, which increases the level of livelihood diversification moving parallel with an increase in the frequency of extension contact. This also creates a good opportunity to practice diversified livelihood activities.

Farming experience is the number of years a household head practiced farming activities. Very little evidence has reported the relationship between farming experience and livelihood diversification. According to Isaac (2016), farming experience has a significant and negative association with livelihood diversification. This implies that more experienced farmers prefer specialization to diversification. In the current study, households had many years of farming

experience. The mean years of farming experience are nearly 21 (Table 5.4), with a standard deviation, minimum, and maximum of ± 10.46 , 1, and 70 years, respectively (see Annex Table 2). Distance to the nearest market also affects the level of livelihood diversification. Farm households visit the market for various purposes such as seeking chemical fertilizers, crop seeds, and livestock, and to sell their farm production. As the distance to the nearest market increases, farmers prefer to stay in limited livelihood activities. The result from one-way ANOVA revealed that there is a statistically significant mean difference in distance to the nearest market across the extent of livelihood diversification in Negele Arsi Woreda.

5.3.2.2. *Disaggregation of child poverty by age group and sex category (child poverty profile)*

This section highlights the disaggregated state of child poverty by age and sex of children in the study area. The descriptive results demonstrate the nature of child poverty across the age and sex categories of children. From the rough observation, we can understand that child poverty is highly concentrated in children aged between 6 and 18 years, and female children are poorer than male children for both age categories. Some studies showed that the burden of poverty is unequally accumulated by age and gender (Feeny and Boyden, 2003). In our study, we have shown the features of child poverty in terms of the age and gender of children.

$$\% \text{ of under – five poor children} = \frac{\text{poor children}}{\text{total under – five children}} * 100 = \frac{385}{477} * 100 = 81\%$$

From the sampled households, the total number of children under-five the age is 477, among which 385 are multidimensionally poor, comprising approximately 81% of the children of the same age. In this approach, when we treat the poverty rate separately for different age categories, it is roughly higher for children aged between six and eighteen years than for children under the age of five years in the study area.

$$\% \text{ of 6 – 18 age poor children} = \frac{\text{poor children}}{\text{total 6 – 18 Children}} * 100 = \frac{1061}{1289} * 100 = 82.3\%$$

The total number of poor children is 1412 and the overall child poverty is approximately 82%.

$$\% \text{ of poor children } \frac{1446}{1766} * 100 = 81.87 \sim 82\%$$

Disaggregating the poverty rate by the sex of children, we can understand that the percentage of poor female children under the age of five years and children aged between 6 to 18 years are poorer than male children for the same age category. The following is the calculated child poverty rate for both age and sex categories.

Percentage of female children under the age of five poor:

$$\% \text{ of female poor children } = \frac{\text{poor female children}}{\text{all under 5 children}} * 100 = \frac{203}{477} * 100 = 43\%$$

Percentage of male children under the age of five poor:

$$\% \text{ of male poor children } = \frac{\text{poor male children}}{\text{all under 5 children}} = \frac{182}{477} = 38\%$$

Percentage of male poor children between 6-18 ages:

$$\begin{aligned} \% \text{ of male poor children between 6 – 18 ages} &= \frac{\text{poor children}}{\text{all children 6 – 18 ages}} * 100 \\ &= \frac{523}{1289} * 100 = 41\% \end{aligned}$$

Percentage of poor female children aged 6-18 years:

$$\begin{aligned} \% \text{ of female poor children between 6 – 18 ages} &= \frac{\text{poor children}}{\text{all children 6 – 18 ages}} * 100 \\ &= \frac{538}{1289} * 100 = 42\% \end{aligned}$$

The total number of children from 401 households is 1766, among which 869 are males and 897 are females. The overall poverty estimates showed that female children are poorer than male children in the study area. From the total poor children, (i.e., under five years of age and between 6-18 years of age), 741 (51.2%) female children are multidimensionally poor, while for similar

age groups, 705 (49%) male children are multidimensionally poor. This figure shows that female children are poorer than male children in the study area. On the other hand, child poverty is significantly higher for children aged between 6 and 18 years. A total of 1061 children between 6 and 18 years old are poor, while 385 children under the age of five are poor. This implies that from the total of 85% of the child poverty rate in the study area, 73.4% of child poverty is concentrated in children aged between 6 and 18 years, while only 26.6% of child poverty comes from children under the age of five. Multidimensional poverty is an outcome of multiple indicators aggregated to indicate an average deprivation in the dimensions considered for poverty measurement. Various studies from different countries indicated that child poverty disproportionally exists between boys and girls and their ages. For example, in Afghanistan and Pakistan, more girls than boys are out of school (44.0% girls vs. 24.8% boys in Afghanistan and 27.2% vs. 19.7% in Pakistan). Similarly, in Bangladesh, fewer girls than boys (7.2% vs. 12.1%) are multidimensionally poor and out of school (Dirksen and Alkire, 2021).

5.3.3. The features of child poverty deprivation in the study area

This section of the study addresses the nature of child deprivation across multidimensional poverty indicators. The descriptive results were used to describe the deprivation status of children from the sampled households. The result of the analysis showed that the incidence (headcount ratio) of multidimensional poverty (H) is 0.85, implying that 85% of children in the study area are multidimensionally poor. The intensity of multidimensional poverty (A) is 0.456, indicating, on average, multidimensionally poor children are deprived in 45.6% of poverty dimensions.

In the study area, the incidence of multidimensional poverty is also higher but below the national average. The following figure illustrates the percentage share of each indicator of child poverty deprivation. The maximum deprivation was observed in computers, fuel, and energy, each comprising 10% of overall deprivation. Most children live in households that use firewood, charcoal, and dung for cooking meals. This has an impact on children in that most of the time children are responsible for collecting firewood in rural areas. Therefore, they might be forced to drop out of school to carry out these activities.

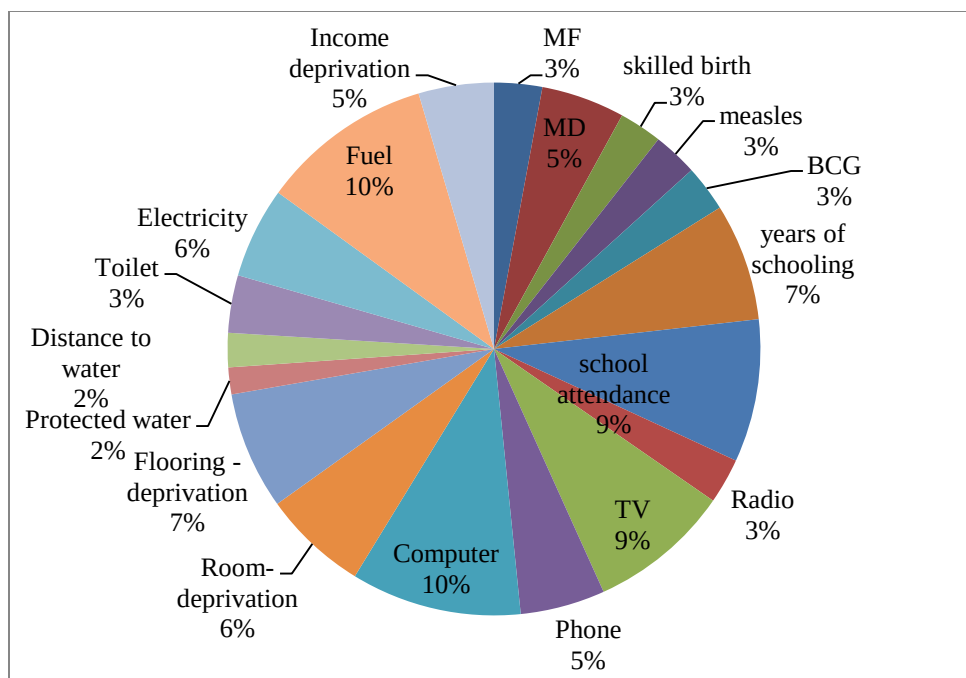


Figure 5.1: The percentage distribution of indicators of child poverty

Education deprivation comprises 16% of aggregated results of the unenrollment of school-aged children; and whether the children at the age of 14 years have not completed primary school. The result indicates that children in the study area are deprived of the lack of enrollment and lack of completing primary school at the age when they would have completed it. The below figure shows that children in the study area are highly deprived of other indicators, such as shelter, sanitation, income, nutrition, and health. A low deprivation rate is observed for access to protected water, and distance to access protected water implying water deprivation contributes 4% to multidimensional child poverty in the study area.

5.3.3.1. *Multidimensional child poverty and deprivation status*

Child deprivation in multiple indicators is very high in Ethiopia. Reports showed that multidimensionally deprived children residing in Addis Ababa are deprived of an average of 3.2 dimensions, whereas their peers residing in Afar and Somali experience an average of 4.8 and 4.7 simultaneous deprivations, respectively (CSA and UNICEF Ethiopia, 2018). The current study assesses child deprivation in three dimensions (Table 5.5). The table compares the patterns of multidimensional child poverty and deprivation across different indicators. The results showed

that multidimensionally poor children are highly deprived in all dimensions compared to multidimensionally non-poor children.

The percentage of child deprivation in meal frequency is higher for the poor than the non-poor. Multidimensionally poor children deprived in meal frequency are two times higher than multidimensionally non-poor children in the study area (see Table 5.5). Similarly, poor children are highly deprived of meal diversity compared to non-poor children. On the other hand, no non-poor children were deprived of skilled birth, measles, and BCG immunization. Nutrition status reports of children indicated that there is a serious problem of malnutrition in Ethiopia. The CSA (2016) report showed that in the country, 38% of children under age 5 are stunted (short for their age); 10% are wasted (thin for their height); 24% are underweight (thin for their age), and 1% are overweight (heavy for their height). In 2008, the FDRE developed the National Nutrition Strategy and the National Nutrition Programs (NNP), and the second NNP, which covers the period from 2016 to 2020, addresses the multisectoral and multidimensional nature of nutrition. However, there is a slight improvement in child dietary intake, leaving plenty of work remaining to satisfy at least the minimum dietary recommendation (EPHI, 2021). The percentage of children deprived in years of schooling is 19 and 76% for non-poor and poor respectively. This implies that the rate of children above the age of 14 years who have not completed primary school is higher for the poor than the non-poor. Similarly, the percentage of non-poor and poor children aged between 5-14 years but not attending primary school is 46 and 89 respectively. Schooling, especially for rural poor children, is very difficult in Ethiopia. The Young Lives study showed that the enrollment rate for poor children was lower (89%) than for non-poor children (92%) during the academic year of 2009, as cited in Yisak (2012). Likewise, the dropout rate is higher for poor children in the same year.

Table 5.5: Status of Child Deprivation

Dimension	Indicators	Poverty status	Deprivation status			
			Not deprived		Deprived	
			Freq.	%	Freq.	%
Health	Meal frequency	Non-poor	50	85	9	15
		Poor	240	70	102	30
	Meal diversity	Non-poor	46	78	13	22
		Poor	162	47	180	53
	Skilled birth	Non-poor	59	100	0	0

Education	Measles immunization	Poor	243	71	99	29
		Non-poor	59	100	0	0
	BCG immunization	Poor	239	70	103	30
		Non-poor	59	100	0	0
	Years of schooling	Poor	235	69	107	31
		Non-poor	48	81	11	19
Living standard	School attendance	Poor	82	24	260	76
		Non-poor	32	54	27	46
	Access to radio	Poor	39	11	303	89
		Non-poor	47	80	12	20
	Access to TV	Poor	249	73	93	27
		Non-poor	17	29	42	71
	Access to telephone	Poor	56	16	286	84
		Non-poor	40	68	19	32
	Access to computer	Poor	165	48	177	52
		Non-poor	2	3	57	97
	Overcrowding	Poor	5	2	337	98
		Non-poor	38	64	21	36
	Floor quality	Poor	120	35	222	65
		Non-poor	28	47	31	53
	Access to safe drinking water	Poor	101	30	241	70
		Non-poor	58	98	1	2
	Distance to water source	Poor	281	82	61	18
		Non-poor	53	90	6	10
	Access to improved sanitation	Poor	269	79	73	21
		Non-poor	41	69	18	31
	Access to electricity	Poor	227	66	115	34
		Non-poor	42	71	17	29
	Cooking fuel	Poor	149	44	193	56
		Non-poor	1	2	58	98
	Income deprivation	Poor	2	1	340	99
		Non-poor	29	49	30	51
		Poor	198	57	144	43

Source: Computed from our survey data, 2020

Most children in the study area are deprived of information from different sources. About 27% of poor and 20% of non-poor children have no access to radio. Similarly, access to television is difficult for poor and non-poor children. The percentage deprivation of television shows that about 84% of poor children and 71% of non-poor children are deprived. The percentage of poor children deprived of telephone access is also higher than that of non-poor. Extreme information deprivation for both poor and non-poor children was observed in access to computers. A report on trend analysis of multidimensional child deprivation shows that the majority of children in

Ethiopia live in households with no source of information from the media (Plavgo *et al.*, 2013). Similarly, the result of this study also showed that accessing information for rural children in the study area is difficult.

Housing conditions are one of the most important indicators of multidimensional poverty. Living with 4 or more people in one room increases the risk of loss of dignity, infectious diseases, and domestic violence. Children's development may suffer through being unable to do homework in a quiet space, poor sleep, illness, abuse, and violence. The result from the current survey showed that about 65% of poor and 36% of non-poor children live with more than 4 individuals in a room. A house is considered to provide a sufficient living space if three or fewer people share the same room. Similarly, roof and floor material quality is poor. A house is considered safe if it can protect from weather extremes such as heat and cold, but also wind and rain (WHO, 2010). In the study area, 70% of poor children and 53% of non-poor children are deprived of roof and floor-quality housing conditions.

Improved sources of drinking water according to SDG 6 include piped water into dwelling, yard, or plot; public taps or standpipes; boreholes or tubewells; protected dug wells; protected springs and rainwater) which is located on the premises available when needed and free of fecal (and priority chemical) contamination. In the study area, it was reported that piped water into dwellings and standpipes are the main sources of drinking water. The percentage of poor children deprived of access to protected water is 18 while only 2% of non-poor children are deprived. Similarly, about 21% of poor children are living at a distance of more than 30 minutes round trip while only 10% of non-poor children are living at at a distance of more than 30 minutes round trip to access protected water. A Central Statistical Agency (2011) report showed that approximately 54% of households in Ethiopia have access to improved sources of drinking water. However, accessing water sources is not easy due to population pressure on limited water sources. Traveling to fetch water and waiting on the lining is spade work, especially for women and children. Children in the study area are also deprived of a lack of access to improved sanitation. Improved sanitation includes flush or pour-flush toilets to sewer systems, septic tanks or pit latrines, ventilated improved pit latrines, pit latrines with a slab, and composting toilets (WHO and UNICEF, 2017). About 34% of poor and 31% of non-poor children are deprived of

access to improved sanitation facilities. An earlier CSA (2011) report indicated that approximately 81% of urban households have no improved toilet facilities, while 91% of rural households use unimproved sanitation (toilet) facilities. This is partly due to a lack of access to water sources.

The majority of children who live in households mainly cooking with coal, wood, charcoal, dung, crop residues, or kerosene are considered exposed. The percentage of children deprived of fuel and energy is high. About 56% of poor children and 29% of non-poor children have no access to electricity. Similarly, almost all children in the study area are living with households using firewood, charcoal, dung, or crop residue to cook meals. Deprivation in income is also high for both poor and non-poor children. Exceptionally non-poor children are more deprived than poor children in income indicators.

5.3.3.2. *Dietary diversity and multidimensional child poverty*

This section of the study assesses the association between multidimensional child poverty and patterns of food consumption (patterns of dietary diversity). The Food Consumption Score (FCS) method was used to measure dietary diversity. Data were gathered on different food groups consumed by children during the seven days before the survey (Kennedy *et al.*, 2011). The chi-square test was used to describe whether food consumption has a significant association with child poverty. Dietary diversity is the number of different food groups consumed by an individual or collectively by a household over a given reference period. It is also the qualitative measure of food consumption and is a proxy for nutrient adequacy of the diet of individuals (FAO, 2013).

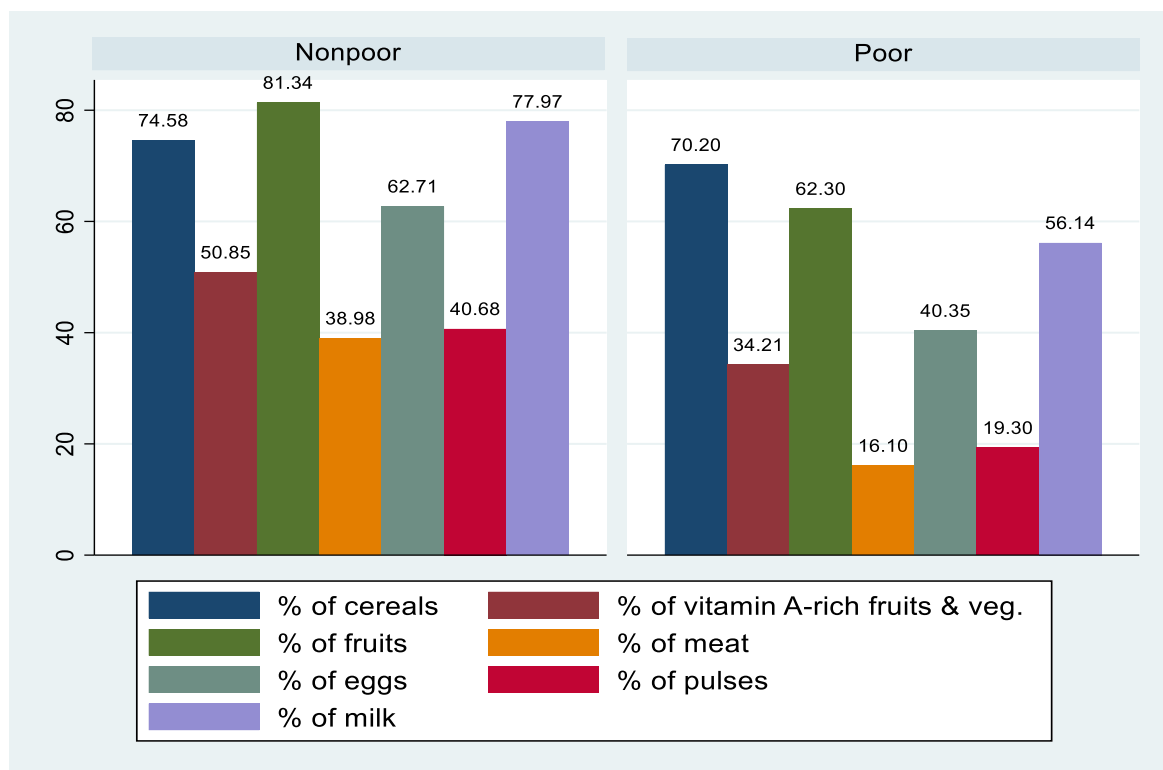


Figure 5.2: Percentage distribution of child dietary intake

Cereals form the major components of the diet in the study area. The above Figure 2 shows that 74.58% of non-poor children receive their diet from cereal sources while nearly 70% of poor children rely on cereal food sources (Figure 2). The result shows that poor children acquiring their diet from cereal sources are slightly lower than non-poor children. The graph clearly shows that there is observable variation in vitamin A-rich fruits and vegetable consumption between poor and non-poor children in the study area. Poor children have less access to vitamin A-rich foods than non-poor children. Most of the sample households feed on food from other fruits and vegetable crops. More than 81% of non-poor children receive other fruit and vegetable food sources compared with poor children receiving nearly 62%. Milk and milk products such as cheese, butter, and yogurt are some of the most commonly consumed diets in the study area. Nearly 78% of non-poor and above 56% of poor children get milk and milk products in their diet.

5.3.4. Livelihood diversification and multidimensional child poverty

A Probit regression model was used to estimate the contribution of livelihood diversification to multidimensional child poverty reduction in the study area. The result in Table (5.6) below shows that χ^2 is significant at the 1% level of probability ($p < 0.001$), which shows the overall significance of the model. The pseudo-R squared revealed that 19.65% of the variation in multidimensional child poverty was jointly explained by the significant variables. The results revealed that total land holding, number of plots of land, off-farm laboring, distance to the nearest market, petty trading, charcoal production and selling, and incidence of household poverty significantly affected the multidimensional child poverty in the study area. The total landholding negatively and significantly affects child poverty. For a unit increase of total land holding in hectares, the probability of children being multidimensionally poor decreases by 6.2%; other factors remain constant.

Table 5.6: Livelihood diversification and child poverty

Variables	dy/dx	Std. Err.	P>z
Sex of household head	0.031	0.064	0.628
Age of household head	0.001	0.002	0.510
Education status of household head	-0.034	0.051	0.508
Household size	-0.015	0.009	0.100
Marital status of household head	-0.042	0.038	0.277
Health status of household head	0.018	0.021	0.397
Total land holding in hectares	-0.062	0.023	0.006***
Number of plot lands owned at different locations	0.068	0.027	0.011**
Participation on off-farm for harvest share	-0.016	0.040	0.683
Laboring on other's farm	0.158	0.087	0.070*
Frequency of extension contact per month	-0.015	0.014	0.308
Distance to the nearest market	-0.005	0.002	0.040**
Total number of livestock in TLU	-0.002	0.005	0.640
Participation in petty trading	-0.185	0.058	0.002***
Charcoal production	-0.151	0.079	0.055*
Incidence of household poverty	-0.126	0.042	0.003***
LR chi2(16) = 65.83 Log likelihood = -134.58445			
Prob > chi2 = 0.0000 Pseudo R2 = 0.1965			

Source: Computed from our survey data, 2020

. *, **, *** represents the 10%, 5% and 1% significance level, respectively

The marginal effect of the number of plots of land owned by a household at a different location is found to be positive and significantly associated with multidimensional child poverty ($p=0.011$). The result implies that a unit increase in the number of plots of land brings a 6.8% increase in multidimensional child poverty. The result is consistent with other studies, which found that owning more land, and other livelihood assets, such as livestock, might have a positive contribution to child poverty because households may engage their children in tending livestock or cultivating land instead of sending them to school (Pereznieto and Jones, 2006). A study in another context, for example in the area where encroachment of wild animals exists, farming activities have a negative effect on children's schooling (Wondimagegnhu *et al.*, 2019). Off-farm participation as agricultural labor is an important predictor of child poverty. The marginal effect of laboring in agricultural activities is significant at the 10% probability level ($p=0.070$) and positively associated with multidimensional poverty. Agricultural laboring offers instant cash payment for individuals and most agricultural laborers prefer this to obtain daily income. This may offer a household to support their daily basic needs, but this might be sometimes at the expense of children's needs like attending school. When a household head is overloaded with such activities, children might be expected to undertake some of the activities at the household level. This study shows that a unit increase in agricultural labor activities increases the probability of child poverty by nearly 16%, holding other factors constant. The result further implies that child poverty is more likely to be associated with other factors than household income.

Distance to the nearest market was found to be negatively and significantly associated with multidimensional poverty. This result is consistent with Dinku (2018) which finds the probability of individuals diversifying beyond the agricultural practice is likely to be reduced as the distance to the market marketplace increases from their villages. However, another study conducted by Amogne *et al.* (2017) showed that there is no statistically significant association between distance to the nearest market and participation of smallholder farmers in non-farm economic activities. In our study, the result showed that a unit change in distance to the nearest market decreases the probability of multidimensional child poverty reduction by 0.50%. This implies that lack of access to the market limits the opportunity of households to engage in non-farm activities, while it offers more time to stay around their home, which might have a positive

contribution to childcare; however, the result is inconclusive in that limited studies are showing the linkage between market participation and child poverty, though, households should generate more income to satisfy their needs, including children's needs.

Petty trading activity is one of the important factors found to affect multidimensional child poverty in the study area. The analysis results showed that a unit increase in the number of petty trading activities could decrease the likelihood of multidimensional child poverty by 18.5%. Household poverty is one of the determinants of child poverty in the study area. The incidence of household poverty is positive and significant at a 1% probability level ($p < 0.001$). The marginal effect showed that being in a poor household decreases the probability of child poverty by 12.6%, other factors held constant. It is believed that poor households are less likely to invest in children's needs sending school, unable to provide sufficient nutritious food. A study from abroad showed that the economic condition of the household has a significant effect on a child's education; for example, children from poor households often drop out of school mainly due to economic difficulties (Thanh *et al.*, 2005). On the other hand, Hegde *et al.* (2019) found that families having more income could easily spend money on children's education, health, information sources, improving housing structure, and other activities. The current study, however, showed the contrary result to these assumptions implying that child poverty is more than household income level; that is child poverty is more likely affected by other factors than household income. However, empirical evidence still stresses that it is essential to expand opportunities for the poor to diversify the business climate not only for large, formal producers but also for tiny and small entrepreneurs (UNICEF, 2012). For poor households, income generated from market participation is crucial to buffer the insufficiency of on-farm income to satisfy household needs in general and child needs in particular.

5.4. Conclusion and recommendations

This study has highlighted the importance of adopting a child-centric perspective in understanding the relationship between household livelihood diversification and child poverty. It examines how child poverty varies across different age groups, as children's needs and vulnerabilities may change throughout their development. The research also explores the potential gender-based differences in child poverty, as girls and boys may face distinct

challenges and deprivations. Furthermore, the study uncovers the linkages between household livelihood diversification and the multidimensional aspects of child poverty in the Negele Arsi *woreda*.

The Simpson index was used to measure the extent of livelihood diversification in the study area. The index was developed from different livelihood activities. Accordingly, livelihood activities were classified as on-farm, off-farm, and non-farm activities. The analysis results showed that a few households are collecting their income from single livelihood activities.

Various studies have shown a significant association between livelihood diversification and household poverty reduction. However, the linkage between household diversification and child poverty remains underexplored, despite the multidimensional nature of child poverty. Moreover, most of the existing research has primarily focused on the unidimensional approach to poverty measurement, based on household income and expenditure, often excluding children as the key unit of analysis. Therefore, there is a need for a deep understanding of how household livelihood strategies influence the specific needs and experiences of children.

Although global poverty is declining, disparities in rates of poverty reduction across countries continue to remain a policy concern. Among all the people living in poverty, children comprise the majority. Empirical evidence confirmed that half of the globally multidimensionally poor are still children. This study also found that the incidence of multidimensional child poverty is high but below the national average. Among all indicators used to examine child poverty, maximum deprivation was observed in information, which comprises 27% of overall deprivation. Poor children have limited connectivity to national and international information sources transmitted through various Media like radios, television, mobile phones, and computer internet services. School-aged multidimensionally poor children are highly deprived of education attainment. About 7% of poor children could not complete primary school at the age they could have to; while 9% of the same-age poor children are not even attending school in the study area. Moreover, age disaggregated analysis results revealed that child poverty is higher for children aged between 6 to 18 years compared with children under the age of five. Similarly, female children are poorer than their counterparts male children in the study area. Therefore, age and sex-specific intervention is needed to reduce child poverty. In dietary indicators, poor children

are more likely deprived than non-poor are. As a result, the percentage deprivation of poor children in meal frequency and meal diversity is higher. They are also deprived of skilled birth attendants and immunizations. Meat, poultry, and fish food are among the least consumed food groups by the children in the study area. Therefore, an awareness campaign on the importance of dietary diversity for child development and health is needed.

The current study has identified that various factors affect child poverty. The Probit model results revealed that total land holding, number of plots of land owned at different locations, engagement in agricultural labor activities, proximity to the market, petty trading, charcoal production, and sale, and the incidence of household poverty have a significant effect on multidimensional child poverty. The study recommends that livelihood provision programs are needed to reduce child poverty. By considering the multidimensional nature of child poverty, the study provided insights that can inform more effective and inclusive policies and interventions to address the complex challenges faced by children in poverty. Moving forward continued research and a holistic approach are crucial to ensuring that the needs and experiences of children are at the forefront of efforts to alleviate poverty and promote sustainable development. Therefore, further research is needed to deepen the understanding of the complex linkages between household livelihood strategies and the various dimensions of child poverty, particularly in diverse cultural and socioeconomic contexts.

CHAPTER SIX: LIVELIHOOD STRATEGIES AND CHILD DIETARY DIVERSITY IN RURAL ETHIOPIA: INSIGHTS FROM NEGELE ARSI WOREDA, OROMIA REGION, ETHIOPIA

Abstract

Various researchers have extensively discussed the benefit of livelihood diversification to household well-being. However, its specific contribution to the diversity of child diets is not adequately addressed, though. In Negele Arsi Woreda, Oromia Regional State, Ethiopia, this study seeks to examine the relationship between household livelihood diversification and child dietary diversity. Data on children's nutritional attainment from 401 sampled households were gathered using the cross-sectional survey approach. The factors influencing children's dietary diversity were determined using an ordered probit model. In this study, the cross-section survey method was employed to collect data. The survey was conducted by trained enumerators who were selected based on their prior experience in data collection and their familiarity with the research areas. Descriptive statistics and probit models were used to analyze data. According to the descriptive analysis, children in the research area eat an average of four different types of food per day, with a mean dietary variety score of 4.01 and a standard deviation of 2.14. For dietary diversity, 8 and 2 were the maximum and least scores, respectively. Additionally, the findings show that 67% of children received a highly diverse diet, 14% of children had low-diversified food, and 19% had medium-diversified food. Child dietary diversity and household livelihood diversification are significantly and positively correlated. In general, this study emphasizes the potential advantages of livelihood diversification for enhancing the variety of a child's food, which may have significant effects on a child's development and health in rural Ethiopia. This study found that a variety of factors, including the household head's sex, age, and availability of resources for subsistence, affect the dietary diversity of children. The study advises the researcher, policymakers, and community that a significant gap needs to be filled to meet the minimal nutritional attainment of children in rural Ethiopia.

Keywords: level of child dietary diversity, livelihood diversification, dietary diversity score, ordered probit model, marginal effect, Oromia, Ethiopia.

6.1. Background and justification

Nutrition is a crucial component of achieving the Sustainable Development Goals (SDG2), which aim to ensure access to safe, nutritious, and sufficient food for all, particularly the poor and vulnerable populations, including infants, by 2030 (FAO, 2018b). However, dietary diversity

in developing countries remains low, both in terms of quantity and quality, and inadequate dietary intake is the primary cause of malnutrition in these countries (FAO, 2013). In developing countries such as Ethiopia, most households rely on staple cereal food sources and have limited access to nutrient-rich foods such as red meat, poultry, and fish due to economic, cultural, or religious constraints (Gibson, 2012). Therefore, a lack of dietary diversity intake is becoming the major cause of under-five child mortality and malnutrition in developing countries. Research on the global state of under-five child malnutrition indicates that approximately 45% of the 5.9 million deaths of under-five children in 2015 were due to undiversified dietary consumption (WHO, 2016). Significantly, a high number of children globally are affected by malnutrition. The WHO's (2020) fact report showed that more than 144 million children under five years were stunted, 47 million were wasted and 38.3 million were overweight.

Numerous studies on dietary diversity have attempted to address aspects of dietary diversity, such as meal frequency, meal adequacy, and associated nutrition problems (Belew *et al.*, 2017; Iqbal *et al.*, 2017; Otekunrin *et al.*, 2021); however, very few studies have investigated the importance of livelihood strategies to child dietary diversity (Mitchodigni *et al.*, 2017; Zanello *et al.*, 2019). Specifically, Zanello *et al.* (2019) suggest that a lack of livelihood diversification is a significant cause of child undernutrition in agriculture-based households in developing countries. Therefore, it is crucial to investigate the association between household livelihood strategies such as off-farm and nonfarm diversification and child dietary diversity to enhance the goals of reducing child malnutrition problems in developing countries.

Despite efforts to improve child nutrition, the under-five and neonatal mortality rates in Ethiopia remain high, with neonatal mortality accounting for 44% of under-five deaths (Federal Ministry of Health, 2015). The country has planned to reduce under-five deaths to 20/1,000 by 2035, but child malnutrition remains a significant health problem, with almost half of all children under five years of age experiencing chronic malnutrition, acute malnutrition, or being underweight (CSA and ICF International, 2012). Studies have shown that changing occupational patterns away from farm-based labor can increase the consumption of energy-dense food items, contributing to greater dietary diversity (Rahman and Mishra, 2020). Livelihood diversification has also increased the consumption of more diversified food items purchased from markets,

which has played a critical role in improving household dietary diversity (Drewnowski and Popkin, 2009; Pingali, 2007). Furthermore, the importance of markets in providing for and satisfying household dietary needs is now significantly recognized by researchers and policymakers. Well-functioning markets are a prerequisite for income pathways to dietary diversification and may be critical to food provisioning even in areas characterized by subsistence agriculture (Zanello *et al.*, 2019). Therefore, this study aims to examine the relationship between household livelihood strategies and child dietary diversity in rural Ethiopia.

6.2. Materials and Methods

6.2.1. Data sources

To collect the necessary data for this study, the researchers used a survey administered to a sample of respondents. The survey was conducted by trained enumerators who were selected based on their prior experience in data collection and their familiarity with the research areas. The enumerators were provided with the necessary training on the interview schedules before they were given the task of administering them to the sample respondents. The researchers closely supervised the enumerators throughout the survey to ensure that the data collected was of high quality and met the study's requirements.

6.2.2. Sampling Techniques and Sample Size Determination

The sampling strategy for this study involved two stages. In the first stage, the Arsi Negele *woreda* in the West Arsi zone was purposefully selected based on convenience and the researcher's experience in accessing relevant data. In the second stage, stratified random sampling was used. *Kebeles* were stratified based on the nature of the dominant livelihood activities (diversification options). Simple random sampling was used to select sample households from each stratum. Finally, purposive sampling was used to select households with children from within the stratified *kebeles*. The sample size was determined using Yamane's formula (Yamane, 1967), expressed as follows:

$$n = \frac{N}{1+N(e)^2} \dots\dots\dots (1)$$

Where N is the population size and e is the level of precision. In 2022, the population of the *woreda* is 398,551, which consists of 196,321 males (49.3%), and 202,230 females (50.7%). Taking the "e" the level of precision to be 5%, the total sample size is around 398. However, in our study, the sample size is 401. Three more questionnaires were distributed to an enumerator, and since the minimum representative sample as per the calculation was 398, and three additional samples would not have a significant effect on estimation, we did not drop them from the sample.

6.2.3. Methods of Data Analysis

Assessing the dietary diversity of individuals involves evaluating the variety of different food groups consumed within a specific recall period, a seven-day recall. The minimum dietary diversity (MDD) for children aged 6–59 months is a widely used individual dietary diversity index that serves as a rough proxy for diet quality and nutrient adequacy (FAO & FHI, 2016). MDD indicates the lowest number of food groups to be acquired by children within a specific reference period when adequate nutrition can be measured by assessing access to dietary diversity, as suggested by Deaton and Drèze (2009).

In the context of combating undernutrition, Gopalan (1992) suggests two practical approaches for measuring undernutrition: anthropometric data collection or surveys of diets. For this study, we focused on dietary survey methods. We collected data on the types and frequency of food consumed by the children within the last seven days immediately before the day of the interview by interviewing the sample households. We assessed eight types of food sources, including grain or cereal food, vitamin A-rich food, other fruits and vegetables, meat, poultry, and fish food sources, eggs, pulses, legumes, nuts, milk and milk products, and oil used in cooking food. Using the counting approach, we evaluated the food frequency and types of food groups consumed by the children within the reference period to determine their dietary intake status as low, medium, or high. Following the Kennedy *et al.* (2013) dietary guideline, we classify a child's dietary diversity as low if it is less than or equal to three food groups; medium if a child consumes four to five food groups; and high if a child's dietary intake is greater than or equal to six food groups. Adequately to assess the child's dietary diversity, it is crucial to have an understanding of common nutrition adequacy measurements (Oldiges, 2017).

The determinants of child dietary diversity were analyzed using the ordered probit model. The model is built based on the latent regression, and specified as follows (Greene, 2018):

$$y^* = x'\beta + \varepsilon.$$

where y^* the exact but unobserved dependent variable (the exact level of dietary diversity by the dietary diversity score); x is the vector of independent variables; and β is the vector of regression coefficients that we wish to estimate. Furthermore, suppose that while we cannot observe, we can only observe the categories of response:

As usual, y^* is unobserved. What we do observe is

$$y = \begin{cases} y = 0 & \text{if } y^* \leq 0 \\ = 1 & \text{if } 0 < y^* \leq \mu_1 \\ = 2 & \text{if } \mu_1 < y^* \leq \mu_2 \\ \vdots & \\ = J & \text{if } \mu_{J-1} \leq y^* \end{cases}$$

which is a form of censoring. The y 's is an unknown parameter to be estimated with β . We assume that ε is normally distributed across observations.

6.3. Results and discussion

6.3.1. Results

This study examined the linkage between household livelihood strategies and child dietary intake patterns (as measured by dietary diversity). Dietary diversity is defined as the range of food groups consumed by an individual or a household over a particular reference period, and it is often used as an indicator of nutrient adequacy (FAO, 2013). The Individual Dietary Diversity Score (IDDS) method was utilized to assess child dietary diversity, which involved collecting data on the various food groups consumed by children over the previous seven days (Kennedy *et al.*, 2011).

To understand the relationship between children's food consumption patterns during the reference period and household socioeconomic characteristics, the chi-square test was employed. Analysis of the summary statistics for the food consumed by the children in the seven days preceding the survey day revealed a mean dietary diversity score of 4.01 with a standard deviation of ± 2.14 (Table 6.1). This indicates that children in the study area consume an average of four different types of food groups per day.

Table 6.1: Summary results of child food consumption

Child poverty status	Obs	Mean	Std. Err.	Std. Dev.	t value	p value
MD non-poor	59	5.220339	.24898	1.91246	t = 4.819	0.000***
MD poor	342	3.804094	.11423	2.11258		
Total	401	4.012469	.1069568	2.141809		

Source: Based on our survey data from 2021

Figure 1 presents the percentage distribution of food consumption by children in the study area during the previous day preceding the survey. The study assessed the types and frequency of foods consumed by children to estimate their dietary diversity. The food groups considered in the study include cereal foods, vitamin A-rich fruits and vegetables, other fruits and vegetables, meat, eggs, pulses/legumes/nuts, milk, milk products, and oil and fats.

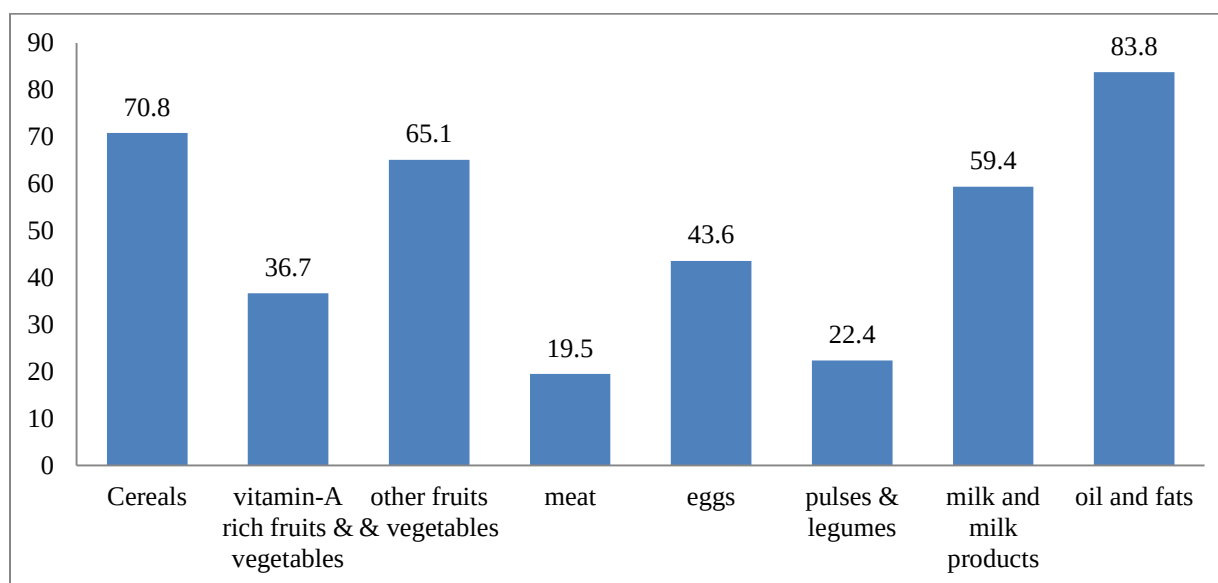


Figure 6.1: The percentage distribution of child dietary intake

Figure 1 reveals that oils and fats are the most commonly consumed food groups, with approximately 84% of children consuming them within the seven-day reference period. Cereal sources are also widely consumed, with approximately 70.8% of children getting their nutrition from them. Other fruits and vegetables are consumed by a significant number of children (65.1%). However, the consumption of meat, pulses, and legumes is relatively low. There is also a low level of consumption of vitamin A-rich fruits and vegetables in the study area.

Similarly, a study conducted in Sinan Woreda, Ethiopia, revealed a low level of consumption of meat, eggs, vitamin-A-rich fruits, and vegetables (Habtam, Tebikew, and Muluken, 2018). Furthermore, the consumption of meat, poultry, and fish is lower in Ethiopia than in some other African countries. According to a Food and Nutrition Technical Assistance Project (FANTA) report (2004), only 13% of Ethiopian children consume meat, poultry, or fish within 24 hours. These findings are consistent with those of Pritchard *et al.* (2018), who reported that children in their study area consume very little meat. In terms of the most commonly consumed food groups, cereals, other fruits and vegetables, oils and fats, and milk and milk products stand out. However, the low consumption of meat, poultry, and fish food sources may suggest inadequate intake of essential nutrients.

6.3.1.1. Household livelihood strategies and the extent of a child's dietary intake

Based on the number of food groups consumed by children in the previous seven days, the extent of dietary diversity intake was classified as low, medium, or high (Figure 6.2). A child's dietary diversity is low if it is less than or equal to three food groups, medium if a child consumes four to five food groups, and high if a child's dietary intake is greater than or equal to six food groups. Figure 2 depicts the state of child dietary diversity in terms of livelihood strategies.

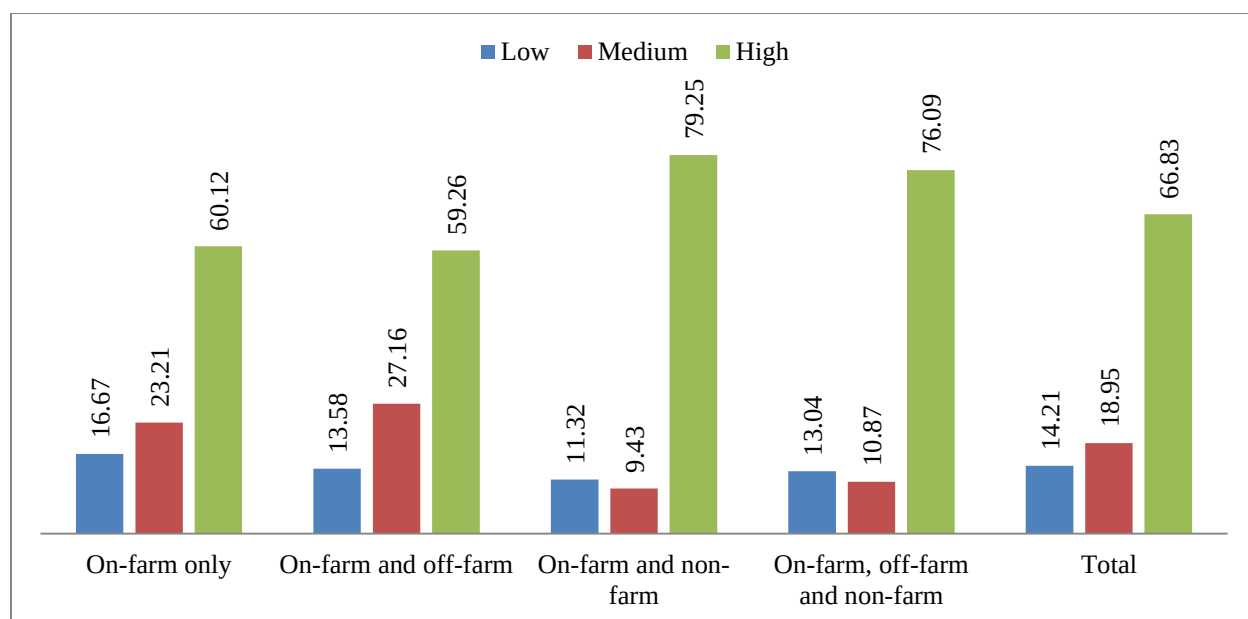


Figure 6.2: Percentage distribution of child dietary intake by household livelihood strategies

The results showed that approximately 67% of children consumed a high level of dietary diversity, while nearly 19% and 14% of children consumed medium and low levels of dietary diversity, respectively. The diversification of livelihoods had a significant impact on the dietary diversity of children. Livelihood combinations, including on-farm and off-farm, on-farm and nonfarm, and on-farm, off-farm, and nonfarm combinations, showed a higher extent of high dietary diversity intake than on-farm-only households did. This indicates that livelihood diversification contributes significantly to child dietary diversity. Additionally, the proportion of children acquiring a high level of dietary diversity was greater for households practicing nonfarm activities than for those relying solely on on-farm sources.

Table 6.2: The percentage of the level of dietary diversity by household livelihood strategy

Livelihood strategies	The % of the level of dietary diversity			Total	χ^2 -value	p-value
	Low	Medium	High			
on-farm only	16.67	23.21	60.12	168	17.406	0.008***
on-farm and off-farm	13.58	27.16	59.26	81		
on-farm and nonfarm	11.32	9.43	79.25	106		
on-farm, off-farm, and nonfarm	13.04	10.87	76.09	46		
Total	14.21	18.95	66.83	401		

The above table 6.2 shows that household livelihood strategies have a significant association with the level of child dietary diversity. When a household engages in multiple livelihood activities, its contribution to child dietary diversity is higher. A few studies on livelihoods and dietary linkages have shown that on-farm activities are crucial to dietary diversity. According to Pritcharda *et al.* (2019), landholding households have higher dietary diversity than landless households. Similarly, LIFT (2013) found that land holding is one of the most important assets affecting dietary diversity in the study area. Pritcharda *et al.* (2019) also further differentiated their findings in two different seasons. Their findings suggested that for ‘good times’, which is during the harvest time, there is no statistically significant association between landholding and dietary diversity since most households consume from their production. However, the important role of nonfarm livelihoods is in ‘hard times’, which exhibits seasonal smoothing. Our finding is also consistent with this empirical evidence, which shows the important role of livelihood diversification in child dietary diversity. The combination of on-farm with non-farm activities shows a higher association with child dietary diversity in the study area.

6.3.1.2. *The association between child dietary diversity and household socioeconomic and demographic characteristics*

The level of dietary diversity among children is influenced by household socioeconomic and demographic characteristics (Table 6.3). Male-headed households have a higher percentage (71%) of children consuming a high level of dietary diversity than female-headed households (41%), while female-headed households have a higher percentage of children consuming low- and medium-diversified diets. This association between the level of child dietary diversity and the gender of the household head is statistically significant ($p = 0.001$), consistent with Sarkar's (2014) findings. Children with medium and high dietary diversity are more likely to be in households headed by individuals aged 22–32 years old, while the level of high child dietary diversity intake decreases as the age of the household head increases. The lowest level of high child dietary diversity intake is observed in households headed by individuals over 65 years old. The relationship between the level of child dietary diversity intake and the age of the household heads is statistically significant ($\chi^2 = 21.821$; $p = 0.001$).

Table 6.3 shows that the marital status of the household head is an important factor that affects a child's nutritional status in the study area. The majority of household heads are married, while only a small percentage are divorced or single. Children living in married households generally have better access to a diverse diet than those living in single-parent households. The chi-squared test ($\chi^2 = 13.299$; $p = 0.039$) indicates a significant association between child dietary diversity and household headship.

Table 6.3: Household head characteristics and the level of child dietary diversity

Characteristics of Household Heads		Level of child dietary diversity (%)			Total (N)	χ^2 -value	p-value
		Low	Medium	High			
Sex of household head	Male	11	18	71	350	24.67	0.000***
	Female	35	24	41	51		
Age category of the household head	22-32	14	29	69	72	21.82	0.001***
	33-51	16	16	68	282		
	52-65	26	16	58	43		
	>65	25	50	25	4		
Household head's educational level	Illiterate	18	24	58	83	3.83	0.148
	Literate	13	18	69	318		
Marital status of the household head	Single	40	40	20	5	13.30	0.039**
	Married	14	19	67	351		
	Divorced	4	8	88	26		
	Widow/er/	26	21	53	19		
Health status of the household head	Excellent	15	7	78	101	48.85	0.000***
	Very good	14	8	78	132		
	Good	14	33	53	129		
	Fair	16	38	46	37		
	Poor	0	50	50	2		
	Undiversified	21	34	45	58		
	Less diversified	15	31	54	13		
The level of livelihood diversification	Moderately diversified	15	31	54	101	42.03	0.000***
	Highly diversified	12	9	79	224		
	very highly diversified	2	20	60	5		
Livelihood activity participation category	1-3 activities	9	55	36	56	67.32	0.000***
	4-6 activities	16	20	64	135		
	7-9 activities	16	9	75	169		
	10-11 activities	7	5	88	41		
Total (N)		57	76	268	401		

*** and ** are significant at 1% and 5%, respectively.

As evident in Table 6.3, the health of the household head is also critical to providing children with a diverse diet. Children living in households with better health conditions have better access to highly dietary-diverse food. The chi-squared test ($\chi^2 = 48.850$; $p < 0.001$) also shows a significant association between the household head's health and the level of dietary diversity among children. The percentage of children receiving high-dietary diversity foods is particularly high for households with excellent and very good health conditions (78% for both types of health conditions).

Additionally, the level of livelihood diversification and the number of livelihood activities that households engage in are also significant factors affecting the level of dietary diversity in children. For households with very highly diversified livelihoods, the percentage of children receiving a highly diverse diet is significantly higher. The study's findings suggest that livelihood diversification plays a crucial role in promoting dietary diversity among children.

These results are consistent with previous research, such as the study by Sarkar (2014), which also found a significant relationship between household characteristics and child dietary diversity. Overall, the study highlights the importance of considering household characteristics, such as household headship, health, and livelihood diversification, when developing strategies to improve child nutrition and promote dietary diversity.

6.3.2. Discussion

This study examined the association between household livelihood strategies and child dietary diversity. Various factors were identified to affect child dietary diversity in the study area. Among these factors, livelihood diversification was found to play a major role in child dietary diversity. Some empirical studies have also recorded a positive relationship between household livelihood diversification and dietary diversity (Koppmair *et al.*, 2017; Remans *et al.*, 2011). This study found that households engaged in various livelihood activities, such as farming, livestock rearing, and nonfarm income-generating activities, had a higher level of dietary diversity for their children. The health status of the household head is also an essential factor in determining the child's dietary diversity. Children living in households with better health conditions for the household head had higher access to highly diversified food, while children

living in households with poor health conditions had less access to a diverse diet. This result is consistent with other studies that have shown a relationship between household health status and child nutritional outcomes (Frongillo *et al.*, 2017).

6.3.2.1. Determinants of child dietary intake

Table 37 presents the marginal effects of the ordered probit model used to analyze the determinants of child dietary diversity. The results indicate that several factors significantly affect the likelihood of children's highly diversified dietary consumption. The analysis suggests that children from female-headed households are less likely to consume a diverse diet than children from male-headed households. The results show that children from female-headed households increase the probability of consuming low dietary diversity by 17.9% and medium dietary diversity by 19.5% while decreasing the probability of consuming high dietary diversity food by 37.5% compared with children from male-headed households. Empirical evidence has also shown that there is a problem fulfilling the minimum dietary diversity requirement for children living in a female-headed household (Temesgen *et al.*, 2016). To close the child dietary gap between female-headed and male-headed households, focusing on mothers' nutrition education is crucial. Research has shown that nutritional education is expected to broaden the knowledge of mothers, leading to improved child-feeding practices (Oyekale, 2012; Mukabutera *et al.*, 2016). In this regard, mainstream media outlets, especially television and radio, can improve the nutritional outcomes of children because information transmitted through mass media may affect behavior since it is considered trustworthy (Solomon *et al.*, 2017; Dafursa and Gebremedhin, 2019).

The age of the household head is also a significant predictor of the level of dietary diversity among children. The marginal effect indicates that for a one-year increase in the age of the household head, the probability of children's highly diversified foods consumption decreases by 1.4% while increasing the probability of children consuming low- and medium-level dietary diversity foods by 0.7% and 0.8%, respectively, holding all other factors constant. Household heads in the 22–32 and 33–51 age groups were more likely to provide highly diversified foods compared to household heads above the 52 age group. Some studies have also shown that the age of parents, especially mothers' age, is significantly associated with children's dietary diversity

(Belew *et al.*, 2017; Rakotonirainy *et al.*, 2018). This finding suggests that older families are less likely to provide high dietary diversity to their children compared with newly married couples.

Table 6.4: Ordinal probit model outputs for the determinants of child dietary intake

Variables	Level of dietary diversity					
	Low		Medium		High	
	dy/dx	S.E	dy/dx	S.E	dy/dx	S.E
Sex of household head	0.179	0.0417***	0.195	0.0477***	-0.375	0.0807****
Age of household head	0.007	0.0014***	0.008	0.0017***	-0.014	0.0027***
The household sizes	-0.035	0.0089***	-0.038	0.0104***	0.073	0.0178***
Education status of household head	0.058	0.0336*	0.063	0.0372*	-0.120	0.0697*
Marital status of household head	-0.065	0.0263**	-0.071	0.0292**	0.137	0.0537**
Total land holding in hectares	0.058	0.0178***	0.063	0.0205***	-0.120	0.0363***
Distance to the nearest market	-0.003	0.0015**	-0.004	0.0016**	0.007	0.0030**
Total number of livestock in TLU	-0.017	0.0047***	-0.019	0.0056***	0.036	0.0097***
Livelihood strategies	-0.007	0.0116	-0.008	0.0126	0.016	0.0241
Incidence of household poverty	0.033	0.0299	0.035	0.0326	-0.068	0.0622
Total annual income	-9.54e-07	0.0001**	-1.04e-06	0.0001**	1.99e-06	0.0001**
LR chi2(11) = 103.88 Pseudo R2 = 0.1503						
Prob > chi2 = 0.0000 Log likelihood = -293.66228						

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

Several household characteristics significantly affect the likelihood of children consuming highly diversified foods. One such factor is an increase in household size, which usually affects the child's dietary diversity negatively. Some empirical studies have revealed that household size is negatively associated with dietary diversity (Koppmair *et al.*, 2016; Tambe *et al.*, 2023). The percentage of children consuming low dietary diversity is higher for household sizes ranging between 1 and 5 members (Keyata *et al.*, 2022). Another study in Gansu Province of China reported that an increase in household size is one of the major causes of child stunting and wasting (Liu *et al.*, 2023). However, some of these studies did not disaggregate dietary diversity into different levels. In the current study, it was identified that household size is a significant predictor of the level of dietary diversity in food consumption among children. Being in a larger household may sometimes reduce dietary diversity and food consumption. However, a household with highly economically active members may also increase the probability of children's high

dietary diversity and diversified food consumption, considering that household members are actively involved in income-generating activities and contribute to household well-being. The result from the model showed that a unit increase in household size increases the probability of children's high dietary diversity food consumption by 7.3%, while it decreases the probability of children falling into low and medium dietary diversity by 3.5 and 3.8%, respectively.

The study also finds that the type of family marital status affects the dietary diversity of children. Children from married households with pooled incomes receive better diets. In contrast, children from unmarried household heads had lower dietary diversity than children from other marital statuses. Being from a family coupled with marriage increases the likelihood of consuming a highly diversified diet by 13.7%, while it decreases the probability of consuming a less diversified and mildly diversified diet by 6.5% and 7.1%, respectively. The finding of the current study is consistent with Dinku *et al.* (2020), who identified that the highest percentage of children living in households coupled with marriage are by far better off than children living with unmarried, divorced, or widowed parents in terms of dietary diversity. Similarly, Aboagye *et al.* (2021) identified that married partners have better child nutrition status than widowed and divorced household heads. Access to land is continuously declining in the country with an increase in population.

Some studies on the linkage between agricultural production and diet revealed that there is a significant association between agricultural production and dietary diversity in general. For example, Muthini *et al.* (2020) found that crop production and animal rearing have a significant association with household and women's dietary diversity in Kisii and Nyamira Counties in Kenya. In contrast, the study found that child dietary diversity is not associated with any of the indicators of farm production diversity. Other researchers from India reported that there are no specific crops except cash crops associated with increased child dietary diversity (Singh *et al.*, 2020). Currently, increasing demand for agricultural production motivates farmers to focus more on producing for the market than on household consumption. In this study, the result showed that for a unit increase in land per hectare, the probability of children consuming foods with high dietary diversity decreases by 12.0%; on the other hand, it pushes households to supply fewer and mildly diversified diets to their children by 5.8% and 6.3%, respectively.

Studies show that distance to market has a significant effect on child dietary diversity. Distance to the market has a negative relationship with children's dietary diversity (Otekunrin *et al.*, 2021). Another study also showed that distance to the nearest market has a significant and negative association with household dietary diversity. However, it did not show a significant association with child dietary diversity (Muthini *et al.*, 2020). In the current study, the results revealed that a unit increase in distance to the nearest market by kilometers reduces the probability of children consuming a less and moderately diversified diet by 2.6 and 2.9%, respectively, while it increases the probability of being in high dietary diversity categories by 2.4%. Livestock production is important for household livelihood diversification and child dietary diversity. Children of households producing livestock have higher levels of dietary diversity than those of households with nonproducing livestock. The marginal effect showed that being a child of a household producing livestock increases the probability of high dietary diversity by 3.6%, while its probability for low and medium categories decreases by 1.7 and 1.9%, respectively. Household education is also one of the factors affecting child dietary diversity. Several studies have shown that there is a positive association between household head and child dietary diversity. Specifically, studies have found a positive association between mothers' educational background and children's nutrition (including higher dietary diversity) in other developing economies (Abuya *et al.* 2011; Frempong and Annim 2017; Rakotonirainy *et al.* 2018; Custodio *et al.* 2019). The education of mothers is vital in determining how diverse the diets of their household would be, especially for young children (Custodio *et al.* 2019).

Similarly, the study finds that household total annual income has a significant effect on the level of dietary diversity among children. An increase in income at the household and national levels is correlated with a decrease in overall undernutrition (Haddad *et al.*, 2003). Off-farm income is significantly associated with household dietary diversity (Muthini *et al.*, 2020). Another study showed that income diversity is the most important factor for children's dietary diversity in Gujarat (Singh *et al.*, 2020). Similar to several empirical studies, the current study also finds that being the child of a household with a higher aggregate livelihood income is in favor of decreasing the probability of consuming low dietary diversity by -9.54 to -07%. In sum, this study highlights the importance of household characteristics, such as family size, marital status, landholding, livestock production, and total annual income, in determining child dietary

diversity. Policymakers can use these findings to design targeted interventions to improve child nutrition and health outcomes in vulnerable households.

6.3.3. Conclusions

The study aimed to investigate the relationship between household livelihood strategies and child dietary diversity in Arsi Negelle Woreda, Oromiya Regional State. Descriptive statistics revealed that 14% of children consume low-diversified food, 19% consume medium-diversified food, and 67% consume high-diversified food. Oil and fats are consumed by nearly 84% of children within seven days, and cereal sources are the most common source of nutrition for approximately 70.8% of children. The study found that household demographic factors, such as the gender of the household head, age, marital status, and health status, have a significant impact on the level of child dietary diversity. Female-headed households were found to have a higher percentage of children consuming low-diversified food compared to male-headed households. Similarly, as the age of the household head increases, child dietary diversity decreases. The study also found that household livelihood strategies and total annual income significantly contribute to child dietary diversity in the study area. Moreover, the findings suggest that child dietary diversity and household livelihood diversification significantly contribute to reducing child nutrition. Meat, pulses, and legumes were among the least consumed food sources, highlighting the need to increase the consumption of these nutrient-rich foods. Overall, the study emphasizes the importance of improving household livelihood diversification and addressing household demographic factors to improve child dietary diversity and reduce multidimensional child poverty.

The findings suggest that there is a positive association between household livelihood diversification and child dietary diversity. The results indicate that children in households with diversified livelihoods tend to have more diverse diets. Overall, this study provides evidence that household livelihood diversification is a potential strategy to improve child dietary diversity, thereby enhancing the nutritional status of children in rural areas. It is recommended that future studies further explore the relationship between livelihood diversification and child nutrition outcomes to identify effective interventions that can be implemented to promote livelihood diversification and improve child nutrition.

CHAPTER SEVEN: SYNTHESIS AND RECOMMENDATIONS

7.1. Synthesis

The status of livelihood diversification

Rural households in sub-Saharan Africa often engage in diverse livelihood activities to generate the means for household survival. The research questioned to understand the types and the status of rural livelihood strategies in the study area (paper I). The study categorized livelihood strategies into on-farm, off-farm, and non-farm activities. Households diversify their livelihoods to manage risks and take advantage of synergies across different income sources. The survey results showed that, except for on-farm only, no other livelihood activities were practiced solely, indicating that on-farm is the major livelihood activity, and other livelihood strategies are allied activities. The results show that the combination of on-farm and non-farm activities is the largest contributor, accounting for 34% of total household income. On-farm, off-farm, and non-farm activities together contribute 29% of income, while on-farm-only and on-farm and off-farm activities contribute 19% and 18%, respectively. Crop production is a major on-farm activity in the study area. Maize is the most important cereal crop, accounting for 34% of total crop production. Other major crops include wheat (31%), teff (22%), barley (3%), and sorghum (1%). Livestock production is also a significant component of livelihoods, with households owning an average of 4.3 tropical livestock units (TLU), including cattle, oxen, sheep, goats, poultry, horses, and donkeys.

The study used the Simpson Diversity Index to measure the extent of livelihood diversification among the sampled households. The results show that the majority of households (56%) have adopted highly diversified, engaging in a wide range of livelihood activities. Another 25% have moderately diversified, while 14.5% are undiversified, relying on a single income source.

Household Livelihood Strategies and Determinants

Livelihood diversification can be defined as the process by which individuals and households construct a diverse portfolio of activities and social support capabilities to improve their standard of living and reduce environmental risk (Ellis, 1997; Hussein and Nelson, 1999). This goes

beyond just income diversification, as it includes on-farm activities like value addition, as well as off-farm and non-farm activities. The research questioned the determinants of livelihood diversification (paper II). Two main forces "push" and "pull" motivate livelihood diversification. Households may diversify to reduce risks or enhance returns from their livelihoods. Push factors include labor supply constraints, crises, and high transaction costs, while pull factors include the desire to increase incomes and improve living standards.

The study uses the Simpson Diversity Index to measure the status of livelihood diversification among households. The index ranges from 0 (no diversification) to 1 (complete diversification), based on the number of income sources and their relative contributions. The study identified five levels of livelihood diversification: undiversified, less diversified, moderately diversified, highly diversified, and very highly diversified.

The research found that various factors affect livelihood diversification in the study area. Among these factors, the age of the household is the one that affects livelihood diversification. The result from the analysis revealed that older household heads are more likely to rely on on-farm activities only. It is found that male-headed households are more likely to engage in diversified livelihood activities compared to female-headed households. This is attributed to the male dominance in agricultural activities and the limited non-farm opportunities available to women due to reproductive responsibilities. Educated household heads are more likely to adopt diverse livelihood strategies than uneducated ones. Formal education enhances the knowledge and skills needed to engage in entrepreneurship and modern agricultural practices, enabling greater livelihood diversification. The health status of the household head is strongly linked to livelihood choices. Respondents with poor health conditions tended to rely on undiversified livelihood activities, while those in excellent or good health were more likely to engage in multiple livelihood sources. Larger families tend to engage in more diversified livelihood strategies, households with larger landholdings are less likely to diversify their livelihoods, and adopting irrigation practices reduces the probability of engaging in non-farm activities. The size of land holdings and the number of livestock owned by a household are important determinants of diversification. Larger landholdings encourage specialization in on-farm activities, while more livestock ownership promotes diversification into non-farm enterprises. Access to markets,

extension services, and transportation infrastructure also play a key role. Households with better market access and lower transportation costs are more likely to engage in diversified livelihood strategies that include off-farm and non-farm activities.

Child Poverty and Its Determinants

This study examines the widespread and persistent issue of child poverty, particularly in developing countries. The research posed questions to understand the status and determinants of child poverty in the study area (paper III). Child poverty has serious and far-reaching consequences, both for the children themselves and for society as a whole. Children who grow up in poverty are at a higher risk of poor health outcomes, including malnutrition, stunted growth, and infectious diseases. They are also more likely to drop out of school, experience social exclusion, and become trapped in a cycle of poverty that can last for generations. Therefore, it is crucial to understand the state and causes of child poverty in specific areas like the Negele Arsi woreda to design effective policies and interventions to combat child poverty.

The study adopted a multidimensional approach to assess child poverty, considering indicators such as nutrition, health, education, information, shelter, water, sanitation, fuel and energy, and household income. The study found that approximately 85% of children in the study area are multidimensionally poor, highlighting the widespread and persistent nature of child poverty in the *woreda*. Dietary diversity was used to assess child nutrition, and the results showed that a significant proportion of children were deprived of essential nutrients, particularly from vitamin A-rich sources and other fruits and vegetables. Child health indicators, such as skilled birth attendance and immunization, were analyzed, revealing that a large number of children were born to unskilled health attendants and lacked access to essential vaccinations. For children aged 6-18 years, education and access to information sources like radio, television, and mobile phones were assessed, highlighting significant disparities between multidimensionally non-poor and poor children.

The study found household factors affecting child poverty such as the age, education, and health status of the household head, as well as the household's livelihood strategies, had a significant impact on child poverty. For example, households with older, less educated, and less healthy

heads were more likely to have multidimensionally poor children. The household's asset base, particularly land and livestock holdings, played a crucial role in determining child poverty. Larger landholdings and more livestock were associated with a lower probability of children being multidimensionally poor. While household income was found to be a significant determinant of child poverty, the study also highlighted that the willingness to invest in children's needs, such as education, health, and nutrition, was an important factor in determining children's well-being.

The study also found child-specific factors affecting poverty. Inadequate dietary diversity, particularly the lack of access to vitamin A-rich foods and other fruits and vegetables, was a significant contributor to child poverty. Lack of access to skilled birth attendants and essential vaccinations, such as measles and BCG, were major health-related factors affecting child poverty. Poor school attendance, low educational attainment, and limited access to information sources like radio, television, and mobile phones were key factors contributing to child poverty. Deprived living conditions, such as poor housing, lack of access to improved water sources, and limited access to electricity, were also significant determinants of child poverty.

The study found that households with larger landholdings and more livestock were less likely to have multidimensionally poor children, highlighting the importance of asset ownership in reducing child poverty. While household income was a significant determinant of child poverty, the study also emphasized the importance of how households allocate their resources to meet children's needs, such as education, health, and nutrition. The multidimensional approach adopted in the study allowed for a comprehensive understanding of the complex and interrelated factors that contribute to child poverty, including both household-level and child-specific determinants.

Livelihood Diversification and Multidimensional Child Poverty

Livelihood diversification is a complex concept that involves households constructing a diverse portfolio of activities to increase income and reduce risks. While numerous studies have linked livelihood diversification to household poverty reduction, there is limited evidence of its impact on child poverty. This is concerning, as child poverty is often multidimensional, encompassing

deprivation, exclusion, and vulnerability. The study aims to uncover the linkages between household livelihood diversification and the multidimensional aspects of child poverty in the Negele Arsi woreda (paper IV).

Despite global declines in poverty, disparities in poverty reduction across countries remain a policy concern. Children comprise the majority of those living in poverty, with half of the globally multidimensional poor being children. In Ethiopia, approximately 13 million children are estimated to live in poor households, with 2 million in extreme poverty. Children account for more than half of the population living in extreme multidimensional poverty. The study found that 81% of children under the age of five are multidimensionally poor, indicating a high incidence of poverty among the youngest age group. For children aged 6-18 years, the poverty rate is even higher at 82.3%, suggesting that older children face more severe deprivations across multiple dimensions. Disaggregating by gender, the study found that female children are poorer than their counterparts male with 43% of girls under 5 and 42% of girls aged 6-18 being multidimensionally poor, compared to 38% and 41% for boys in the respective age groups.

The study found high rates of education deprivation, with 76% of multidimensionally poor children aged 14 and above not having completed primary school and 89% of poor children aged 5-14 not attending school. Children in the study area face significant deprivation in access to information sources, with 84% of poor children lacking access to television and 52% deprived of telephone access. Overcrowding is a major issue, with 65% of poor children living in households with more than 4 people per room. Poor housing quality, such as substandard flooring and roofing, also affects 70% of multidimensionally poor children. Access to improved water and sanitation facilities is limited, with 18% of poor children deprived of protected water sources and 34% lacking access to improved sanitation.

The study found that poor children rely more heavily on cereal-based diets, with 70% of poor children's diets coming from cereal sources compared to 75% for non-poor children. Poor children have significantly less access to vitamin A-rich fruits and vegetables, with only 62% of poor children consuming these food groups compared to 81% of non-poor children. Milk and dairy product consumption is also lower among poor children, with only 56% of poor children receiving these nutrient-rich foods compared to 78% of non-poor children.

Various factors were found to determine the association between household livelihood diversification and multidimensional child poverty. The study found that increased total land holding was found to have a significant negative effect on multidimensional child poverty, with a 1-hectare increase in land reducing the probability of child poverty by 6.2%. Engaging in off-farm agricultural labor activities was positively associated with child poverty, increasing the probability by 15.8%, as it may divert children from school to support household income. Greater distance to the nearest market was found to decrease the probability of multidimensional child poverty by 0.5%, as it may limit opportunities for non-farm income generation but increase time for childcare. Engaging in petty trading activities was found to decrease the probability of multidimensional child poverty by 18.5%, highlighting the importance of non-farm income sources for improving child well-being. Households involved in charcoal production and selling were also less likely to have multidimensionally poor children, with a 15.1% reduction in the probability of child poverty.

Livelihood Strategies and Child Dietary Diversity in Rural Ethiopia

Nutrition is a crucial component of achieving the Sustainable Development Goals, particularly in ensuring access to safe, nutritious, and sufficient food for vulnerable populations, including infants. However, dietary diversity remains low in developing countries, with inadequate dietary intake being a primary cause of malnutrition. In Ethiopia, most households rely on staple cereal foods and have limited access to nutrient-rich foods, leading to a lack of dietary diversity and high rates of child mortality and malnutrition.

Despite efforts to improve child nutrition, the under-five and neonatal mortality rates in Ethiopia remain high. Studies have shown that changing occupational patterns and livelihood diversification can increase the consumption of energy-dense and diverse food items, contributing to greater dietary diversity. Therefore, this study aims to examine the relationship between household livelihood strategies and child dietary diversity in rural Ethiopia (paper V).

The study assessed child dietary diversity using the Minimum Dietary Diversity (MDD) indicators, which measure the variety of different food groups consumed within a 24-hour recall period. The determinants of child dietary diversity were analyzed using an ordered probit model,

which examined the influence of household characteristics, resources, and livelihood strategies on the level of dietary diversity. The study found that children in the research area consume an average of four different types of food groups per day, with a mean dietary diversity score of 4.01 and a standard deviation of 2.14. Approximately 67% of children received a highly diverse diet, 14% had low-diversified food, and 19% had medium-diversified food.

Children in the study area consume a variety of food groups, including cereals, fruits, vegetables, and oils. However, the consumption of meat, poultry, and fish is relatively low, indicating a need to increase the intake of nutrient-rich foods. Pulses, legumes, and nuts are also consumed at low levels, highlighting the potential for improving dietary diversity. The study found a significant and positive correlation between household livelihood diversification and child dietary diversity. Households engaged in multiple livelihood activities, such as farming, livestock rearing, and non-farm income-generating activities, had a higher level of dietary diversity for their children. Households relying solely on on-farm activities had the lowest percentage of children with high dietary diversity (60.12%). Households with a combination of on-farm, off-farm, and non-farm activities had the highest percentage of children with high dietary diversity (76.09%). Households engaged in non-farm activities, in addition to on-farm sources, had a higher proportion of children with high dietary diversity (79.25%). These findings highlight the importance of livelihood diversification in promoting child dietary diversity and improving overall child nutrition in rural Ethiopia.

Different factors affect child dietary diversity. Household head characteristics, household resources (assets), marital status, education, and health are among the major factors found to affect child dietary diversity. Children from female-headed households are less likely to consume a diverse diet compared to those from male-headed households. Older household heads are also associated with lower child dietary diversity. Larger household sizes, greater distance to markets, and higher land ownership negatively affect child dietary diversity. In contrast, livestock ownership and higher household income positively influence dietary diversity. Children from married households have a higher probability of consuming a highly diverse diet compared to those from unmarried, divorced, or widowed households. Higher education levels of the household head and better health status are associated with increased child dietary diversity.

These findings suggest that a multifaceted approach targeting household characteristics, resources, and livelihood strategies is necessary to improve child nutrition and dietary diversity in rural Ethiopia.

7.2. Conclusion

This study provides valuable insights into the household livelihood diversification status in a rural area of Ethiopia. The findings demonstrate the widespread adoption of diversified livelihood strategies, with the majority of households engaged in a range of on-farm, off-farm, and non-farm activities. The significant contribution of non-farm and diversified income sources to overall household well-being highlights the importance of supporting the development of the rural non-farm economy.

This study has also highlighted the importance of adopting a child-centric perspective in understanding the relationship between household livelihood diversification and child poverty. By considering the multidimensional nature of child poverty, the study aims to provide insights that can inform more effective and inclusive policies and interventions to address the complex challenges faced by children in poverty. Moving forward continued research and a holistic approach are crucial to ensuring that the needs and experiences of children are at the forefront of efforts to alleviate poverty and promote sustainable development.

7.3. Recommendations

By implementing the following recommendations, policymakers and development practitioners can help rural households in the study area further diversify their livelihoods, manage risks more effectively, and improve their overall well-being and resilience.

- ❖ Invest in the development of the rural non-farm economy to provide more diverse income opportunities for rural households.
- ❖ Enhance access to education, vocational training, and extension services to enable rural households to diversify their livelihood activities.
- ❖ Improve access to financial services, such as credit and savings, to support rural households in investing in diversified livelihood strategies.
- ❖ Implement age and gender-specific interventions to address child poverty

- ❖ Promote livelihood diversification programs that consider children's needs
- ❖ Improve access to education, information, water, and sanitation for rural children
- ❖ Further research is needed to deepen the understanding of the complex linkages between household livelihood strategies and the various dimensions of child poverty, particularly in diverse cultural and socioeconomic contexts.

Additionally, interventions targeting household demographics, including female empowerment, education, and health, can contribute to improving child dietary diversity. Strengthening market access and infrastructure can also play a crucial role in increasing the availability and affordability of diverse food items. Therefore, there is a need to:

- ❖ Promote diverse livelihood strategies to improve child dietary diversity
- ❖ Address gender, education, and health disparities to enhance child nutrition
- ❖ Improve market infrastructure and connectivity to increase food diversity

The findings from this study can also inform policymakers and development practitioners on the need to adopt a child-centric approach in designing livelihood interventions and poverty alleviation strategies. Addressing child poverty requires a comprehensive understanding of the multidimensional nature of children's well-being, going beyond just income-based measures to include deprivation, exclusion, and vulnerability.

7.4. Contributions of the Study (Policy Implications)

The findings of this study highlight the importance of livelihood diversification for rural households in the study area. The high degree of diversification observed, with the majority of households engaged in a range of on-farm, off-farm, and non-farm activities, suggests that households are actively seeking to manage risks and expand their income sources. The significant contribution of non-farm and diversified activities to household income underscores the need to support the development of the rural non-farm economy, which can provide important employment and income opportunities, particularly for women and the poor. Policies and interventions that facilitate access to education, skills training, and financial services can help strengthen rural households' ability to diversify their livelihoods and improve their overall well-being.

The study findings suggest the need for interventions to support and promote female-headed households' access to diverse livelihood opportunities, as they tend to be more constrained in livelihood diversification. Establishing a reliable agricultural input supply system, especially for remote farmers, can enhance their ability to engage in diversified on-farm and off-farm activities, thereby improving overall livelihood resilience. Given the growing importance of non-farm activities in supporting rural livelihoods, policymakers should prioritize investments and interventions to promote the development of the non-farm sector in addition to the agricultural sector.

The findings also highlighted the need for a holistic, multidimensional approach to address child poverty in the study area. Targeted interventions and policies should focus on improving access to diverse and nutrient-rich foods, healthcare, education, and basic services to enhance children's well-being. Empowering households through asset-building and income-generating activities can also contribute to sustainable child poverty reduction. By adopting a multidimensional approach to assessing child poverty and identifying its key determinants, this study provides valuable insights for policymakers and stakeholders to develop effective strategies to address the persistent challenge of child poverty in the Negele Arsi *woreda* and similar contexts. A comprehensive, multi-faceted approach targeting both household-level and child-specific factors is essential to achieve sustainable child poverty reduction and ensure a brighter future for all children.

Supporting off-farm and non-farm income-generating activities to improve household access to diverse foods is needed. Empowering women, improving education, and enhancing health positively to influence child nutrition are found to be essential to support households and child dietary status. Investing in market infrastructure and connectivity to increase the availability and affordability of diverse food items is needed. By implementing a comprehensive approach targeting livelihood strategies, household factors, and market access, policymakers can effectively address child malnutrition and promote sustainable development in rural Ethiopia.

7.5. Suggestions for future research

Based on the key findings, scope, and limitations of this study, some key future research recommendations are provided. There is a need to:

- ❖ Expand the study to cover a wider geographic area, allowing for a more comprehensive understanding of livelihood diversification patterns and their determinants across different regions.
- ❖ Conduct a longitudinal study to capture the dynamic nature of livelihood strategies and how they evolve in response to the changing socioeconomic and environmental conditions.
- ❖ Broadly incorporate qualitative research methods to gain deeper insights into the motivations, perceptions, and decision-making processes underlying household livelihood choices.
- ❖ Evaluate the effectiveness of policy interventions aimed at promoting livelihood diversification and assess their impact on the well-being of rural households.
- ❖ This study adopted a dietary diversity approach to understand child nutrition status. There is a need to apply the mixed approach such as the inclusion of anthropometric methods, and bio-chemical and clinical methods to deepen the understanding of child nutrition in line with households' socio-economic activities.

REFERENCES

- A. Soltani., Angelsen A., Eid, T., Saeid M., Naieni N., and Shamekhi T. 2012. Poverty, sustainability, and household livelihood strategies in Zagros, Iran. *Journal of Ecological Economics*, 79 (2012): 60–70
- Abera A., Teshome Y. and Abera U. (2021). Determinants of rural livelihood diversification strategies among Chewaka resettlers’ communities of southwestern Ethiopia. *Agriculture & Food Security*, 10 (30): 1-19.
- Abimbola O. Adepoju and Olaniyi O. Oyewole, (2014). Rural Livelihood Diversification and Income Inequality in Local Government Area Akinyele, Ibadan, Oyo State, Nigeria. *Journal of Agricultural Sciences*, 59: 175-186.
- Aboagye, R.G., Seidu, A. A., Ahinkorah, B.O., Arthur-Holmes, F., Cadri, A., Dadzie, L.K., Hagan, J.E., Jr., Eyawo, O., Yaya, S. (2021). Dietary Diversity and Undernutrition in Children Aged 6–23 Months in Sub-Saharan Africa. *Nutrients*, 13, 3431. <https://doi.org/10.3390/nu13103431>.
- Abuya B., Onsomu E., Kimani J., Moore D. (2011). Influence of maternal education on child immunization and stunting in Kenya. *Maternal Child Health J*, 15:1389–1399
- Access: Livelihood Support Programme; Working Paper No. 9; Food and Agriculture Organization. <http://www.fao.org/DOCREP/006/AD689E/AD689E00>.
- ACPF (African Child Policy Forum) (2013). Definition of the Child: The International/Regional Legal Framework. Available at: <http://www.africanchildforum.org>
- Adepoju, A.O. & Obayelu, O.A. (2013). Livelihood Diversification and Welfare of Rural Households in Ondo State, Nigeria. *Journal of Development and Agricultural Economics*, 5(12): 482-489.
- Ahmed M.T., Bhandari H., Gordoncillo P.U., Quicoy C.B., and Carnaje, G. P. (2018). Factors Affecting Extent of Rural Livelihood Diversification in Selected Areas of Bangladesh. *SAARC J. Agri.*, 16(1): 7-21 (2018). DOI: <http://dx.doi.org/10.3329/sja.v16i1.37419>.
- Ajakaiye, O., A.T. Jerome, O. Olaniyan, K. Mahrt, and O.A. Alaba (2014). ‘Multidimensional Poverty in Nigeria: First Order Dominance Approach’. WIDER Working Paper 2014/143. Helsinki: UNU-WIDER.
- Alemu, B. A., Nuppenau, E. & Boland, H. (2008). Technical Efficiency of Farming Systems across Agro-ecological Zones in Ethiopia: An Application of Stochastic Frontier Analysis.
- Alemu, Z.G., (2012). Livelihood strategies in rural South Africa: Implications for poverty reduction, Zarihun Gudeta Alemu, Foz do Iguacu.

- Ali, M. and Peerlings, J. (2012). Farm households and non-farm activities in Ethiopia: Does clustering influence entry and exit? *Agricultural Economics*, Vol. 43, pp. 253–266.
- Alkire S., Jindra C., Robles G. and Vaz A. (2017). Children's Multidimensional Poverty: Disaggregating the global MPI. OPHI Briefing 46; May 2017.
- Alkire. S., J. E. Foster, S. Seth, M. E. Santos, J. M. Roche and P. Ballon, (2015). Multidimensional Poverty Measurement and Analysis, Oxford: Oxford University Press, ch. 4.
- Alobo Loison, S. (2015). 'Rural livelihood diversification in sub-Saharan Africa: a literature review.' *The Journal of Development Studies*, 51(9): 1125–38.
- Alula, P., Woldehanna, T., Araya, M., Tafere, Y., Rossiter, J., Tiumelissan, A. and Birhanu K., (2018). *Young Lives Ethiopia: Lessons from Longitudinal Research with the Children of the Millennium*. Young Lives: Addis Ababa.
- Amao, O. J., Ayantoye, K., Fanifosi, E. G. (2017). An analysis of multidimensional poverty and its determinants in rural Nigeria. *Journal of Development and Agricultural Economics*, 9(11): 303-311.
- Amare Molla Dinku (2018). Determinants of livelihood diversification strategies in Borena pastoralist communities of Oromia regional state, Ethiopia. *Journal of Agriculture & Food Security*, Vol. 7(41), 1-8. Accessed at <https://doi.org/10.1186/s40066-018-0192-2>.
- Amogne Asfaw, Belay Simane, Ali Hassen & Amare Bantider (2017). Determinants of non-farm livelihood diversification: evidence from rainfed-dependent smallholder farmers in north-central Ethiopia (Woleka sub-basin). *Development Studies Research*, 4(1): 22-36, DOI: 10.1080/21665095.2017.1413411
- Ana Damena and Demmelash Habte (2017). Effect of Non-farm Income on Rural Household Livelihood: A Case Study of Moyale District Oromia Regional State, Ethiopia. *American Scientific Research Journal for Engineering, Technology, and Sciences*, Volume 33(1): pp 10-36.
- Andersson, A. D., Mawunyo, F. D., and Cuthbert A. I., (2018). *Agriculture, Diversification, and Gender in Rural Africa: Longitudinal Perspectives from Six Countries*. Oxford University Press: Great Clarendon Street, Oxford.
- Annabel Erulkar and Abebaw Ferede, (2009). Social Exclusion and Early or Unwanted Sexual Initiation among Poor Urban Females in Ethiopia. *International Perspectives on Sexual and Reproductive Health*, Vol. 35, No. 4; 186-193.
- Ann G. and Craig C. (2001). *Rural Non-farm Activities and Poverty Alleviation in Sub-Saharan Africa. Policy Series 14*. University of Greenwich: Greenwich

- Arimond, M., and M. T. Ruel. (2004). "Dietary Diversity Is Associated with Child Nutritional Status: Evidence from 11 Demographic and Health Surveys. *Journal of Nutrition*, 134 (10): 2579–2585.
- Asfaw, S., Palma, A. and Lipper, L. (2016). Diversification strategies and adaptation deficit: Evidence from rural communities in Niger. ESA Working Paper No. 16-02. Rome.
- Asfir S. (2016). Determinants of Rural Households Livelihood Strategies: Evidence from Western Ethiopia. *Journal of Economics and Sustainable Development*, 7(15):103-109.
- Ashley C and S Maxwell. (2001). Rethinking rural development. *Development Policy Review* 19(4): 395-425.
- Asmamaw Enquobahrie, (2004). Understanding Poverty: The Ethiopian Context: A Paper presented at The Gambia AAPAM Roundtable Conference, Banjul, The Gambia, April 19 - 23, 2004.
- Atkinson, A. B. (2003). 'Multidimensional Deprivation: Contrasting Social Welfare and Counting Approaches'. *Journal of Economic Inequality*, 1(1): 51–65.
- Babatunde, R.O. (2008), "Income portfolios in rural Nigeria: Composition and Determinants", *Trends in Agricultural Economics*, 1 (1):35-41.
- Babatunde, R.O., and Qaim, M. (2009). Patterns of income diversification in rural Nigeria: determinants and impacts. *Quarterly Journal of International Agriculture*, 48(4): 305-320.
- Bárcena, E., Blanco, M. and Pérez, S. (2015). Differences in Child Poverty between European Countries. *Papeles de trabajo*, (2):7-21.
- Barrett, C. B., Reardon, T., and Webb, P. (2001). "Nonfarm income diversification and household livelihood strategies in rural Africa: Concepts, dynamics, and policy implications." *Food Policy*, 26(4): 315-331.
- Batana.Y. M., (2008). *Multidimensional Measurement of Poverty in Sub-Saharan Africa*. Oxford: Oxford University Press, OPHI Working Paper 13.
- Becker, Gary, 1975. *A Theoretical and Empirical Analysis, With Special Reference to Education* (2nd Ed). National Bureau of Economic Research: New York
- Belew A. K., Bekrie M. A., Zegeye A. and Berihun A. D. (2017). Dietary diversity and meal frequency among infants and young children: a community-based study. *Italian Journal of Pediatrics*, 43(73): 1-10. DOI 10.1186/s13052-017-0384-6
- Beneberu A. Wondimagegnhu, Admassu T. Huluka & Sarah M. Nischalke (2019). Determinants of farm livelihoods of smallholder farmers in Yayu biosphere reserve, SW Ethiopia: a

gender-disaggregated analysis. *Cogent Economics & Finance*, 7:1, 1645583, DOI:10.1080/23322039.2019.1645583

- Birhanu Negeri and Getachew Demissie, (2016). Livelihood Diversification: Strategies, Determinants, and Challenges for Pastoral and Agro-Pastoral Communities of Bale Zone, Ethiopia. *Journal of International Review of Social Sciences and Humanities*, 11(2): 37-51.
- Birhanu, Mulugeta Y. and Ambaw, Birhanu and Mulu, Yohannis (2017). Dynamics of multidimensional child poverty and its triggers: Evidence from Ethiopia using Multilevel Mixed Effect Model. Accessed on July 7/20/2021 and available: Online at <https://mpira.ub.uni-muenchen.de/79377/>
- Blein, R. (2013). Agriculture in Africa: Transformation and outlook, viewed 11 November 2018, from <https://www.un.org/en/africa/osaa/pdf/pubs/2013africanagricultures.pdf>
- Block, S. and Webb, P. (2001), “The dynamics of livelihood diversification in post-famine Ethiopia”, *Food Policy*, Vol. 26, pp. 333-350.
- Bradbury, B. and Jantti, M. (2001) Child poverty across industrialized countries: Evidence from the Luxembourg Income Study. In *Child Wellbeing, Child Poverty, and Child Policy in Modern Nations*, eds. K. Vleminckx and T. Smeeding, 1, (1): 385-406. Bristol: The Policy Press.
- Bradshaw, J., and Hoelscher, P. (2007). Child poverty and social exclusion in Europe. Policy Press.
- Browder, J., Pedlowski, M., Summers, P. (2004). Land use patterns in the Brazilian Amazon: comparative farm-level evidence from Rondônia. *Hum. Ecol.* 32, 197–224.
- Brown, D.R., Stephens, E.C., Ouma, J.O., Murithi, F.M., Barrett, C.B., 2006. Livelihood strategies in the rural Kenyan highlands. *Afr. J. Agr. Resour. Econ*, 1, 21–36
- Bryceson D. (1996). Deagrarianization and rural employment in sub-Saharan Africa: a sectoral perspective. *World Development*, 24(1), 97–111.
- Bryceson, D. (1999). Diagrarinazation and rural employment in sub-Saharan Africa: A sectoral Perspective. *World Development*, 4(1)
- Bryceson, D.F., 2005. Rural livelihoods and agrarian change in Sub-Saharan Africa: processes and policies. In: F. Ellis and H.A. Freeman (Eds), *Rural Livelihoods and Poverty Reduction Policies*, London: *Routledge*, 48–61
- Byerlee, D., A. de Janvry and E. Sadoulet. 2009. Agriculture for development: Toward a New Paradigm. *Annual Review of Resource Economics*, 1, 15-18.

- Central Statistical Agency (CSA) (2011). Ethiopia Demographic and Health Survey 2016: Key Indicators Report. Addis Ababa and Rockville, Maryland: CSA and ICF.
- Chambers, R., and G. R. Conway, (1992): Sustainable rural livelihoods: practical concepts for 21st century. Institute of Development Studies Discussion: Cambridge.
- Chapman, R. and Tripp, R. (2004) Background Paper on Rural Livelihood Diversity and Agriculture. Paper prepared for the 2004 AgREN electronic conference on the implications of Rural Livelihood Diversity for Pro-poor Agricultural Initiatives.
- Chawanote, C. and Barrett, C. B. (2014). Farm and Non-farm Occupational and Earnings Dynamics in Rural Thailand. Cornell University: Ithaca, NY 14853
- Chen, S. & Ravallion, M. (2010). The developing world is poorer than we thought but no less successful in the fight against poverty. *Quarterly Journal of Economics*, 125 (4), 1577–1625.
- Chen, W. and Corak, M (2008) Child poverty and changes in child poverty. *Demography*, 45(3): 537-553.
- Chen, W. and Corak, M. (2005). Child Poverty and Changes in Child Poverty in rich countries since 1990. <https://ssrn.com/abstract=708202>.
- Cockburn J., J. Kabubo-Mariara (2010). Child Welfare in Developing Countries: Poverty and Economic Policy (PEP) Research Network, DOI 10.1007/978-1-4419-6275-1_1.
- Cockburn, John, Anyck Dauphin and Mohammad A. Razzaque (2009). "Child Poverty and Intra-Household Allocation." *Children, Youth, and Environments* 19(2): 36-53.
- Conway, T. (2001). Human rights, assets and livelihood security, and sustainable development: Synthesis report from an inter-agency workshop. London: ODI.
- Crowley, A., and Vulliamy, C. (2007). Listen up! Children and young people talk: About poverty. Save the Children Wales.
- Crowley, A., and Vulliamy, C. (2007). Listen up! Children and young people talk: About poverty. Save the Children Wales.
- CSA and ICF International. (2012). *Ethiopia Demographic and Health Survey 2011*. Addis Ababa, Ethiopia, and Calverton, Maryland, USA: CSA and ICF International.
- CSA and UNICEF Ethiopia (2018). Multidimensional Child Deprivation in Ethiopia. CSA and UNICEF Ethiopia, Addis Ababa. CSA and UNICEF Ethiopia, Addis Ababa.
- CSA and UNICEF Ethiopia (2020). Faces of poverty: Studying the overlap between monetary and multidimensional child poverty in Ethiopia.

- CSA, UNICEF, & OPM. (2015). Child well-being in Ethiopia: analysis of child poverty using the HCE/ WMS 2011 datasets. Central Statistical Agency, UNICEF, and Oxford Policy Management.
- Custodio E., Herrador Z., Nkunzimana T., Węziak-Białowolska D., Perez-Hoyos A., Kayitakire F. (2019). Children's dietary diversity and related factors in Rwanda and Burundi: a multilevel analysis using 2010 Demographic and Health Surveys. *PLoS ONE*, 14(10): e0223237
- Cynthia L. Fonta, Thomas B. Yameogo, Halidou Tinto, Tiff van Huysen, Hamtandi Magloire Natama, Adelaide Compaore and William M. Fonta (2020). Decomposing multidimensional child poverty and its drivers in the Mouhoun region of Burkina Faso, West Africa. *BMC Public Health*, 20(149): 1-17. <https://doi.org/10.1186/s12889-020-8254-3>
- Dafursa K, Gebremedhin S. (2019). Dietary diversity among children aged 6–23 months in Aleta Wondo District, Southern Ethiopia. *Journal of Nutrition Metabolism* 2019:1–10.
- Datta, S.K., and Singh, K. (2011). Livelihood diversification: A case study of some backward regions in India. *International Journal of Current Research*, 3, 139-151.
- David Gordon & Shailen Nandy (2012). Global Child Poverty and Well-Being: Measurement, concepts, policy, and action. Townsend Centre for the International Poverty Research University of Bristol. Accessed on 7/31/2018.
- Davis, B., Di Giuseppe, S., & Zezza, A. (2014). Income diversification patterns in rural sub-Saharan Africa: Reassessing the evidence. The World Bank; 2014.
- Davis, B., Di Giuseppe, S., & Zezza, A. (2017). Are African households (not) leaving agriculture? Patterns of households' income sources in rural Sub-Saharan Africa. *Food Policy*, 67, 153–174.
- Davis, B., P. Winters, G. Carletto, K. Covarrubias, E. J. Quiñones, A. Zezza, K. Stamoulis, C. Azzarri and S. DiGiuseppe (2010). "A Cross-Country Comparison of Rural Income Generating Activities." *World Development*, 38(1): 48-63.
- Davis, J. R. (2003). "The Rural Non-farm Economy, Livelihoods and Their Diversification: Issues and Options." NRI Report No: 2753.
- De Janvry, A. and E. Sadoulet (2001). 'Income Strategies among Rural Households in Mexico: The Role of Off-farm Activities', *World Development*, 29(3): pp.467–80.
- De Janvry, A., Sadoulet, E., & Murgai, R. (2002). Rural development and rural policy. In: B.L. Gardner and G.C. Rausser (ed.). *Handbook of Agricultural Economics*. 1593-1658. Amsterdam: Elsevier. Retrieved October 11, 2013, from mpra.ub.uni-muenchen.de/13365.

- Deaton, A. and J. Drèze (2009). Food and Nutrition in India: Facts and Interpretations. *Economic and Political Weekly XLIV*, 42–65.
- Delgado, C. and A. Siamwalla (1997). Rural Economy and Farm Income Diversification in Developing Countries, Discussion Paper No. 20, Markets and Structural Studies Division, International Food Policy Research Institute, Washington D.C.
- Delgado, C. L., (1998). ‘Agricultural growth linkages in sub-Saharan Africa.’ International Food Policy Research Institute, Research Report 107, Washington, DC, IFPRI.
- Delgado, C., Hazell, P., Hopkins, J., and Kelly, V. (1994). ‘Promoting intersectoral growth linkages in rural Africa through agricultural technology and policy reform.’ *American Journal of Agricultural Economics*, 76(5): 1166–71.
- Dercon, S. and Krishnan, P. (1996), “Income portfolios in rural Ethiopia”, *Journal of Development Studies*, 32(6): 850-875.
- Desta Bukulu (2020). Determinants of Stunting Among Children Aged 6-59 Months, Siraro District, West Arsi Zone, Oromia Region, Ethiopia. *Journal of Health, Medicine and Nursing*, 74: 1-13.
- DFID, (2007). The sustainable livelihoods distance learning guide. <http://www.livelihoods.org/infor/dlg/Index.htm>
- DFID, (2007). Sustainable livelihoodsguidance sheets. <https://www.livelihoodscentre.org/documents/114097690/114438878/Sustainable+livelihoods+guidance+sheets.pdf>
- Dieden, S. & Gustafsson, B. (2003). Child poverty in South Africa an assessment based on microdata for 1995. *International Journal of Social Welfare*, 12: 326-338.
- Dinku A. M. (2018). Determinants of livelihood diversification strategies in Borena pastoralist communities of Oromia regional state, Ethiopia. *Agriculture & Food Security*, 7(41): 1-8. <https://doi.org/10.1186/s40066-018-0192-2>
- Dinku A. M., Tefera C. M. and Getachew S. A. (2020). Child dietary diversity and food (in)security as a potential correlate of child anthropometric indices in the context of the urban food system in the cases of north-central Ethiopia. *Journal of Health, Population, and Nutrition*, 39(11): 1-11. <https://doi.org/10.1186/s41043-020-00219-6>
- Dirksen, J.; Alkire, S. (2021). Children, and Multidimensional Poverty: Four Measurement Strategies. *Sustainability*, 13, 9108. <https://doi.org/10.3390/su13169108>
- Dirksen, J. and Alkire, S. (2021). Children, and Multidimensional Poverty: Four Measurement Strategies. *Sustainability*, 13, 9108. <https://doi.org/10.3390/su13169108>

- Djoke G. K. A., A. Djadou, A. Almeida, and R. Ruffino. (2010). Profiling Child Poverty in Four WAEMU Countries: A Comparative Analysis Based on the Multidimensional Poverty Approach. A consortium of Research and Development (CERD), Lomé, Togo.
- Dorward, A. (2002). Understanding small stock as livelihood assets: Final technical report. In Understanding small stock as livelihood assets: Indicators for facilitating technology development and dissemination (pp. 7). London: Imperial College, ZC0167.
- Drever F, Doran T, Whitehead M. (2001). Exploring the relation between class, gender, and self-rated general health using the new socioeconomic classification. A study using data from the 2001 census. *J Epidemiol Community Health*, 2004; 58:590-6.
- Drewnowski, A., & Popkin, B. M. (2009). Nutrition Transition: New Trends in the Global Diet. *Nutrition Reviews*, 55, 31–43. <https://doi.org/10.1111/j.1753-4887.1997.tb01593.x>.
- Drèze, J. and Sen, A. (1989). Hunger and Public Action; Clarendon Press: Oxford, UK.
- Duncan, G, J., Gunn, J, B., Yeung., W.J and Smith, J, R., (1998) “How Much Does Childhood Poverty Affect the Life Chances of Children? *American Sociological Review*, 1998, 63: 406-423.
- Ehrenberg, Ronald G., and Robert S. Smith, Modern Labor Economics, 4th edition. (New York: Harper Collins Publishers Inc., 1991).
- Ellis F. and S. Biggs (2001). Evolving themes in rural development the 1950s – 2000s. *Development Policy Review* 19(4): 437-448.
- Ellis, F. & Mdoe, N. (2003). Livelihoods and Rural Poverty Reduction in Tanzania, *World Development*, 31(8):1367-1384.
- Ellis, F. (1997). Household Strategies and Rural Livelihood Diversification. *Journal of Development Studies*, 3(1): 87-98.
- Ellis, F. (1998). Household Strategies and Rural Livelihood Diversification. *Journal of Development Studies*, 35(1): 1-38.
- Ellis, F. (2000), *Rural Livelihoods and Diversity in Developing Countries*, Oxford University Press.
- Ellis, F. (1999). Rural livelihood diversity in developing countries: evidence and policy implications. *Natural Resource Perspectives* No. 40. London, UK, Overseas Development Institute.
- Ellis, F., (1997). Household Strategies and Rural Livelihood Diversification. *Journal of Development Studies*, 3(1): 87-98.

- Ellis, F., and Freeman, H. A. (2004). Rural Livelihoods and Poverty Reduction Strategies in Four African Countries. *Journal of Development Studies*, 40(4): 18-23.
- Elton, E. J., Gruber M. J., Brown S. J., and Goetzmann W. N. (2014). *Modern Portfolio Theory and Investment Analysis*. 9th Edition. John Wiley & Sons, Inc.
- Ersado, L., (2003), Income Diversification in Zimbabwe: Welfare Implications from Urban and Rural Areas, FCND Discussion Paper 152, International Food Policy Research Institute, Washington, D.C.
- Escobal, J., (2001). "The Determinants of Non-farm Income Diversification in Rural Peru", *World Development*, Vol. 29, No. 3.
- Esubalew Yenesew, Daniel Masresha. Impact of Livelihood Diversification on Rural Household Food Security: Evidence from Goncha-Siso Enesie District of Amhara Regional State, Ethiopia. *International Journal of Agricultural Economics*, 4(6), 288-297. doi: 10.11648/j.ijae.20190406.16
- Ethiopian Public Health Institute (EPHI) [Ethiopia] and ICF. (2021). Ethiopia Mini Demographic and Health Survey 2019: Final Report. Rockville, Maryland, USA: EPHI and ICF.
- European Foundation for the Improvement of Living and Working Conditions, (1995). *Public Welfare Services and Social Exclusion: The Development of Consumer Oriented Initiatives in the European Union*, Dublin: The Foundation.
- Fantu Nisrane Bachewe, Guush Berhane, Bart Minten, and Alemayehu Seyoum Taffesse, (2015). *Agricultural Growth in Ethiopia (2004-2014): Evidence and Drivers*. Working Paper 81: International Food Policy Research Institute.
- FAO and FHI, (2016). "Minimum dietary diversity for women: a guide for measurement"
- FAO, (1998). *The State of Food and Agriculture: Rural Non-Farm Income in Developing Countries*, Food and Agriculture Organization, Rome.
- FAO, (2005). Module 1: Livelihoods, poverty, and institutions, viewed on 25 December 2012, from <http://www.fao.org/docrep/008/a0273e/ao27e04.htm>.
- FAO, (2009). *The State of Food and Agriculture, 2010–11 Women in Agriculture: Closing the gender gap for development*. Publication cycle: Annual Webpage: www.fao.org/publications/sofa.
- FAO, (2013). *Guidelines for measuring household and individual dietary diversity*. Food and Agriculture Organization, Rome.
- FAO, (2018b). *The role of public finance in Goal 2 and Target 2. as of the 2030 Agenda*. FAO, Rome.

- FAO. (2013). The state of food and agriculture. Retrieved from <http://www.fao.org/docrep/018/i3300e/i3300e00.htm>
- FAO. (2018a). Dietary Assessment: A resource guide to method selection and application in low resource settings. Rome.
- FDRE (Federal Democratic Republic of Ethiopia), (2000). National Report on the Implementation of the Beijing Declaration and Platform for Action.
- FDRE (Federal Democratic Republic of Ethiopia), (2013). Development and Poverty in Ethiopia 1995/6-2010/11. MoFED: Addis Ababa.
- FDRE (Federal Democratic Republic of Ethiopia), (2017). Ethiopia 2017 Voluntary National Review on SDGs. National Planning Commission: Addis Ababa.
- FDRE Ministry of Health (2015). Draft Health Sector Transformation Plan (2015/16 – 2019/20), Addis Ababa, FMOH.
- Feeny, T. and J. Boyden (2003). Children and Poverty: A Review of Contemporary Literature and Thought on Children and Poverty, Children and Poverty Series, Part I, Richmond, VA: Christian Children's Fund, Richmond.
- Food and Agriculture Organization (2012). Livelihood Diversification and Natural Resource
- Frempong R.B., Annim S.K. (2017). Dietary diversity and child malnutrition in Ghana. *Heliyon*, 3, e00298.
- Gautam, Y., & Andersen, P. (2016). Rural livelihood diversification and household well-being: Insights from Humla, Nepal. *Journal of Rural Studies*, 44: 239–249. <https://doi.org/10.1016/j.jrurstud.2016.02.001>
- Gebreyesus, B. (2016). Determinants of livelihood diversification: The case of Kembata Tambaro zone, Southern Ethiopia. *Journal of Poverty, Investment, and Development*, 23, p. 1–10.
- Geremew Worku Kassie, Sangho Kim & Francisco P. Fellizar Jr. (2017). Determinant factors of livelihood diversification: Evidence from Ethiopia, *Cogent Social Sciences*, 3:1, 1369490, DOI: 10.1080/23311886.2017.1369490
- Getachew Adem (2009). Child Poverty in Ethiopia. African Child Policy Forum, Addis Ababa.
- Getachew Yirga Belete (2022). Children's multidimensional deprivation, monetary poverty and undernutrition in Ethiopia. *Rev Econ Household*, (20): 1087–1118. <https://doi.org/10.1007/s11150-021-09568-5>.
- Getnet Alemu. 2009. Poverty analysis of children in child-headed households in Addis Ababa. Institute of Development Studies, Addis Ababa University.

- Gibson, R. (2012). A historical review of progress in the assessment of dietary zinc intake as an indicator of population zinc status. *Advances in Nutrition*, 3(6), 772-782.
- Gideon Danso-Abbeam, Gilbert Dagunga, Dennis Sedem Ehiakpor, Abiodun A. Ogundeji, Edinam Dope Setsoafa1 and Joseph A. Awuni (2021). Crop–livestock diversification in the mixed farming systems: implication on food security in Northern Ghana. *Agriculture & Food Security*, 10(35): 1-14. <https://doi.org/10.1186/s40066-021-00319-4>
- Gilling, J. et al. (2001). Sector approaches, sustainable livelihoods, and rural poverty reduction. *Development Policy Review*, 19(3): 303-319.
- Gollin, D. 2010. Agricultural productivity and economic growth. pp. 3825-3866. In *Handbook of Agricultural Economics*. P. Pingali and R. Evenson, eds. New York, Elsevier
- Gopalan, C. (1992). Undernutrition: Measurement and Implications. In S. Osmani (Ed.), *Nutrition and Poverty*, pp. 17–47. Oxford: Clarendon Press.
- Gordon, D. and Nandy, S. (2012). Measuring child poverty and deprivation. University of Bristol: The Policy Press.
- Gordon, D., Nandy, S., Pantazis, C., Pemberton, S., and Townsend, P. (2003). Child poverty in the developing world, Bristol: The Policy Press.
- Gordon, D., Nandy, S., Pantazis, C., Pemberton, S., and Townsend, P. (2003). Child poverty in the developing world, Bristol: The Policy Press.
- Gornick, J. C. and Jantti, M. (2012). Child poverty in cross-national perspective: Lessons from the Luxembourg Income Study. *Children and Youth Services Review*, (34), 558-568.
- Gornick, J. C. and Jantti, M. (2012). Child poverty in cross-national perspective: Lessons from the Luxembourg Income Study. *Children and Youth Services Review*, (34). Pp. 558-568.
- Government of the Federal Democratic Republic of Ethiopia. (2013). National Nutrition Programme: June 2013-June 2015, Addis Ababa: Government.
- Greene W. H. (2018). *Econometric Analysis* (8th edition). The Stern School of Business; New York University.
- Gregg, Paul and Machin, Stephen (1998) "Child Development and Success or Failure in the Youth Labor Market" Centre for Economic Performance, London School of Economics and Political Science, July 1998.
- Gujarati D. N. (2009). *Basic Econometrics* (5th ed.). McGraw-Hill/Irwin, a business unit of The McGraw-Hill Companies, Inc., 1221 Avenue of the Americas, New York, NY, 10020.

- Habtmu Temesgen, Tebikew Yeneabat and Muluken Teshome (2018). Dietary diversity and associated factors among children aged 6–23 months in Sinan Woreda, Northwest Ethiopia: a cross-sectional study. *Journal of BMC Nutrition*, 4(5), 1-8.
- Haddad L., J. Hoddinott, H. Alderman (1997). *Intrahousehold Resource Allocation in Developing Countries*. Baltimore, MD & London: John Hopkins University Press.
- Haddad, L., Alderman, H., Appleton, S., Song, L., & Yohannes, Y. (2003). Reducing child malnutrition: How far does income growth take us? *World Bank Economic Review*, 17(1), 107–131.
- Haggblade, S. 2007. "Alternative Perceptions of the Rural Nonfarm Economy. In *Transforming the Rural Non-Farm Economy: Opportunities and Threats in the Developing World*, edited by S. Haggblade, P. Hazel, and T. Reardon, 490. Washington, DC: The International Food Policy Research, Institute the Johns Hopkins University Press.
- Haggblade, S., Hazell P. & Reardon, T. (2007). *Transforming the rural non-farm economy*. John Hopkins University Press Baltimore.
- Haggblade, S., Hazell, P. and Reardon, T. (2010). ‘The Rural Non-farm Economy: Prospects for Growth and Poverty Reduction, *World Development*, 38(10), 1429-1441.
- Haggblade, S., Hazell, P. B. R., & Reardon, T. (2007). *Transforming the rural non-farm economy: Opportunities and threats in the developing world* (490 p). Washington, DC: International Food Policy Research Institute.
- Haggblade, S., Hazell, P., & Reardon, T. (2010). The rural non-farm economy: prospects for growth and poverty reduction. *World Development*, 38(10), 1429–1441.
- Haggblade, S., Hazell, P., & Reardon, T., (2007). “Introduction”, in Haggblade, S, P. Hazell, and T. Reardon, (Eds), *Transforming the Rural Nonfarm Economy*, Baltimore, Johns Hopkins University Press.
- Haggblade, S., Hazell, P., and Reardon, T. (2002). *Strategies for Stimulating Poverty and Alleviating Growth in the Rural Non-Farm Economy in Developing Countries*. EPTD Discussion paper 92. International Food Policy Research Institute & the World Bank.
- Haggblade, S., P. Hazell, and J. Brown (1989). Farm-nonfarm linkages in rural sub-Saharan Africa. *World Development*, 17(8): 1173–201.
- Haggblade, S., P. Hazell, and T. Reardon (2007). *Transforming the rural nonfarm economy: opportunities and threats in the developing world*. Baltimore, Johns Hopkins University Press.
- Hart, Gillian (1994), “The Dynamics of Diversification in an Asian Rice Region”, Chapter 2, in Bruce Koppel, John Hawkins and William James (eds) *Development or Deterioration? I work in Rural Asia*, Lynne Rienner Publishers Inc., USA.

- Headey, D. D., & Jayne, T. S. (2014). Adaptation to land constraints: Is Africa different? *Food Policy*, 48, 18–33. doi: 10.1016/j.foodpol.2014.05.005
- Hegde G.N., L. Devarani, B. Lahiri, K.K. Datta and L. Hemochandra (2019). Child Multidimensional Poverty and its Determinants in Rural Farm-Households of Garo Hills, Meghalaya. *Economic Affairs*, 64(2):459-467.
- Helmy Imane (2020). Livelihood Diversification Strategies: Resisting Vulnerability in Egypt, GLO Discussion Paper, No. 441, Global Labor Organization (GLO), Essen
- Hick, Rod (2012). The capability approach: insights for a new poverty focus. *Journal of Social Policy*, ISSN 0047-2794 (In Press).
- Hill, M.O. (1973). Diversity and evenness: a unifying notation and its consequences. *Ecology*, 54(2), 427-432.
- Hiremath, B. N. (2007). The changing faces of rural livelihood in India, In National Civil Society conference on what it takes to eradicate poverty, held at Institute of Rural Management, Anand, 4-6 December.
- Hoddinott J., Headey D. and Mekdim Dereje, (2015). Cows, Missing Milk Markets, and Nutrition in Rural Ethiopia. *The Journal of Development Studies*, 51(8), 958-975. <https://doi.org/10.1080/00220388.2015.1018903>.
- Hussein, K. and J. Nelson, (1998). Livelihood diversification. IDS: Brighton
- Ibekwe, U. (2001), *Income Distribution among Farm Households in Orlu Agricultural Zone of Imo State*. Unpublished Ph.D. Thesis in Agricultural Economics, University of Nigeria, Nsukka.
- ICRA, (2002). Food security among households in the different agroecological zones in Arsi Negele Woreda, Ethiopia.
- IDS (Institute of Development Studies), (2017). Transforming Development Knowledge. IDS Bulletin, Volume 48.
- IFAD, (2010). Rural Poverty Report 2011. International Fund for Agricultural Development, Rome.
- International Labor Office, (2008). Promotion of rural employment for poverty reduction. ILO, Geneva.
- Isaac A. D., (2016). Analysis of Livelihood Diversification by Farming Households in Selected Local Government Areas of Kaduna State, Nigeria. MSc. A thesis submitted to the Department of Agricultural Economics and Rural Sociology, Nigeria.

- Janica Anderzén, Alejandra Guzmán Luna, Diana V. Luna-González, Scott C. Merrill, Martha Caswell, V. Ernesto Méndez, Rigoberto Hernández Jonapá, and Mateo Miery Terán Giménez Cacho (2020). Effects of on-farm diversification strategies on smallholder coffee farmer food security and income sufficiency in Chiapas, Mexico. *Journal of Rural Studies*, (77): 33-46.
- Jansen, H.G.P., Pender, J., Damon, A., Wielemaker, W., Schipper, R., 2006. Policies for sustainable development in the hillside areas of Honduras: a quantitative livelihoods approach. *Agric. Econ.* 34, 141–153.
- Jayne, T. S., Yamano, T., Weber, M. T., Tschirley, D., Benfica, R., Chapoto, A. & Zulu, B. (2003). Smallholder income and land distribution in Africa: implications for poverty reduction strategies. *Food policy*, 28, 253-275.
- Jehoel-Gijsbers, G. (2004). Sociale Uitsluiting in Nederland (Social Exclusion in the Netherlands). The Hague: SCP (Social and Cultural Planning Office).
- Johnston, J. & Dandiro, J. (1997) *Econometrics Methods*, Fourth Edition, New York: McGraw Hill Companies, Inc.
- Joshi, P.K., Gulati, A., Bithal, P.S., and Tewari, L. (2004). Agriculture diversification in South Asia: patterns, determinants, and policy implications. *Economic and Political Weekly*, 2457-2467.
- Kang C. (2011). Family size and educational investments in children: evidence from private tutoring expenditures in South Korea. *Oxf Bull Econ Stat.* 73(1): 59–78. <https://doi.org/10.1111/j.1468-0084.2010.00607.x>.
- Karaman, K. K., Yıldırım-Karaman, S. (2019). How does financial development alter the impact of uncertainty? *J. Bank. Financ.* 102, 33–42.
- Kassam, L. and A. Dorward, (2017). A comparative assessment of the poverty impacts of pond and cage aquaculture in Ghana. *Journal of Aquaculture*, ELSEVIER publisher, 470; 110-122.
- Kassie, S. K., & Fellizarjr, F. P. (2017). Determinant factors of livelihood diversification: evidence from Ethiopia. *Cogent Social Sciences*, 3(1), 1–16. <https://doi.org/10.1080/23311886.2017.1369490>
- Kennedy G., Ballard T., and Dop M. C. (2013). *Guidelines for Measuring Household and Individual Dietary Diversity*. FAO, Rome.
- Kennedy, G., M. Razes, T. Ballard and M.C. Dop. (2010). *Measurement of Dietary Diversity for monitoring the impact of food-based approaches*. Available: http://www.foodsec.org/fileadmin/user_upload/eufaofsi4dm/docs/Dietary_Diversity_paper.pdf

- Kennedy, G., Terri B. and Marie-Claude D. (2011). Guidelines for measuring household and individual dietary diversity. FAO: Rome. www.foodsec.org.
- Keyata E. O., Abebe D. and Alemayehu O. (2022). Dietary diversity and associated factors among preschool children in selected kindergarten school of Horo Guduru Wollega Zone, Oromia Region, Ethiopia. *BMC Nutrition*, 8(71): 1-7.
- Khatriwada, S. P., Deng, W., Paudel, B., Khatriwada, J. R., Zhang, J., & Su, Y. (2017). Household livelihood strategies and implications for poverty reduction in rural areas of central Nepal. *Sustainability*, 9(4), 1–20.
- Khatun, D., and Roy, B.C. (2012). Rural livelihood diversification in west Bengal: determinants and constraints. *Agricultural Economics Research Review*, 25(1), 115-124.
- Kimenju, S. C. & Tschirley, D. (2008) Agriculture and Livelihood Diversification in Kenyan Rural Households. Tegemo Institute of Agricultural Policy and Development, Nairobi, Kenya.
- Kłopocka, A.M., 2017. Does consumer confidence forecast household saving and borrowing behavior? Evidence for Poland. *Soc. Indic. Res.* 133 (2), 693–717.
- Koppmair S. Menale K. and Matin Q. (2016). Farm production, market access and dietary diversity in Malawi. *Public Health Nutrition*, 20(2), 325–335
- Kumar, A., S. Sunil, R. K. P. Singh, and J. Shiv. (2016). Agricultural Diversity, Dietary Diversity, and Nutritional Intake: An Evidence on Inter-linkages from Village Level Studies in Eastern India. *Agricultural Economics Research Review*, 29:15–29.
- Kumar, M.B., S.J. George and S. Chinnamani (1994). ‘Diversity, Structure and Standing Stock of Wood in the Home Gardens of Kerala in Peninsular India’, *Agroforestry Systems*, 25(3): 243-262.
- Lanjouw J. and P. Lanjouw (2001). The rural non-farm sector: issues and evidence from developing countries. *Agricultural Economics*, 26, 1–23.
- Lanjouw, P. (2007). Does the Rural Non-Farm Economy Contribute to Poverty Reduction, In T. Haggblade, S., Hazell, P.B.R., Reardon (Ed.), *Transforming the rural non-farm economy: Opportunities and Threats in the Developing World*. International Food Policy Research Institute. Baltimore: Johns Hopkins University Press, USA.
- Leventhal T., J. Brooks-Gunn, (2001). "Poverty and Child Development" in *International Encyclopedia of the Social & Behavioral Sciences*.
- Levitas, R. (2006). The concept and measurement of social exclusion. In: Pantazis, C., D. Gordon and R. Levitas (eds.). *Poverty and social exclusion in Britain; The millennium survey*. Bristol: *The Policy Press*, pp. 123-160.

- Li M, Huo X, Peng C, Qiu H, Shangguan, Z, Chang C, Huai J. (2017). Complementary livelihood capital as a means to enhance adaptive capacity: A case of the Loess Plateau, China. *Global Environmental Change*, (47) 143-152.
- LIFT, 2013. Livelihoods and Food Security Trust Fund 2013 Household Survey. LIFT, Yangon. http://www.lift-fund.org/sites/lift-fund.org/files/publication/LIFT_HH_Survey_2013_0.pdf, Accessed date: 11 July 2023.
- Liu X., Liu C., Chen K. (2023). Agricultural production diversity, child dietary diversity, and nutritional status in poor, rural Gansu Province of China. *PLoS ONE* 18(6): 1-12. e0287000. <https://doi.org/10.1371/journal.pone.0287000>.
- Loening, J., Rijkers, B. & Soderbom, M. (2008). Nonfarm microenterprise performance and the investment climate: evidence from rural Ethiopia.
- Loison, S. (2015). Rural Livelihood Diversification in Sub-Saharan Africa: A Literature Review. *Journal of Development Studies*, 51(9), 1125–1138. Retrieved from <http://dx.doi.org/10.1080/00220388.2015.1046445>
- Luttrell, C. (2009). The family is good for nothing: Child poverty and work-family strategies among Ethiopian street children. *Children and Society*, 23(5), 381-391.
- Ma, H., Hao, D. (2022). Economic policy uncertainty, financial development, and financial constraints: Evidence from China. *Int. Rev. Econ. Finance*, 79, 368–386.
- Ma, J. L. C., Wong, T. K. Y., Lau, Y. K., & Pun, S. H. (2009). Perceived family functioning and family resources of Hong Kong families: Implications for social work practice. *Journal of Family Social Work*, 12(3): 244–263.
- Maniriho A. and Nilsson P., (undated). Determinants of Livelihood Diversification among Rwandan Households: The Role of Education, ICT, and Urbanization. East Africa Research Papers in Economics and Finance. EARP-EF No. 2018:24
- Matshe, I. and Young, T. (2004), “Off-farm labor allocation decisions in small-scale rural households in Zimbabwe”, *Agricultural Economics*, Vol. 30 No.3, pp. 175-186.
- Mayer, S. (1997). *What Money Can't Buy, Family Income and Children's Life Chances*, Harvard University Press, Cambridge, Massachusetts.
- McMillan, M. and K. Harttgen (2014). ‘What is driving the “African growth miracle”?’ Working Paper Series, No 209. Tunis, African Development Bank.
- Md. Sherf-Ul-Alam, Jasim Uddin Ahmed, Maksuda Mannaf, Kanij Fatema¹ and Md. Nur Mozahid, (2017). Farm and Non-farm Income Diversification in Selected Areas of Sunamganj District of Bangladesh. *Asian Journal of Agricultural Extension, Economics & Sociology*, 21(2): 1-9.

- Meghnad Desai, (1984). A General Theory of Poverty? A Review Article. *Indian Economic Review*, Vol. 19, No. 2
- Mentamo M, Regassa Geda N. Livelihood diversification under severe food insecurity scenario among smallholder farmers in Kadida Gamela District, Southern Ethiopia. *Kontakt* 2016; 18(4): e258–e264; <http://dx.doi.org/10.1016/j.kontakt.2016.09.003>
- Ministry of Finance and Economic Development (MoFED). 2002. Sustainable Development and Poverty Reduction Program (SDPRP), MoFED: Addis Ababa.
- Ministry of Health of Ethiopia (2019). Essential Health Services Package of Ethiopia. Ministry of Health: Addis Ababa.
- Ministry of Labor and Social Affairs. (2004). Ethiopia's National Plan of Action for Children covers the period 2003-2010 and beyond, Addis Ababa.
- Minujín, A., Delamonica, E., Davidziuk, A., Gonzalez, E.D. (2006). The definition of child poverty: A discussion of concepts and measurements. *Environ. Urban.* 2006, 18, 481–500.
- Mishi, S. & Mudziwapasi, L., 2014, 'Remittances and sustainability of family livelihoods: Evidence from Zimbabwe'. *Journal of Economics and Behavioral Studies*, 6(12): 958–973.
- Mishi, S., Sikhunyana, Z., Ngonyama, N. & Sibanda, K. (2020). 'Livelihood strategies and diversification amongst the poor: Evidence from South African household surveys', *The Journal for Transdisciplinary Research in Southern Africa* 16(1), a726. <https://doi.org/10.4102/td.v16i1.726>
- MOFED (2010b). *Ethiopia: Growth and Transformation Plan (GTP) 2010/11–2014/15*, Addis Ababa: Ministry of Finance and Economic Development
- MOFED (2010c). *PASDEP Implementation Review*, Addis Ababa: Ministry of Finance and Economic Development
- Mukabutera A, Thomson DR, Hedy-Gauthier BL, Basinga P, Nyirazinyoye L, Murray M. (2016). Risk factors associated with underweight status in children under five: an analysis of the 2010 Rwanda Demographic Health Survey (RDHS). *BMC Nutrition*, 2(1):1–2.
- Muthini D., Jonathan N. and Rose N. (2020). Farm production diversity and its association with dietary diversity in Kenya. *Food Security*, 12:1107–1120. <https://doi.org/10.1007/s12571-020-01030-1>
- Nagler, P. and Naudé, W. (2014). 'Non-farm Entrepreneurship in Rural Africa: Patterns and Determinants', *IZA Discussion Paper no. 8008*, Bonn: IZA, Institute for the Study of Labor.

- Narayan D. (2000). Poverty is powerlessness and voicelessness. *Finance and development*, 37(4): 18-21.
- Neglo, K. A. W., Gebrekidan, T., Lyu, K. (2021). The Role of Agriculture and Non-Farm Economy in Addressing Food Insecurity in Ethiopia: A Review. *Sustainability*, 13, 3874. <https://doi.org/10.3390/su13073874>
- Newton, D.E. (2009). *Environmental justice: a reference handbook*. 2nd ed. Contemporary world issues. ABC-CLIO, LLC, California.
- Nkechi S. OwooandWim N. (2014). Non-Farm Enterprise Performance and Spatial Autocorrelation in Rural Africa: Evidence from Ethiopia and Nigeria.
- NPC. (2017). Ethiopia's progress towards eradicating poverty: an interim report on 2015/16 poverty analysis study. Addis Ababa: National Planning Commission.
- O'Brien, K., Quinlan, T., Ziervogel, G., (2009). Vulnerability interventions in the context of multiple stressors: lessons from the Southern Africa Vulnerability Initiative (SAVI). *Environ. Sci. Policy*, 12 (1), 23-32
- Ogueri E.I, Unaeze H.C, Odok G.N., Mbah G.O, Ugwu J.N, Essien U.A., Onini M.T., and Ohajianya D.O. 2018. Effects of Livelihood Sustenance Activities on Off-Farm Income of Poultry Farmers in IMO State, Nigeria. *International Journal of Environment, Agriculture, and Biotechnology (IJEAB)*. Vol (3): 1461-1466.
- Oldiges, C. (2017). "Measuring malnutrition and dietary diversity: Theory and evidence from India." *OPHI Working Paper 108*, University of Oxford.
- Olsson, L., M. Opondo, P. Tschakert, A. Agrawal, S.H. Eriksen, S. Ma, L.N. Perch, and S.A. Zakieldean, 2014: Livelihoods and poverty. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 793-832.
- ORS, (2004). The Oromiya Regional State Government: Socioeconomic profile of East Shoa Zone.
- Oshio, Takashi., Sano, Shinpei., and Kobayashi, Miki (2009). "*Child poverty as a determinant of life outcomes: Evidence from nationwide surveys in Japan*" Institute of Economic Research, Hitotsubashi University,
- Otekunrin O. A., Oluwaseun A O., Idris A. A., Rahman A. S., Oluseye O. O., Oluwaseun A. (2021). Dietary diversity, environment and health-related factors of under-five children: evidence from cassava commercialization households in rural South-West Nigeria.

- Environmental Science and Pollution Research*, 29:19432–19446.
<https://doi.org/10.1007/s11356-021-17221-y>.
- Oxford Poverty and Human Development Initiative (2017). “Ethiopia Country Briefing”, Multidimensional Poverty Index Data Bank. OPHI, University of Oxford. Available at: www.ophi.org.uk/multidimensional-poverty-index/mpi-country-briefings/.
- Oyekale AS (2012). Factors explaining acute malnutrition among under-five children in Sub-Saharan Africa (SSA). *Life Science Journal*, 9(4):2101–7.
- Oyinbo, O. and K. T. Olaleye (2016). Farm Households Livelihood Diversification and Poverty Alleviation in Giwa Local Government Area of Kaduna State, Nigeria. *The Journal of Sustainable Development*, Vol. 15: P219- 232.
- Paul Mark Mitchell, Tracy E. Roberts, Pelham M. Barton, Joanna Coast, (2015). Assessing sufficient capability: A new approach to economic evaluation. *Journal of Social Science and Medicine*, 139: 71-79.
- Pereznieto P, and Jones N, (2006). Educational choices in Ethiopia: What determines whether poor children go to school? Young Lives Policy Brief 2.
- Persha, L. and Farrell, W. (2017). Livelihoods Diversification Analysis: Literature Review. USAID.
- Pichón, F.J., 1997. Settler households and land-use patterns in the Amazon frontier: farm-level evidence from Ecuador. *World Dev*, 25, 67–91.
- Pingali, P. (2007). Westernization of Asian diets and the transformation of food systems: Implications for research and policy. *Food Policy*, 32, 281–298.
<https://doi.org/10.1016/j.foodpol.2006.08.001>.
- Plavgo, Ilze; Martha Kibur, Mahider Bitew, Tesfayi Gebreselassie, Yumi Matsuda, and Roger Pearson (2013). Multidimensional Child Deprivation Trend Analysis in Ethiopia. Further Analysis of the 2000, 2005, and 2011 Demographic and Health Surveys. DHS Further Analysis Reports No. 83. Calverton, Maryland, USA: ICF International.
- Pritchard, B., Dibley, M., Rammohan, A., Htin, Z. S., Khay, M. M., Htet, K. Welch, E. (2018). Food and nutrition insecurity in rural Myanmar under conditions of rapid livelihood change: Survey findings from the 2015-18 Australian Research Council projects. Retrieved from <https://feedingmyanmar.wordpress.com/publications/>
- Pritcharda B., Anu R., and Mark V. (2019). The importance of non-farm livelihoods for household food security and dietary diversity in rural Myanmar. *Journal of Rural Studies*, 67: 89-100.

- Rahman, A. & Mishra, S. (2020). Does Non-farm Income Affect Food Security? Evidence from India. *Journal of Development Studies*, 56, 1190–1209. <https://doi.org/10.1080/00220388.2019.1640871>.
- Rakotonirainy NH, Razafindratovo V, Remonja CR, Rasoloarijaona R, Piola P, Raharintsoa C, et al. (2018). Dietary diversity of 6-to 59-month-old children in rural areas of Moramanga and Morondava districts, Madagascar. *PLoS ONE* 13(7): e0200235. <https://doi.org/10.1371/journal.pone.0200235>
- Ratcliffe, Caroline, and Signe-Mary, McKernan (2010) “*Childhood Poverty Persistence: Facts and Consequences*” The Urban Institute: Brief 14, June 2010
- Reardon, T. (1997). “Using Evidence of Household Income Diversification to Inform Study of the Rural Non-Farm Labor Market in Africa”, *World Development*, 25 (5): 735-748.
- Reardon, T. (1997). “Using Evidence of Household Income Diversification to Inform Study of the Rural Non-Farm Labor Market in Africa”, *World Development*, Vol. 25, No. 5.
- Reardon, T., J. Taylor, K. Stamoulis, P. Lanjouw and A. Balisacan (2000). Effect of Non-Farm Employment on Rural Income Inequality in Developing Countries. An Investment Perspective, *Journal of Agricultural Economics* 51(2): 266-288.
- Reardon, T., Stamoulis, K., Balisacan, A., Cruz, M.E., Berdegue, J. & Banks, B. (1998). Rural Nonfarm Income in Developing Countries. Special Chapter in *The State of Food and Agriculture* 1998. Rome, FAO.
- Remans, R., Wood, S.A., Saha, N. et al. (2014). Measuring nutritional diversity of national food supplies. *Global food secur*, 3(2014): 174-182.
- Rijkers, B. and Costa, R. (2012). Gender and Rural Non-Farm Entrepreneurship. *World Development*, 40 (12):2411–2426.
- Ringen, S. (1987). *The Possibility of Politics*. Oxford: Clarendon Press.
- Rodgers, G., C. Gore and J. B. Figueiredo (eds), (1995). *Social Exclusion, Rhetoric, Reality, Responses*, International Institute for Labor Studies, ILO, Geneva.
- Roelen, K. and F. Gassmann (2008). Measuring Child Poverty and Well-Being: a literature review," Mpra paper, University Library of Munich, Germany.
- Ruben, R., Van Der Berg, M. (2001). Nonfarm employment and rural farm households in Honduras. *World Development*, 29(3): 549-560.
- Ruel, M. T. (2002). Is dietary diversity an indicator of food security or dietary quality? A review of measurement issues and research needs. Food Consumption and Nutrition Division Discussion Paper 140. Washington, D.C.: International Food Policy Research Institute.

- Ruel, M. T., and P. Menon. (2002). Child Feeding Practices Are Associated with Child Nutritional Status in Latin America: Innovative Uses of the Demographic and Health Surveys. *Journal of Nutrition*, 132: 1180–1187.
- Saha B. and Bahal R. (2014). Livelihood Diversification Pattern among the farmers of West Bengal. *Journal of Economic Affairs*, 59(3): 321-334.
- Saha, B., and Bahal, R. (2010). Livelihood Diversification Pursued by Farmers in West Bengal. *Indian Research Journal of Extension Education*, 10(2): 1-9.
- Samuel G. S. (2001). Summary report on recent economic and agricultural policy. Paper prepared for the Roles of Agriculture international conference 20–22 October 2003, Rome, Italy.
- Saturnino M.Borras Jr, Cristóbal Kay and A. Haroon Akram-Lodhi, (2007). Agrarian reform and rural development: Historical overview and current issues. Taylor & Francis e-Library.
- Save the Children (2016). Child Poverty: What Drives It and What it Means to Children across the World. Save the Children, UK.
- Scoones, I. (1998). Sustainable Rural Livelihoods: A Framework for Analysis. IDS Working Paper.No. 72. Sussex Institute of Development Studies.
- Scoones, I., 2009. Livelihoods perspectives and rural development. *Journal of Peasant Studies*, 36 (1), 171–196.
- Seaman J. A., Gary E. S., James A. and Celia P. (2014). The Household Economy Approach. Managing the impact of climate change on poverty and food security in developing countries. *Journal of Climate Risk Management*: Vol. 4(5), pp.59-68.
- Sen, A. (1976). Famines as Failures of Exchange Entitlements. *Econ. Polit. Wkly.* 11, 1273–1280.
- Sen, A. (1981). *Poverty and Famines: An Essay on Entitlement and Deprivation*; Clarendon Press: Oxford, UK.
- Sen, A. (1993). Capability and well-being. In *The Quality of Life*; Nussbaum, M., Sen, A., Eds.; Clarendon Press: Oxford, UK.
- Senadza, B. (2012), “Non-farm income diversification in rural Ghana: Patterns and determinants”, *African Development Review*, Vol. 24 No.3, pp. 233-244.
- Shanta Paudel Khatiwada, Wei Deng, Bikash Paudel, Janak Raj Khatiwada, Jifei Zhang and Yi Su. (2017). Household Livelihood Strategies and Implication for Poverty Reduction in Rural Areas of Central Nepal. *Journal of sustainability*, 9(612): 1-20.

- Shehu, A. and Abubakar, N. (2015). Determinants of Participation of Farm Households in Non-Farm Enterprise Activities in Rural Nigeria. *International Journal of Economics, Commerce and Management*, vol 3(6): pp 57-71.
- Sherf-Ul-Alam Md., Jasim Uddin Ahmed, Maksuda Mannaf, Kanij Fatema and Md. Nur Mozahid (2017). Farm and Non-farm Income Diversification in Selected Areas of Sunamganj District of Bangladesh. *Asian Journal of Agricultural Extension, Economics & Sociology*, 21(2): 1-9.
- Silver, H. (1995). Reconceptualising Social Disadvantage: Three paradigms of social exclusion, in Rodgers et al (eds).
- Simpson, E.H. (1949). 'Measurement of Diversity', *Nature* 163: 688.
- Singh R. and Sarkar S., (2014). The Relationship of Household Monetary Poverty and Multidimensional Child Deprivation: A Longitudinal Study of Children Growing Up in India. *Young Lives 2014*; ISBN: 978-1-909403-35-2
- Singh R. and Sarkar S., (2014). The Relationship of Household Monetary Poverty and Multidimensional Child Deprivation: A Longitudinal Study of Children Growing Up in India. *Young Lives 2014*; ISBN: 978-1-909403-35-2
- Singh S., Andrew D., Jones, Ruth S., DeFries, Meha J. (2020). The association between crop and income diversity and farmer intra-household dietary diversity in India. *Food Security*, 12:369–390 <https://doi.org/10.1007/s12571-020-01012-3>.
- Smith, L. E. D., Nguyen Khoa, S., & Lorenzen, K. (2005). Livelihood functions of inland fisheries: Policy implications in developing countries. *Water Policy*, 7, 359–383.
- Smith, Lisa C., and Ali Subandoro. (2007). Measuring Food Security Using Household Expenditure Surveys. Food Security in Practice technical guide series. Washington, D.C.: International Food Policy Research Institute.
- Solomon D, Aderaw Z, Tegegne TK. (2017). Minimum dietary diversity and associated factors among children aged 6–23 months in Addis Ababa, Ethiopia. *Int J Equity Health*, 16(1):1–9.
- Swindale, A., and P. Bilinsky. (2006). Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide (v.2). Washington, D.C.: FHI 360/FANTA.
- Tambe, A.B., Mbah L. A., Nicholas T., Thembekile D., Given C. and Xikombiso M. (2023). The predictors of food security and dietary diversity among internally displaced persons' children (6–59 months) in Bamenda health district, Cameroon. *Conflict and Health*, 17(11): 1-11.

- Tamerat T. (2016). Livelihood Resources and Determinants in Tigray Region of Ethiopia. *International Journal of Lean Thinking*, 7(2):57- 66
- TARKI (2010). Child Poverty and Child Well-being in the European Union. Report prepared for the European Commission, (1). Pp. 11-106. Budapest: Tarki Social Research Institute.
- Taruvinga, A., Gumpo, N., Mudemba, R. and Ngarava, S. (2018). “Rural income portfolios, compositions, diversity, and determinants: Evidence from Nyandeni local municipality, South Africa”, *International Journal of Development and Sustainability*, Vol. 7 No. 2, pp. 792-807.
- Tassew Woldehanna, Retta Gudisa, Yisak Tafere and Alula Pankhurst, (2011). Understanding Changes in the Lives of Poor Children: Initial Findings from Ethiopia. Young Lives Department of International Development: University of Oxford.
- Temesgen, M., Sewitemariam D., Helen A., Moges M., Daniel S., Mahlet B., Robel H. K. (2016). Minimum dietary diversity and its associated factors among infants and young children in Ethiopia: evidence from Ethiopian Demographic and Health Survey (2016). *Heliyon*, 8: 1-5.
- Teshome, B. and A.K. Edriss (2013), Determinants and Patterns of Income Diversification among Smallholder Farmers in Akaki District, Ethiopia. *Journal of Research in Economics and International Finance* (JREIF), 2(4): 68-78.
- Tess R., (2009). Living with poverty: A review of the literature on children’s and families’ experiences of poverty. Department for Work and Pensions: Norwich.
- Thanh, H. X., Dang N. A. and Cecilia T. (2005). Livelihood Diversification and Rural-Urban Linkages in Vietnam’s Red River Delta. FCND Discussion Paper 193, IFPRI: Washington, DC. The report, Washington DC: 72-93
- The United Nations Children’s Fund (UNICEF), 2004. The State of the World’s Children 2005: childhood under threat. UNICEF: New York.
- The United Nations Children’s Fund (UNICEF), 2011. A Multidimensional Approach to Measuring Child Poverty: Social and Economic Policy Working Briefs. UNICEF: New York.
- Turner, B. L., Kasperson, R. E., Matson, P. A., McCarthy, J. J., Corell, R. W., Christensen, L., et al., 2003. A framework for vulnerability analysis in sustainability science. *Proc. Natl. Acad. Sci.* 100 (14), 8074-8079.
- UdayaWagle, (2008). *Multidimensional Poverty Measurement: Concepts and Applications*. Springer. New York.
- Udoh, N.E, & Nwibo, S.U. (2017). Socio-economic determinants of rural non-farm households' income diversification in southeast Nigeria. *International Research Journal of Finance*

- and Economics, 2017 164, 1116-128.
http://www.internationalresearchjournaloffinanceandeconomics.com/ISSUES/IRJFE_Issue_164.htm
- UNDP (United Nations Development Programme), (2004). Children and Poverty. UNDP: International Poverty Centre (IPC), Brasilia.
- UNDP, & OPHI. (2019). Global multidimensional poverty index 2019: illuminating inequalities. United Nations Development Programme and Oxford Poverty & Human Development Initiative.
- UNDP, (2018). Ethiopia's Progress towards Eradicating Poverty. UNDP: Addis Ababa
- UNICEF (2005) "State of the World's Children 2005: Childhood Under Threat" UNICEF HQ New York. Available: <http://www.unicef.org/sowc/>
- UNICEF (2005a) "*State of the World's Children 2005: Childhood Under Threat*" UNICEF HQ New York. Available: <http://www.unicef.org/sowc/>
- UNICEF Ethiopia (2018). Financing the Child-Centred Sustainable Development Goals (SDGs) in Ethiopia: Policy Brief.
- UNICEF Ethiopia and Central Statistical Agency of Ethiopia (2016). The Multidimensional Child Deprivation in Ethiopia is based on the Ethiopian Demographic and Health Surveys Data Sets of 2011 and 2016. CSA, Addis Ababa.
- UNICEF Ethiopia and Central Statistical Agency of Ethiopia, (2016). The Multidimensional Child Deprivation in Ethiopia. Available: www.unicef.org/Ethiopia and <http://www.csa.gov.et>; accessed on 8/25/2021.
- UNICEF, (2015). Multidimensional child poverty of ethnic minority children: situation, dynamics, and challenges.
- UNICEF, (2017). A world free from child poverty: A guide to the tasks to achieve the vision. UNICEF: New York.
- UNICEF. (2018). Child Notice Ethiopia. UNICEF/UNI160382/Ose: UNICEF.
- United Nations Children's Fund (UNICEF), (2012). Child Poverty and Inequality: New Perspectives. Division of Policy and Practice, New York.
- United Nations Food and Agriculture Organisation (UN-FAO), (2013). Word Food and Agriculture FAO: Statistical yearbook, viewed 06 May 2019, from <https://www.fao.org/docrep/018/i3107e/i3107e.PDF>

- United Nations Food and Agriculture Organisation (UN-FAO), (2013). Word Food and Agriculture FAO: Statistical yearbook, viewed 06 May 2019, from <https://www.fao.org/docrep/018/i3107e/i3107e.PDF>
- United Nations University/World Institute for Development Economics Research (UNU/WIDER) (2004). *Inequality, Growth, and Poverty in an Era of Liberalization and Globalization*. Oxford University Press.
- USAID (2017). Livelihoods Diversification Analysis (LDA). Literature Review. https://2017-2020.usaid.gov/default/files/documents/1860/LivelihoodDiversification_Final_LitReview_ENG.pdf.
- Uunk, W.J.G. and Vrooman, J.C. (2007). Explaining Social Exclusion: A theoretical model tested in the Netherlands Institute for Social Research, Hague.
- Vandemoortele, J. (2012). Equity begins with children. The Policy Press: University of Bristol
- Watkins, K. and Quattri, M. (2016) Child poverty, inequality, and demography: why sub-Saharan Africa matters for the Sustainable Development Goals. ODI Report. London: ODI World Bank (n.d.) 'The human capital project'. World Bank (www.worldbank.org/en/publication/human-capital).
- Weldebrhan Werede, Bihon Kassa and Kibrom Aregawi (2013). Assessment of Non-Farm Livelihood Diversification of Farmers in Enderta Woreda, Tigray. Unpublished MSc. Thesis in Development Studies, Mekelle University, Ethiopia.
- Woldehanna, T., and Ambaye, G. (2016). Multidimensional child poverty in Ethiopia: Evidence from DHS. *Ethiopian Journal of Economics*, 25(1), 63-88.
- Whelan, C, and Maitre, B. (2005). Economic exclusion, social exclusion, and social integration in an enlarged European Union. Economic and Social Research Institute (ESRI); 43p
- World Health Organization and the United Nations Children's Fund, (2021). Indicators for assessing infant and young child feeding practices: Definitions and measurement methods. WHO: Geneva. <https://creativecommons.org/licenses/by-nc-sa/3.0/igo>.
- WHO (2008). Access to improved drinking water sources and improved sanitation, WHO Statistical information system, retrieved from: <http://www.who.int/whosis/indicators/compendium/2008/2wst/en/>.
- WHO, (2020). Fact sheets-malnutrition. Available: <https://www.who.int/news-room/fact-sheets/detail/malnutrition>, 2020.
- WHO, 2016. Children: reducing mortality (Internet). WHO. [cited 2016 Jul 8]. Available from: <http://www.who.int/mediacentre/factsheets/fs178/en/>.

- Wiesmann, D., L. Basset, T. Benson, and J. Hoddinott. (2009). Validation of the World Food Programme's Food Consumption Score and Alternative Indicators of Household Food Security. IFPRI Discussion Paper 00870. Available: <http://www.ifpri.org/sites/default/files/publications/ifpridp00870.pdf>
- Wilbanks, T.J., (2003). Integrating climate change and sustainable development in a place-based context. *Clim. Policy* 3 (Suppl. 1), S147eS154.
- William H. G. (2018). *Econometric Analysis*, 8th edition. Pearson Education, inc.: New York.
- Winters, P., Essam, T., Zezza, A., Davis, B. and Carletto, C. (2010), "Patterns of Rural Development: A Cross-Country Comparison using Microeconomic Data", *Journal of Agricultural Economics*, Vol. 61 No. 3, pp. 628-651.
- WoBANR (Woreda Bureau of Agriculture and Natural Resources), (2018). Annual Report on agricultural household information. WoBANR: Arsi Negele.
- Woldehanna, T. (2000). Economic Analysis and Policy Implications of Farm and Off-Farm Employment. A Case Study in the Tigray Region of Northern Ethiopia. Ph.D. thesis. Wageningen: Wageningen University, The Netherlands
- Woldehanna, T. Hagos, A., Tafere, Y. (2017). Dynamics of Multi-Dimensional Poverty Among Children in Ethiopia: Evidence Using Longitudinal Data of Children from the Young Lives Study. Research Report, Ethiopian Development Research Institute (EDRI), April 2017, Addis Ababa, Ethiopia.
- Woldehanna, Tassew (2010b). Do Pre-natal and Post-natal Economic Shocks Have a Longlasting Effect on the Height of 5-Year-Old Children? Evidence from 20 Sentinel Sites of Rural and Urban Ethiopia, Working Paper 60, Oxford: Young Lives
- Wondim A. K. (2018). Determinants and challenges of rural livelihood diversification in Ethiopia: Qualitative review. *Journal of Agricultural Extension and Rural Development*, 11(2): 17-24.
- World Bank (2005). *Introduction to Poverty Analysis: Poverty Manual*. Washington, D.C.: World Bank.
- World Bank (2010) "Making BOS Effective under Decentralization" Policy Brief, December 2010.
- World Bank (2012). *Data-Methodologies*. Washington, DC: World Bank. <http://data.worldbank.org/about/dataoverview/methodologies>.
- World Bank (2012). *World Development Indicators*. Washington, DC: World Bank.
- World Bank (2020). *Ethiopia Poverty Assessment: Harnessing Continued Growth for Accelerated Poverty Reduction*. Washington, D.C.: World Bank.

- World Bank (2023). Global Trends in Child Monetary Poverty According to International Poverty Lines. Policy Research Working Paper 10525. World Bank, Washington DC.
- World Bank, (2006). Participatory Approaches to Attacking Extreme Poverty: Case Studies Led by the International Movement ATD Fourth World. World Bank; Washington, D.C.
- World Bank, (2008). Rural households and their pathways out of poverty. World Development the report, Washington DC: 72-93
- World Development Report (2008). Agriculture for Development. Washington, DC: The World Bank.
- World Health Organization (2010) Nutrition Landscape Information System (NLIS) country profile indicators: interpretation guide, Geneva: WHO.
- World Health Organization (WHO) and the United Nations Children’s Fund (UNICEF), (2017). Progress on drinking water, sanitation, and hygiene: 2017 update and SDG baselines. Geneva: Licence: CC BY-NC-SA 3.0 IGO.
- World Health Organization, (2014). Making fair choices on the path to universal health coverage. Final report of WHO Consultative Group on Equity and Universal Health Coverage. Geneva: World Health Organization.
- Wu, S., (2003). The Effect of Health Events on the Economic Status of Married Couples. *Journal of Human Resource*, 209-230.
- Yamane, T. (1967). Elementary sampling theory. Englewood Cliffs, New Jersey: Perentice-Hall, Inc.
- Yeboah, F. K. & Jayne, T. S. (2018). Africa’s Evolving Employment Trends. *The Journal of Development Studies*, 54(5): 803–832.
- Yenesew Sewnet Yizengaw, Eric Ndemo Okoyo and Fekadu Beyene, (2015). Determinants of livelihood diversification strategies: The case of smallholder rural farm households in Debre Elias Woreda, East Gojjam Zone, Ethiopia. *African Journal of Agricultural Research*, Vol. 10(19): 1998-2013.
- Yi-ping Fang, Jie Fan, Mao-Ying Shen, Meng-Qiang Song. (2014). Sensitivity of livelihood strategy to livelihood capital in mountain areas: Empirical analysis based on different settlements in the upper reaches of the Minjiang River, China. *Journal of Ecological Indicators*, (38): 225–235
- Yisak Tafere, (2012). Children’s Experiences and Perceptions of Poverty in Ethiopia. Young Lives, London.

- Yishak Gecho, Gezahegn Ayele, Tesfaye Lemma, Dawit Alemu. Rural Household Livelihood Strategies: Options and Determinants in the Case of Wolaita Zone, Southern Ethiopia. *Social Sciences*, 3(3), 92-104. doi:10.11648/j.ss.20140303.15
- Yizengaw, Y. S., Okoyo, E. N. and Beyene, F. (2015). Determinants of livelihood diversification strategies: The case of smallholder rural farm households in Debre Elias Woreda, East Gojjam Zone, Ethiopia. *Academic Journals*, 10(19).
- Yograj Gautam and Peter Andersen, (2016). Rural livelihood diversification and household well-being: Insights from Humla, Nepal. *Journal of Rural Studies*, 44: 239-249.
- Yohannes Yona and Tafese Mathewos, (2017). Assessing challenges of non-farm livelihood diversification in Boricha Woreda, Sidama zone. *Journal of Development and Agricultural Economics*, 9(4): 87-96.
- Young Lives, (2018). Poverty and Intergenerational Change: Preliminary Findings from the 2016 Young Lives Survey (Round 5): Ethiopia, Addis Ababa.
- Zanelloa G., Shankarb B. and Poole N. (2019). Buy or make? Agricultural production diversity, markets, and dietary diversity in Afghanistan. *Food Policy*, 87: 1-15.
- Zerai, B. and Gebreegziabher, Z. (2011). Effect of nonfarm income on household food security in eastern Tigray, Ethiopia: an entitlement approach. *Food Science and Quality Management*, 1:1-23

Appendices

Appendix Table 1: Dimensions, indicators, and weight attached to multidimensional child poverty

Dimensions	Indicators	Deprived if...	Related to...	Relative weight
Nutrition	Meal frequency	A child is feeding < 2 times per day	SDG 2	1/6
	Meal diversity	A child is feeding <2 food groups per day	SDG 2	1/6
Health	Skilled birth	A mother didn't attend antenatal care before giving a newborn	SDG 3	1/9
	Measles vaccination	A child has not been vaccinated	SDG 3	1/9
	BCG vaccination	A child has not been vaccinated	SDG 3	1/9
Education	Years of schooling	A child aged above 14 years of age has not completed primary school	SDG 4	1/6
	School attendance	A child aged 5-14 not attending primary school	SDG 4	1/6
Information	Radio	No access to radio	SDG 1	1/12
	Television	No access to television	SDG 1	1/12
	Phone	No access to mobile phone	SDG 1	1/12
	Computer	No access to computer services	SDG 1	1/12
Shelter	Room crowded	A child is living with ≥ 4 people in a room	SDG 11	1/6
	Flooring	A floor is made of wood, and covered by grass	SDG 11	1/6
Water & sanitation	Access to protected water	A child has no access to protected water	SDG 6	1/9
	Distance to protected water	Child travel ≥ 30 minutes on a round trip to collect water	SDG 6	1/9
	Access to flush toilet	The sanitation facility is not improved but it is improved but shared with other households.	SDG 6	1/9
Fuel and energy	Electricity	Has no access to electricity	SDG 7	1/6
	Cooking fuel	Households are using charcoal, wood, or dung for cooking meal	SDG 7	1/6
Household income	Average annual income	The average annual household income is <7,184 Ethiopian birr	CSA and UNICEF (2020)	1/3

Appendix Table 2: Summary statistics of continuous variables

Variable	Indicators	The extent of livelihood diversification					
		Undiversified	Less diversified	Moderately diversified	Highly diversified	Very highly diversified	Total
Age of household head	Mean	40.26	35.69	38.78	42.81	45.20	41.22
	Std. Dev.	12.79	8.47	9.29	8.65	8.20	9.68
	Minimum	23.00	22.00	22.00	22.00	35.00	22.00
	Maximum	95.00	50.00	60.00	70.00	57.00	95.00
Household size	Mean	3.71	3.52	4.03	4.85	4.04	4.43
	Std. Dev.	1.10	1.31	1.46	1.69	1.47	1.62
	Minimum	1.70	1.70	1.50	1.00	2.40	1.00
	Maximum	6.10	5.40	11.00	11.20	6.30	11.20
Number of economically active labor	Mean	2.49	2.41	2.50	3.36	3.66	2.99
	Std. Dev.	1.04	0.86	1.06	1.46	1.04	1.36
	Minimum	1.70	1.70	1.00	1.00	2.40	1.00
	Maximum	5.90	3.80	7.30	8.70	5.20	8.70
Total land holding in hectares	Mean	0.76	1.14	1.32	1.90	2.05	1.57
	Std. Dev.	0.34	0.77	0.88	1.21	0.65	1.11
	Minimum	0.25	0.13	0.25	0.38	1.25	0.13
	Maximum	2.00	3.00	4.50	9.00	3.00	9.00
Frequency of extension contact	Mean	1.41	2.23	1.76	2.97	3.40	2.42
	Std. Dev.	0.92	0.83	1.15	1.27	1.67	1.36
	Minimum	0.00	1.00	0.00	0.00	2.00	0.00
	Maximum	4.00	4.00	5.00	8.00	6.00	8.00
Farming experience in years	Mean	19.79	15.77	16.74	22.77	22.20	20.59
	Std. Dev.	13.13	11.29	10.03	9.27	8.23	10.46
	Minimum	1.00	1.00	1.00	1.00	15.00	1.00
	Maximum	70.00	33.00	40.00	48.00	35.00	70.00
Number of plot lands	Mean	1.53	1.46	1.62	2.01	2.60	1.83
	Std. Dev.	0.75	0.66	0.85	0.80	0.55	0.83
	Minimum	1.00	1.00	1.00	1.00	2.00	1.00
	Maximum	4.00	3.00	4.00	4.00	3.00	4.00
Distance to the nearest market	Mean	11.11	17.54	14.43	9.12	11.30	11.04
	Std. Dev.	8.94	9.51	9.74	6.28	8.22	8.18
	Minimum	4.00	5.00	4.00	4.00	7.50	4.00
	Maximum	27.00	26.00	26.00	26.00	26.00	27.00
Total number of livestock in TLU	Mean	1.52	2.16	2.95	5.74	3.30	4.28
	Std. Dev.	1.76	1.56	3.13	4.87	1.40	4.37
	Minimum	0.00	0.00	0.00	0.00	1.94	0.00
	Maximum	6.30	6.40	19.00	19.66	5.35	19.66
Total annual income	Mean	12821.55	28053.85	33095.54	68220.38	111180.0	50594.18
	Std. Dev.	16057.90	13284.98	33997.63	45516.40	45641.40	45026.69
	Minimum	1600.00	6600.00	2600.00	3400.00	72500.00	1600.00
	Maximum	107000.00	49000.00	171700.00	236600.00	164000.00	236600.00

Interview schedules for sample respondents

Name of the kebeles/woreda/_____

Date of the visit: _____ (dd)/_____ (mm)/_____ (YY)

Consent: Hello. My name is _____. I am working with Bogale Gebeyehu, an Addis Ababa University Ph.D. student. We are surveying Livelihood diversification and child poverty, Arsi Negele Woreda. The information we collect will help the student (Bogale Gebeyehu) in partial fulfillment of the requirement of the degree of doctor philosophy (Ph.D.) in development studies. Your household was selected for the survey. I would like to ask you some questions about your household. The questions usually take about 20 to 25 minutes. All of the answers you give will be confidential and will not be shared with anyone other than the researcher. You do not have to be in the survey, but we hope you will agree to answer the questions since your views are important. Thank you for your willingness to be interviewed.

General Information

Part I: Household characteristics

1. Name of the PA _____
2. Sex of the HH head 0). Male ☐ 1) female ☐
3. Age of the HH head _____
4. Education status of household head _____
Illiterate ☐
Literate: ☐ years of schooling ☐
5. Number of household members

	The age group of household members					
Sex	0-5	6-14	15-18	15-65	>65	Total
Number of Females						
Number of Males						
Total						

6. Marital status: single=0; married =1; divorced/separated =2; widow(er) = 3
7. What is your income per capita in birr a day? _____
8. How could you state your health status?
1. Excellent ☐ 2. Very good ☐ 3. Good ☐ 4. Fair ☐ 5. Poor ☐

Children related information

1. Do you have children? 1) Yes ☐ 0) No ☐
2. If your answer for Q1 is “Yes”, what is the age of a child or children under 18 years of age?

S.No.	Child name	Sex (M/F)	Date of birth DD/MM/YYYY	Age
1				
2				
3				
4				
5				
6				

3. How many times do your children under 5 age get meals per day? _____
4. How many types of food do your children under 5 ages get per day? _____
5. Did a mother attend antenatal care before she gave birth? 1) Yes_____ 0) No_____
6. Did your child get a Measles vaccination? 1) Yes ☐ 0) No ☐
7. Did your child get BCG vaccination? 1) Yes ☐ 0) No ☐

For children Age group 5-17

1. Are there any of your children aged between 5 and 17 not attending school?
- 1) Yes ☐ 0) No ☐
2. Are there any of your children older than 14 years but have not completed primary school?
- 1) Yes ☐ 0) No ☐
3. Do your children have radio access? 1) Yes ☐ 0) No ☐
4. Do your children have access to television? 1) Yes ☐ 0) No ☐
5. Do your children have access to the phone? 1) Yes ☐ 0) No ☐
6. Do your children have access to a computer? 1) Yes ☐ 0) No ☐

All age groups

1. With how many people do you share one living room? _____
2. What are the types of materials used to build a house? _____
3. Do you have access to protected water? 1) Yes ☐ 0) No ☐
4. How long do you travel to get protected water? _____
5. Do you have access to a flush toilet or pit latrine toilet? 1) Yes ☐ 0) No ☐
6. Do you have access to electricity? 1) Yes ☐ 0) No ☐
7. Which types of fuel do you use to cook your food? 1) Charcoal ☐ 2) Wood ☐
3) Dung ☐ 4) Stove ☐

Part II: Farming characteristics

1. Do you cultivate crops on your land?
1) Yes ☐ 0) No ☐
2. If yes to question No. 1, select which one of the following crops you cultivate

S.No.	Types of crops	Total land allocated (ha)	Yield harvested	Income earned from the sale (birr)	Income earned from the straw sale (birr)
1)	Maize	☐			
2)	Wheat	☐			
3)	Teff	☐			
4)	Barley	☐			
5)	Sorghum	☐			
6)	Millet	☐			
7)	Bean	☐			
8)	Pea	☐			
9)	Others	☐			

3. How many plots of land do you have at different locations? _____
4. Do you apply irrigation for your farming? 1) Yes ☐ 0) No ☐
5. Do you participate in farming activities on other people's farmland for harvest share?

1) Yes ☐ 0) No ☐

6. If yes to Q5, how much yield did you get in terms of quintal? _____

7. Do you participate in farming activities on other people's farmland as labor workers?

1) Yes ☐ 0) No ☐

8. If yes to Q7, how much money did you earn in total per annum? _____

9. How do you cultivate your land?

1) By tractor ☐ 2) Manually ☐ 3) By Oxen ☐

10. Do you contact the agricultural extension agents?

1) Yes ☐ 0) No ☐

11. If yes to Q10, how many times do you visit per month? _____

12. Do you apply chemical fertilizer on your farmland?

1) Yes ☐ 0) No ☐

13. Do you use an improved seed?

1) Yes ☐ 0) No ☐

14. Do you use pesticides on your farmland?

1) Yes ☐ 0) No ☐

15. Do you use herbicides on your farmland?

1) Yes ☐ 0) No ☐

16. For how long have you been cultivating crops? (Years) _____

17. How do you get crop seeds for your farming?

1. From own last year reserve ☐ 2. On credit ☐ 3. Buying from the seed market ☐

18. How far is your farmland from the input market? _____ km (travel hour)

19. How far is your farmland from the grain market? _____ km (travel hour)

20. Do you rear livestock?

1) Yes ☐ 0) No ☐

21. If “yes” to Q20, fill in the following table

S.No.	Types of livestock	Heads (number)	Purposes	Income earned
1)	Cattle			
2)	Oxen			
3)	Sheep			
4)	Goats			
5)	Poultry			
6)	Horses			
7)	Donkeys			
8)	Others			

22. How much cost do you incur to transport agricultural products from the farm to your home?

23. Have you ever experienced drought during the last five years?

1) Yes ☐ 0) No ☐

24. If you respond to the Q23 is “Yes”, how many times did this happen during the last five years? _____

25. Have you ever experienced floods during the last five years?

1) Yes ☐ 0) No ☐

26. If your response to the Q25 is “Yes”, how many times did this happen during the last five years? _____

27. Have you ever received credit services? 1) Yes ☐ 0) No ☐

28. If your answer for the Q27 is “Yes”, for what purposes did you receive it?

29. Do you use fertilizers for your farming activities? 1) Yes ☐ 0) No ☐

30. If yes to Q29, how do you apply on your farm? 1) Based on information from agricultural extension workers ☐ 2) based on own experiences ☐ 3) based on other farmers' experiences ☐

31. Do you apply pesticides to your farming? 1) Yes ☐ 0) No ☐

32. Do you apply herbicides to your farming? 1) Yes ☐ 0) No ☐

33. Have you ever encountered any problems related to fertilizer application? 1) Yes ☐ 0) No ☐

34. If yes to Q33, how has the problem happened? _____
35. Have you ever encountered a problem while applying pesticides? 1) Yes ☐ 0) No ☐
36. If yes to Q35, how did the problem happen? _____
37. Have you ever encountered a problem in applying herbicides? 1) Yes ☐ 0) No ☐
38. If yes to Q37, how did the problem happen? _____

Nonfarm related activities

39. Do you participate in shopping activities?
1) Yes ☐ 0) No ☐
40. If your answer to the Q39. If “Yes”, how much did you earn per year? _____
41. Do you participate in activities like carpentry?
1) Yes ☐ 0) No ☐
42. If your answer to the Q41. If “Yes”, how much did you earn per year? _____
43. Do produce charcoal?
1) Yes ☐ 0) No ☐
44. If your answer to the Q43. If “Yes”, how much did you earn per year? _____
45. Why do you participate in nonfarm activities?
1) Due to landlessness ☐ 2) Due to small farmland holding ☐ 3) To minimize consumption variability across seasons ☐
46. Have you ever received any assistance from your relatives living in the country or abroad in terms of money or materials?
1) Yes ☐ 0) No ☐
47. If “yes” and money to Q46, what amount of money do you receive per year?

48. If “yes” and material to Q46, estimated monetary value of material received? _____
49. Have you ever received any remittance from anyone either in the form of cash or kind?
1) Yes ☐ 0) No ☐
50. If your answer to Q 49 is “Yes” and in cash, the amount of money you received. _____
51. If your answer to Q 49 is “Yes” and in kind, the estimated amount is in terms of money.
