DETERMINANTS OF MARKET OUTLET CHOICE AND LIVELIHOOD OUTCOMES OF COFFEE PRODUCING FARMERS: THE CASE OF LALO ASSABI *WOREDA*, OROMIYA, ETHIOPIA

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I hereby certify that I have read and evaluated this Thesis entitled "***Determinants of Market Outlet Choice and Livelihood Outcomes of Coffee Producing Farmers: The case of Lalo Assabi Woreda, Oromiya, Ethiopia***" prepared under my guidance by Mekonin Abera. I recommend that it be submitted as fulfilling the thesis requirement.

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BIOGRAPHICAL SKETCH

The author was born on May 10, 1988 in West Wollega zone of Oromiya National Regional State. He attended his elementary, high school and preparatory level education at Dongoro Gebo elementary school, Wollega Adventist Academy high school and Ghimbi Comprehensive high school, respectively. After passing University Entrance examination, he joined Wollega University in 2007 and graduated with B. Sc degree in Statistics on June 28, 2010. After graduation, he was recruited to serve Madawalabu University as a Graduate Assistant starting September 2011. He served Madawalabu University for three years until he joined Haramaya University to pursue M .Sc degree studies in Statistics (Econometrics stream).

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ACRONYMS AND ABBREVIATIONS

AMA	American Marketing Association
DFID	Department for International Development
DA	Development Agent
ECX	Ethiopian Commodity Exchange
ECXA	Ethiopian Commodity Exchange Authority
ECEA	Ethiopian Coffee Export Association
ERD	European Report on Development
HDR	Human Development Report
ITC	International Trade Center
MNL	Multinomial Logistic Regression Model
MLR	Multiple Linear Regression
NCBE	National Coffee Board of Ethiopia
NG	Non-Governmental Organization
OLS	Ordinary Least Square
TLU	Tropical Livestock Unit
USDA	United States Department of Agriculture
USHSP	United States Human Settlement Program

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ABSTRACT

Determinants of Market Outlet Choice and Livelihood Outcomes of Coffee Producing Farmers: The case of Lalo Assabi woreda, Oromiya, Ethiopia

This study was aimed at assessing the determinants of market outlet choice and livelihood outcomes of coffee producing farmers in Lalo Assabi woreda of Oromiya region with specific objectives of identifying key roles of coffee marketing on the livelihood; identifying major factors affecting market outlet choice, and identifying determinants of livelihood outcomes as measured by housing condition, schooling of children and annual total income of coffee farmers. Random sample of 141 coffee producers were selected for interview and both descriptive and inferential statistical methods were employed for data analysis. For the marketing of coffee, 11.3%, 51.8% and 36.9% of the respondents mainly choose end consumer, private trader and cooperative outlets, respectively. The result of multinomial logistic model shows that the choice of end consumer outlet is positively and significantly affected by access to transportation facility, access to price information and access to credit compared to private trader outlet whereas quantity of coffee sold and access to extension service negatively affected the main choice of end consumer outlet. Similarly, the choice of cooperative outlet is positively and significantly affected by distance to the market, access to transportation facility, access to price information and access to training compared to private trader outlet. The result of binary logistic regression shows that the probability of having corrugated iron sheet roofed house increases with the increase in square root of total annual income. Multiple linear regressions results show that schooling of children is positively and significantly influenced by age of household head, year of education of household head, and square root of total annual income. Similarly, log of total annual income is positively and significantly affected by age of household head, TLU, access to credit, and total land owned. Therefore, policies aiming at increasing farmer's access to modern farming system, developing infrastructure and improving extension system are recommended to improve coffee productivity and livelihoods of coffee farmers.

Key words: Market outlet choice, Coffee, Livelihood outcomes, Multinomial logistic model, Binary logistic regression, Multiple linear regression

1. INTRODUCTION

1.1. Background of the Study

Coffee is one of the most important commodities in the world economy. The production of this commodity varies across regions. Coffee in particular is the backbone of the Ethiopian economy and is the leading commodity in generating foreign exchange for the country. Ethiopia is the origin of Arabica coffee and the world's fifth and Africa's leading producer. By its very nature, coffee is highly labor-intensive production activities. Very significant part of the population derives its livelihood from coffee. Coffee, thus, has a significant impact on the socio-economic life of the people and economic development of the country (ECEA, 2013).

Coffee is produced in more than 60 countries providing income for smallholder producers. Ethiopia and Brazil are the only coffee producing countries that consume a significant portion of their production. Ethiopia is one of the few countries where coffee sale is not liberalized. That means buyers must purchase through the commodity exchange. Only cooperatives and large scale growers are exempt, but their coffee qualities are still checked by ECX laboratories. Coffee production is mainly in west and south Ethiopia, around 90% based on smallholder farmers (ITC, 2011).

Ethiopia is famous as the origin of coffee and is the largest producer in Africa. About 15 million people directly or indirectly depend on coffee for their living. The largest volume of coffee is grown in the two large regions, Oromiya and the Southern Nations, Nationalities and Peoples Region. Only five percent of coffee production is grown on modern plantations, which are owned by private investors or by the government. The rest is grown by smallholder farmers, and about half of that production is in backyards or gardens. In both cases (modern plantations and smallholder production), coffee is generally grown under shade (Abu, 2012).

Modern coffee marketing based on coffee standard classification, grading and licensing was started in 1950s, following the establishment of the National Coffee Board of Ethiopia in 1957. National Coffee Board of Ethiopia (NCBE) was established to regulate coffee marketing

in the country and improve the quality of Ethiopian coffee for export. The NCBE have centers for coffee inspection, grading and auction in Addis Ababa and Dire Dawa with its own operational rules, regulations, and modalities which are operating till now. Ethiopian coffee marketing is constrained by major problems. The major constraints are unfavorable coffee international price, relatively high transaction cost, lack of adequate local standard processing and handling facilities, centralized coffee inspection and grading system, lack of export marketing skill and inconsistency in coffee quality (ECXA, 2008).

The quality standards of Ethiopian coffee are classified according to their origin of production. Among the best known coffee varieties in Ethiopia, Harar, Wollega, Limu, Sidama and Yirga cheffee take the priority. The first, Harar coffee is the highest premium coffee in Ethiopia and also in the world. Harar coffee has medium size bean, with a greenish to yellowish color with medium level of acidity and a distinctive mocha flavor. The second well known variety of Ethiopian coffee is Wollega coffee which is produced in western Ethiopia. The beans of Wollega has medium to bold bean with fruity taste. The third type, Limu coffee is known for its spicy and wine flavor, and good acidity. It is most preferred and popular in Europe and the United States of America. The fourth type of Ethiopian coffee is Sidamo coffee which has greenish to grayish color and medium sized beans (ECXA, 2008).

In the study area the main crops are coffee, maize, sorghum, finger millet and sweet potato. Honey also contributes to incomes. Poorer groups purchase staple and depend largely on agricultural and construction labor and sale of handicrafts. Livestock sale complement crop sales. The main cash crop is coffee and the livelihoods of smallholder farmers in the area highly rely on this cash crop (*Woreda's* Agricultural Office, 2014/15).

In order to solve such basic crops marketing problems and to assess its roles towards improving the livelihood and wellbeing of farmers, the role of statistical investigation is indispensable. Thus, the current study tries to focus on the assessment of the determinants of coffee market outlet choice and livelihood outcomes of smallholder coffee farmers in the study area. The particular emphases of the current study were to demonstrate what livelihood activities of coffee producers look like, identifying major determinants of market outlet choice

for supply of coffee and identifying major determinants of livelihood outcomes with particular attentions on the living condition of farmers, schooling of children and annual total income of coffee farmers using different statistical methodologies.

1.2. Statement of the Problem

In an effort to identify interventions that could stimulate farmers' participation in markets, it is important that factors influencing the farmers' choice of marketing channels are identified and understood. An increase in market participation in turn makes it easy for farmers to shift into commercial farming, in turn increasing economic growth (Jari and Fraser, 2009). Facilitating market participation of households as well as developing chain competitiveness and efficiency is valuable preconditions to improve livelihoods (Lundy *et al*., 2004; Padulosi *et al.*, 2004).

Improving market infrastructure by providing more and better markets and making it easier for farmers to access them is also deemed necessary for increasing the level of commercialization, especially in developing countries (Shilpi and Umali-Deininger, 2008). The lack of market participation that many agricultural households face is considered to be a major constraint to combating or fighting poverty (Best *et al*., 2005). Livelihood outcomes are important because they help the analyst to understand the results of peoples' livelihoods strategies in a particular context, why people pursue particular strategies and what their priorities are, and how people are likely to respond to new opportunities or constraints (ERD, 2010).

Though studies were undertaken on determinants of market outlet choice decision in different areas throughout the country by different authors, they are highly focused on market price information and marketing constraints. They do not say much about statistical assumptions and validity of models before practical application of employed methodologies. Many researchers are silent about livelihood improvements made by marketing of coffee and silent about determinants of livelihood outcomes in connection with coffee marketing. For instance, Anteneh *et al.* (2011) conducted study on the factors affecting coffee farmer's market outlet choice in Sidama zone, Ethiopia, using tobit model and identified that education, proportion of land allocated to coffee, proportion of off-farm income to total income, cooperative

performance, satisfaction on cooperative performance and second payment affected market outlet choice. But, in their study, the role of coffee marketing on the livelihood of coffee farmers is not included and there is no clear explanation about the implementation and validity of Tobit model for the coffee market outlet choice.

Tinsae (2008) carried out study on the performance of primary coffee cooperatives in Wonago and Yirga Chaffe *woreda* using Tobit model. The result of Tobit model revealed that position in cooperative, farm size, production of coffee, price offered to coffee by cooperative, presence of traders who offer competitive price, distance to the market center and non-farm income significantly affect the quantity of coffee marketed through cooperative. This study included only single market outlet (cooperative) and this is not enough to talk about marketing of coffee. In addition to this, the role of coffee marketing on the livelihood outcomes is not pointed.

Demeke (2007) conducted study on performance of coffee marketing cooperatives and members' satisfaction in Dale district, Southern Ethiopia. The result of Probit model revealed that age, family size, terms of payment for red cherry and dry cherry significantly affected the satisfaction of members of the coffee marketing cooperatives. This study has basically focused only on the members of cooperative in addition to using single coffee market outlet and cooperative non-members were not included. But, both cooperative members and non-members should be studied to make good representative of the entire population. This study did not touch what the livelihood outcomes of the coffee farmers look like.

To the best of my knowledge, even though coffee is economically and socially crucial crop, coffee marketing outlets and its role on the improvement of livelihood of farmers have not yet been undertaken and assessed for the target study area. In the current study, factors affecting coffee market outlet choice of coffee farmers; key roles of coffee marketing on the improvements of livelihood and determinants of the achievements of livelihood outcomes of coffee farmers in the study area are identified. The statistical methodology of the present study is completely different from those mentioned above.

1.3. Research Questions

The study made an attempt to answer the following questions:

1. What does the livelihood activities of coffee producing farmers look like?
2. What are the key factors affecting coffee market outlet choice of coffee producers?
3. What are major determinants of livelihood outcomes of the coffee producing farmers in the study area?

1.4. Objectives of the Study

1.4.1. General Objective

The overall objective of the study was to assess determinants of coffee market outlet choice and livelihood outcomes of coffee farmers in the study area.

1.4.2. Specific Objectives

1. To explore the general characteristics and livelihoods activities of coffee producing farmers;
2. To identify major factors affecting coffee market outlet choice of coffee producing farmers, and
3. To identify determinants of livelihood outcomes of coffee producing farmers in the study area.

1.5. Scope and Limitation of the Study

The study has been conducted in Lalo Assabi *woreda* of West Wollega zone, Oromiya National Regional State. The scope of the study was limited to assessing determinants of coffee market outlet choice and livelihood outcomes of coffee farmers. It would not include market outlet choice of other commodities. The study covered demographic, socioeconomic and institutional factors that influence livelihood outcomes and market outlet choice made by

coffee producers. Additionally, the study included general characteristics and livelihood activities, and determinants of livelihood outcomes of coffee producers. The result of the study may have limitations to make generalizations and make them applicable to the country as a whole since it is limited to only one *woreda*. However, it may be useful for areas with similar context with the study areas. The study could not cover determinants of all livelihood outcomes due to scarcity of time and budget allocated for the study.

1.6. Significance of the Study

Addressing the role of coffee marketing on the improvements of livelihood, factors affecting coffee market outlet choices and understanding determinants of the livelihood outcomes of rural households in the study area assist in making relevant policy and strategy recommendations, and also allow the preparation of future plans with better information. Knowing the loyal future target market based on the present marketing performance, it is possible to plan a target oriented research and production and marketing improvements. This helps the country to satisfy the customers with their best quality references. A cost effective references and advertisement is also possible with a known target market.

The study is a good stepping-ground for other studies on agricultural marketing and livelihood analysis. In the area of agricultural area, it is useful to cooperatives societies, researchers, and governmental and non-governmental organizations for policy formulation, planning and development of agricultural marketing and cooperatives in the country. Since there are scarcities of empirical literatures on wellbeing analysis in the country context, especially regarding housing condition and education in the country, the current study would have a great advantage in empirical literatures.

1.7. Organization of the Thesis

With the above brief introduction, the remaining part of the thesis is organized as follows. Chapter 2 presents review of literature on coffee market outlet and livelihood outcomes from different sources. Subsequently, methodologies and description of study area are presented in chapter 3. Chapter 4 presents results and discussions using both descriptive and inferential statistical models. Summary, conclusion and recommendations are presented in detail under chapter 5. References and Appendices are presented under chapter 6 and 7, respectively.

2. LITERATURE REVIEW

This chapter presents concepts and definitions of basic terminologies of market outlet and livelihood approaches such as marketing, marketing efficiency, marketing channel, livelihood strategies, livelihood outcomes, education, housing or shelter and income, decision making theory, and analytical framework. Empirical reviews on factors affecting market outlet choice, determinants of livelihood outcomes with particular emphasis on the housing condition, education and annual total income, as well as conceptual framework of livelihood outcomes are presented.

2.1. Basic Concepts and Definitions

2.1.1. Marketing

According to the definition of American Marketing Association (AMA), marketing is described as "the performance of business activities that directs the flow of goods and services from producers to consumers." This definition reveals the traditional perspectives of marketing where marketing was purely distribution and trade driven. Another definition given by American Marketing Association is that "marketing is the process of planning and executing the conception, pricing, promotion, and distribution of ideas, goods and services to create exchanges that satisfy individual and organizational objectives" (AMA, 2007)

American marketing association acknowledged that marketing was a customer and customer relationship-driven term. They changed their former definition to "marketing is an organizational function and a set of processes for creating, communicating, and delivering value to customers and for managing customer relationships in ways that benefit organization and its stakeholders." This definition was further revised and described as "the activity, set of institutions, the process of creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners and society at large" (AMA, 2007).

2.1.2. Marketing Channel

Marketing channel is the chain of interrelated enterprises that take part in the process of the movement of goods from the producer to the consumer. Marketing channels by timely providing the proper amount of goods and services in the proper place, of right quality and optimal price, not only meet the needs of consumers, but also stimulate the demand, by using different methods of promotion among all organizations in the marketing channel. Different authors described the possible options of marketing channels in different ways. Nevertheless, the basic division is into direct and indirect channels. In direct channels, producers or manufacturers sell their goods directly to individual consumers, while indirect channels include a trading company as well. An indirect marketing channel can be both short and long. Only one trading company is included in the short channel. In the long channel, there are two or more intermediaries (Guibert, 2006).

2.1.3. Marketing Efficiency

The term marketing efficiency refers to the efficient allocation of resources to achieve the greatest possible consumer satisfaction. Some factors that affect the efficiency of markets are market control, externalities, and information. Market control at its turn refers to structure, conduct and performance issues, while externalities relate to the non market price incorporated costs and benefits and imperfect information to the access to and availability of market information such as price, supply, demand and quality information (Raymon, 2003).

2.2. Livelihood Approaches

The term livelihood comprises the capabilities, assets including both material and social resources, and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shock, maintain or enhance its capabilities and assets without undermining the natural resource base. The concept of livelihood is increasingly used in development debates, in which capabilities of people and material assets are recognized to be important to make a living. The livelihood approach is concerned first and foremost with

people. It seeks to recognize and obtain an understanding of own strategies of people to survive and improve their livelihoods using their assets and capabilities (Kanji *et al*., 2005).

In Particular, livelihood approaches have proved to be valuable in understanding the dynamics of the trajectory out of social protection to the production and promotion of more viable livelihoods, even for those with very few assets, analyzing complex trends such as climate change and conflict situations, that is, situations in which a key objective is to strengthen people's overall resilience as the future becomes more uncertain and linking these to practical action and providing a framework for understanding food crises (Clark and Carney, 2008).

2.2.1. Livelihood Strategies

The term livelihood strategies are defined as the range and combination of activities and choices that people make in order to achieve their livelihood goals, including productive activities, investment strategies, reproductive choices, etc. They are composed of activities that generate means of household survival and the planned activities that they undertake to build their livelihoods. Livelihood approaches provide a way to order information and understand not only the nature of poverty, but also the links between different aspects of livelihoods of people. They help users to understand complex and changing situations. Livelihood approaches broaden the policy dialogue and assist in identifying where key constraints and opportunities exist. Furthermore, livelihoods approaches are also essential within social and economic research on poverty and food security, both as embedded in research strategies or as a research tool (Ellis and Freeman, 2007).

Livelihood strategies are the combination of activities that people choose to undertake in order to achieve their livelihood goals. They include productive activities, investment strategies and reproductive choices. A major influence on people's choice of livelihood strategies is their access to assets and the policies, institutions and processes that affect their ability to use these assets in order to achieve positive livelihood outcomes. Livelihoods approaches try to understand the strategies pursued and the factors behind decisions of people to re-enforce the positive aspects of these strategies and mitigate against constraints (ERD, 2010).

2.2.2. Livelihood Outcomes

The livelihood outcomes are achievements of livelihood strategies, such as more income and increased well-being (non-material goods like health status and access to service). In most cases, livelihood outcomes can be thought of as the inverse of poverty. That is, if an individual describes poverty as food insecurity, powerlessness and a lack of access to key services, then the livelihood outcomes they seek might be expected to be food security, a sense of power and dignity and improved access to services. Therefore, the primary method of understanding livelihood outcomes is to develop a thorough understanding of local definitions of poverty. This is an area in which there has been considerable progress over the past decade (DFID, 2006).

The livelihood outcome is described as the goals to which people aspire the results of pursuing their livelihood strategies, such as increased income, reduced vulnerability, increased well-being, improved food security, and more sustainable use of natural resources. Livelihood outcomes are important because they help the analyst to understand the results of peoples' livelihoods strategies in a particular context, why people pursue particular strategies and what their priorities are. Livelihood outcomes are also important to understand how people are likely to respond to new opportunities or constraints (ERD, 2010).

2.2.3. Housing, Education and Income as Livelihood Outcomes

Housing is an investment in physical, human and social capital and is important independent of any direct effects on health. However, if one wishes to make health-based housing policies and interventions, then the nature of the relationship between housing and health becomes highly relevant. Although improvements in the both the quantity and quality of housing are not certain to improve health, it is logical that they should do so. Housing is a central focus of everyday life and is likely to influence the ways in which socio-economic factors impact health (Moloughney, 2004).

Housing is one of the basic social conditions that determine the quality of livelihood and welfare of people and places. Housing conditions strongly influence people's quality of life. Adequate housing protects individuals and families from harmful exposures and provides them with a sense of privacy, security, stability and control. Conversely, poor quality and inadequate housing such as lacking of access to basic sanitation, functional utilities and overcrowding contributes to health problem (Balestra and Sultan, 2013).

Education, in its broadest sense, refers to the ways in which people learn or acquire skills and gain knowledge and understanding about the world and about themselves. Education is concerned with the general acquisition of values, knowledge, skills and attitudes. It is designed to remove the chains of ignorance, superstition and diseases. Education is a precondition for progress in development and reduction of poverty. It helps people to earn more income and become more productive, it also leads to improvements in health, nutrition and people are empowered to transform their own lives and those of their communities through acquiring the basic skills of literacy and numeracy as well as the capacity to utilize knowledge and information (Hamman, 2006).

The Human Development Index (HDI) is a summary measure for assessing long-term progress in three basic dimensions of human development. These basic dimensions of development are a long and healthy life, access to knowledge and a decent standard of living. Access to knowledge is measured by mean years of schooling for the adults and the expected years of schooling for children of school entrance age (HDR, 2013).

Household income and wealth are essential component of individual well-being. The ability to command resources allows people to satisfy basic needs and pursue many other goals that they deem important to their lives. Economic resources enhance individuals' freedom to choose the lives that they want to live and protect them against economic and personal risk. At the society-wide level, economic resources allow countries to invest in education, health, security, etc. Indeed, even if income alone is insufficient to assess a country's welfare, it is often a necessary condition for the country's overall development (Balestra, C. and J. Sultan, 2013).

2.3. Decision Making Theory

Modern decision theory has developed since the middle of the 20th century through contributions from several academic disciplines. Although it is now clearly an academic subject of its own right, decision theory is typically pursued by researchers who identify themselves as economists, statisticians, psychologists, political and social scientists or philosophers. There is some division of labor between these disciplines. A political scientist is likely to study voting rules and other aspects of collective decision making. A psychologist is likely to study the behavior of individuals in decisions, and a philosopher the requirements for rationality in decisions. However, there is a large overlap and the subject has gained from the variety of methods that researchers with different backgrounds have applied to the same or similar problems (Hansson, 2005).

A normative decision theory is a theory about how decisions should be made and a descriptive theory is a theory about how decisions are actually made. The "should" in the foregoing sentence can be interpreted in many ways. There is, however, virtually complete agreement among decision scientists that it refers to the prerequisites of rational decision-making. In other words, a normative decision theory is a theory about how decisions should be made in order to be rational. This is a very limited sense of the word "normative". Norms of rationality are by no means the only or even the most important norms that one may wish to apply in decision making. However, it is practice to regard norms other than rationality norms as external to decision theory (Hansson, 2005).

2.4. Individual Decision Making

Individual decision making forms the basis for nearly all of microeconomic analysis. In the standard view, rational choice is defined to mean the process of determining what options are available and then choosing the most preferred one according to some consistent criterion. The utility maximization approach to choice has several characteristics that help account for its long and continuing dominance in economic analysis. First, from its earliest development, it has been deeply attached to principles of government policy making. Second, many of the

comparative statics predictions of the choice theory that is the qualitative predictions concerning the ways in which choices change as people's environments change tend to be confirmed in empirical studies. Third, the optimization approach including utility maximization and profit maximization has a spectacularly wide scope (Levin and Milgrom, 2004).

2.5. Analytical Framework

Multinomial logit formulation is widely used to capture the potential interdependencies among the alternatives. Multinomial logit model is used where the assumption of independence of irrelevant alternatives which states that the odds in each outcome are mutually exclusive is fitted. This implies that the omission an outcome does not affect the odds in the remaining outcomes. The multinomial probit (MNP) model provides the most general framework for inter-dependent alternatives in discrete choice analysis. The interdependencies are accounted for through the correlation structure of normally distributed error terms. The primary impediment to the application of the Multinomial probit model is related to the dimensionality of the multifold normal choice probability integrals of about the size of the choice set.

The multivariate probit model is an extension of the probit model and is used to estimate several binary outcomes jointly. It simultaneously models the influence of the set of explanatory variables on each of different outcomes, while allowing the unobserved and/or unmeasured factors (error terms) to be freely correlated. In other ways, the choice of probit model and binary logit model mainly depends on personal interest since the interpretation and diagnostic checking procedures are similar. The dependent variable should be binary or dichotomous in nature to use binary logit model and odds ratios are used to interpret the parameters estimated by maximum likelihood estimation. The estimation procedure of binary logit model is more complex than the usual multiple linear regression which is estimated by the ordinary least square method. Multiple linear regression is preferred due to its practical applicability when the dependent variable under consideration is continuous (Greene, 2000).

2.6. Review of Empirical Studies

2.6.1. Factors Affecting Market Outlet Choice

Jari and Fraser (2009) provided an insight into the institutional and technical factors that influence agricultural marketing channel choices among smallholder and emerging farmers in Kat River Valley. The institutional factors that influence agricultural marketing channel choices include transaction costs, market information flow and the institutional environment which encompasses formal and/or informal rules, the use of grades and standards, organization in the markets and the legal environment. An appropriate institutional environment reduces transaction costs for traders. Rao *et al*. (2010) found that educational level of the operator, off-farm employment, access to transportation facility and age of operator had positive effect where as the household size was negatively associated with supper marketing channel choices.

Nyaupane *et al*. (2010) confirmed that farmers choose a market outlet considering its convenience and economic profitability. Farmers will therefore choose the channel that is most convenient and that offers the highest returns. The survey results of the factors influencing producers' marketing decisions in the Louisiana Crawfish Industry showed that most farmers choose wholesale markets compared to selling directly to consumers, retailers and producers. Farmers have a choice of whether to sell through direct or indirect marketing channels. Demographics farm characteristics (farm size and diversification) and premarket characteristics had significant influences on market choice. The choice of channel therefore also depends on the farmer's demographics such as age, gender, marital status and education level as well as on the farm characteristics.

Anteneh *et al*. (2011) employed tobit model and identified factors affecting market outlet choice of coffee farmers in Sidama zone. The finding of their study revealed that younger coffee farmers, with better education, higher proportion of off-farm income to total income, and higher proportion of land allocated to coffee tend to diversify their market choices by selling to traders. Farmer delivering exclusively to the cooperatives seems to be the older ones, with a relative lower individual performance. Among non-members however, younger farmers

with lower proportion of off-farm income are ones using the cooperative outlet channel through their friends or relatives. Mamo and Degnet (2012) employed multinomial logistic model and identified that gender and educational status of the household head together with household access to free aid, agricultural extension services, market information, non-farm income, volume of sales and market distance had statistically significant influence on choice of market outlet.

Kadigi (2013) employed multinomial logistic regression to identify factors influencing choice of milk outlets in Iringa and Municipality and Tanga city. The result revealed that access to credit decreases the choice of neighbor milk market outlet. The probability of choosing to sell to milk vendors is positively influenced by the price paid per liter and a possibility of dairy farmer being a female than a male. Milk vendors who offer better price are likely to increase dairy farmers' willingness to market their milk produce through the milk vendor market outlet, which are more rewarding than milk collection centers. Female headed dairy household would increase the probability for marketing milk to milk vendors.

Geoffrey (2015) Conducted study on the factors affecting the choice of marketing outlets among small-scale pineapple farmers in Kericho country. The result of multinomial logistic regression revealed that gender, group marketing, pineapple produce, price information and vehicle ownership significantly influenced the choice of pineapple marketing outlets. The result confirmed that price information had a positive influence on the choice of local market outlet while vehicle ownership positively and significantly influenced the choice of both local and urban market outlets.

Riziki *et al.* (2015) employed multinomial logistic regression to identify determinants of choice of marketing outlets for African Indigenous Vegetables (AIV) among the agro-pastoral Maasai of two countries of Kenya and Tanzania. The result of their study revealed that quantity of AIVs sold, distance to the agricultural market, sex of the household head, education level, family size, levels of value addition, farming experience in agro-pastoralism, off-farm income and marketing costs influenced the choice of marketing outlet of the sampled agro-pastoral Maasai.

2.6.2. Determinants of Housing Condition as a Measure of Livelihood Outcomes

Fiadzo (2004) conducted study on the estimating determinants of housing quality in Ghana. The empirical analysis based on the logistic regression revealed that tenure, age of household head, gender, marital status and employment status were significant determinants of housing quality. Female headed households and married family households were more likely to experience overcrowded housing situations than male headed households. Income and age of household head had significant and negative influence on the overcrowding in rural areas.

Adem (2005) in his study of socioeconomic impact of export oriented agricultural production on farmers in Eastern Ethiopia identified variables affecting the probability of having corrugated iron sheet roofed house. The result of logistic regression revealed that the variables area farmland allotted to chat, area of farmland allotted to cereals, years of education of the father, number of cows owned by the farmer and number of goats owned by the farmers were found to be statistically significant. The probability of having corrugated iron sheet roofed house increases with the increase in the area allotted to chat, years of education of father, number of cows owned by the farmer and number of goats owned by the farmer, and decrease with the decrease in the area allotted to cereals.

Gambo *et al*. (2012) conducted study on impact of poor housing condition on the economy of the poor in Makoko, Lagos state in view and found that there exist a complex relationship between housing condition with quality of education, health care affordability and level income which subsequently impede the economic enterprise of poor. The study found that effect of these variables can be very negative when people reside in unsafe neighborhood characterized by crime, violence and lack of opportunity. The study also revealed that those in a slum neighborhood are paying a variety of hidden costs on health, poor quality of education, water, employment opportunity and etc which may subsequently affect their economic productivity.

Another study undertaken by Saddozai *et al.* (2013) on descriptive analysis of determinants of quality of housing in Pakistan identified important variables affecting quality of houses. The

result of their study confirmed that age of household head; dependency ratio and grand income of household head have positive impact on the quality of houses. Wangui (2014) identified determinants of access to affordable housing in Nairobi. The result of multiple linear regression showed that a unit increase in access to finance and loan repayment period will increase housing quality. On the other hand, a unit increase in interest rates and land prices will lead to decreases on housing affordability.

2.6.3. Determinants of Education as a Measure of Livelihood Outcomes

Adem (2005) conducted study on the socioeconomic impact of export oriented agricultural production on farmers in Eastern Ethiopia. The result of ordinary least square (OLS) showed that area of land allotted to chat has positive and significant impact on the percentage of children sent to school. The finding of his study also revealed that the number of cows owned by the farmer has negative and significant impact on the percentage of children sent to the school with the possible reason that children help parents by herding (looking after) the cattle.

Chaudhury *et al*. (2006) identified determinants of child schooling in Ethiopia. The regression result revealed that year of education of household head has positive and significant influence on the determinants of child schooling where as distance to the nearest school has negative relationship with schooling of children. Households with better educated adults and those living in better educated communities are more likely to have children enrollment in the school. The distance of the nearest school from homestead negatively affects the enrollment and completion probabilities in rural areas.

Tullao and Rivera (2009) conducted study on Economic, demographic and factors affecting school participation among children in urban and rural households in Pasay and eastern Samar. The empirical result showed that promoting household economic status and employment, limiting family size, and providing access to quality basic public services have positive impacts on children's school participation. Although intervention can be done using household income as an avenue, its impact on school participation is not as powerful if intervention will be done through the enhancement and provision of public services such as food distribution,

medical support, housing services, and employment generation. A positive and significant relationship between household income and school participation exists. It has also been empirically verified that there is a negative relationship between population and school participation together with the positive relationship between the employment status and highest educational attainment of parents. The variables capturing the need for sufficient public services namely the state of hunger, availability of electricity, and housing services have significant impacts on school participation

.

Adem *et al*. (2012) conducted study on Education poverty among the rural households in Arsi zone focusing on school dropout and literacy rate. The result of truncated regression model revealed that age of household head, religion, years of education of household head, livestock size and agro-ecology difference were statistically significant. The result showed that literacy rate decreases with the age of the household for some years and increase on the higher ages and livestock herd size.

2.6.4. Determinants of Annual Total Income as a Measure of Livelihood Outcomes

Aikaeli (2010) carried out study on the determinants of income of rural household in Tanzania. The result of multiple linear regression showed that level of education of household head, size of household labor force, and acreage of land used ownership of non-farm rural enterprise have positive and significant effect where as gender of the household head has negative effect on income of rural household. The positive relationship revealed that investment in education is income improving. Increasing acreage is more effective to earn more income if complemented by improvements in inputs such as the mechanization of agriculture in addition to increase the size of the labor force.

According to Tasie *et al.* (2012), the major sources of income for the households included small-scale agriculture (crop and livestock production, and sale of trees and fruits), engagement in off-farm and non-farm activities and participating in public works programs. The major source of incomes for the households were categorized as agricultural production (sale of crops, trees, fruits and livestock), off-farm and non-farm activities, public works

programs and remittance. Income from agricultural production was the dominant followed by non-farm or off-farm incomes sources.

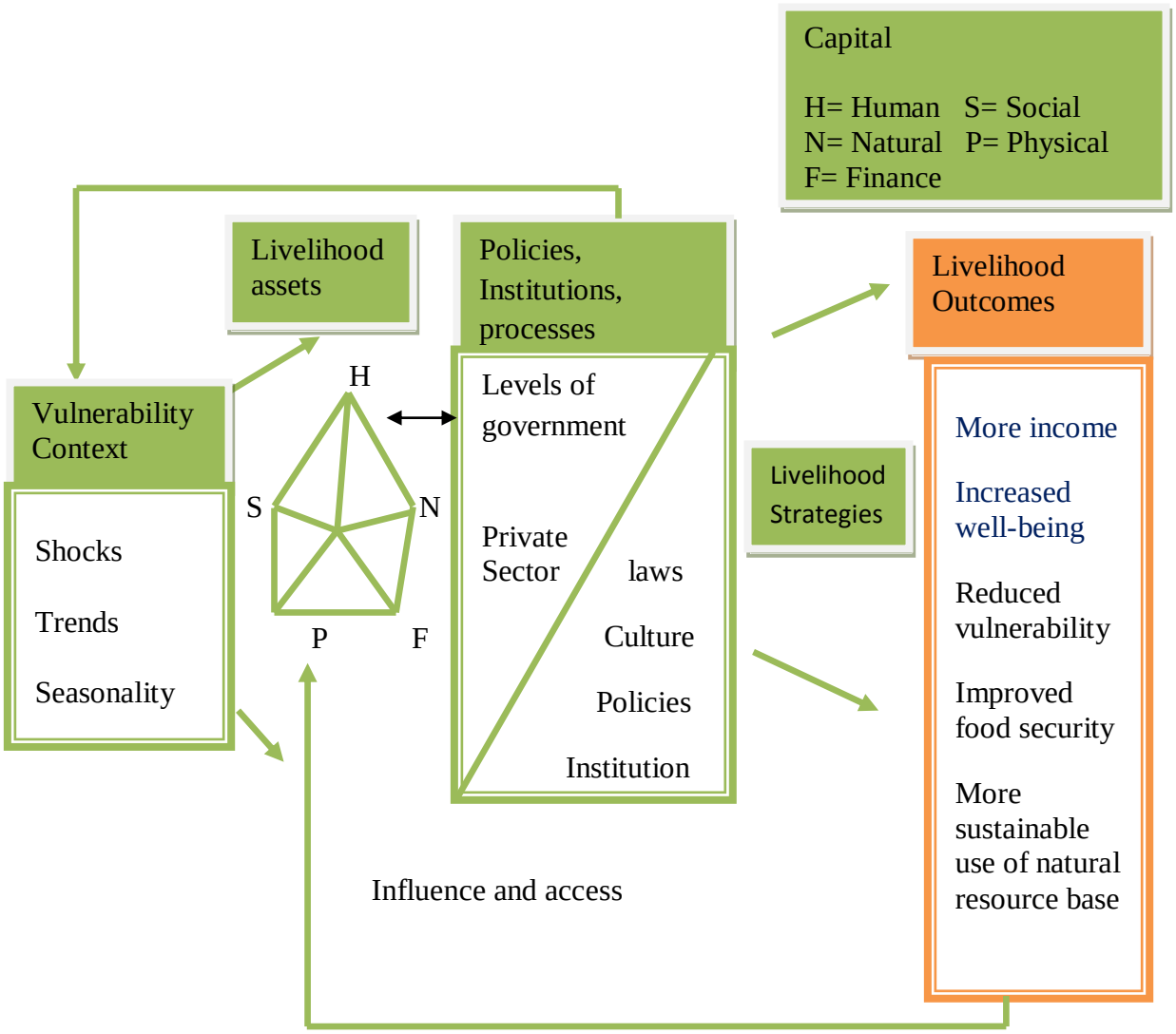
Amare and Belaineh (2013) conducted study on Determinants of income diversification among rural households of Fedis district of Eastern Hararghe zone. The result of tobit model showed that male household headed have obtained better self employment income because of their ability to access more lucrative or profitable off-farm self employment activities than the female headed household. Household heads with formal education are better in their perceptive values, knowledge, and decision making ability to participate into rewarding self employment activities and earn better income than the illiterate households. The result showed that households owning large livestock holding have the capacity to accumulate capital and overcome cash constraints for participation and obtain self employment income as compared to those with small or no livestock holding. On the other hand, as the distance to the market increases, the likelihood of the household to earn non or off-farm self employment income declines implying that households residing far from market centers have less probability to access and participate into opportunistic self employment activities.

Arega *et al*. (2013) empirically showed that rural households' livelihood outcomes as measured by their annual total income is generally influenced by a range of biophysical, socioeconomic and institutional factors in the drought areas of Ethiopia. The result of multiple linear regressions showed that livelihood ownership, trees and fruit production, access to credit, agro ecology and engagement in non-farm activities are the important factors influencing annual incomes of households and thus their livelihood outcomes. Agro-ecology as a variable captures influence of location factors on household annual incomes. Livestock ownership was strongly and positively correlated to annual income of households.

2.7. Conceptual Framework of sustainable Livelihood

The Sustainable Livelihood Framework is composed of Livelihood outcomes, Livelihood assets, Livelihood strategies, Policies and institutions and Vulnerability context. The framework has been widely used to design multiple entry points for investment strategies or

policies for sustainable development aimed at poverty reduction or resource management improvement in the long term.



Source: DFID (2006)

Livelihood Assets: Livelihood assets are the resources on which people draw in order to carry out their livelihood strategies. The members of a household combine their capabilities, skills and knowledge with the different resources at their disposal to create activities that will enable them to achieve the best possible livelihood for themselves. Everything that goes towards creating that livelihood can be thought of as a livelihood asset (Farrington *et al.*, 2002).

Policies and Institutions: Policies, institutions and processes refer to the complex social, economic and political context within which people pursue their livelihood strategies. They can have a great influence on access to assets. That is creating them, determining access, and influencing rates of asset accumulation. Those elements in the sustainable livelihoods framework cover the inter-related issues of social relations, social and political organization, governance, service delivery, social norms, policy and policy processes. These operate at global, national, regional, district and local levels. Key to understanding their impact on local livelihoods is an analysis of the operation, or absence, of links between micro, meso and macro levels (ERD, 2010).

The vulnerability Context: The vulnerability context within which people pursue their livelihoods includes trends (for example, economic or resource trends), shocks (for example, conflict, economic shocks, natural shocks, etc.), seasonal fluctuations in prices, production, health, employment opportunities. These factors can have a direct impact on people's assets and on the options available to them to pursue beneficial livelihood strategies. The vulnerability context of poor people's livelihoods is usually influenced by external factors outside their direct control and is dependent on wider policies, institutions and processes. To support people in order for them to be more resilient to the negative effects of trends, shocks and seasonality, development policy-makers and practitioners can support people's access to assets and help ensure that critical policies, institutions and processes are responsive to their needs (ERD, 2010).

3. MATERIALS AND METHODS

This chapter presents the research methodology used in the study including location and description of study area, sampling procedure and sample size determination, type of data and methods of data analysis.

3.1. Description of the Study Area

The study area, Lalo Assabi *woreda*, is one of the 19 *woredas* of West Wollega zone which is one of the zones of Oromiya National Regional State. West Wollega zone is located in the western part of the country at a distance of 441 kilometers away from Addis Ababa, the capital city of the country. Lalo Assabi *woreda* has 27 rural *kebeles* (Farmers' Associations) and 3 urban administrations. The *woreda* is situated at latitudinal and longitudinal ranges of 19^0 to 20^0 N and 35^0 to 45^0 E geographical grids, respectively. The estimated total area coverage of the *woreda* is 43355 hectares. The geographical division of the *woreda* is rural area 42,337 hectare, urban 1018 hectare, individual 38,325.7 hectare; communal area 3496.624 hectare and residence area is 514.626 hectares. The estimated total population of the *woreda* is 86,327 of which 45,678 are males and the rest 40,649 are females (Lalo Assabi *woreda* agricultural office, 2014).

Table 1. Total population of Lalo Assabi *woreda*

Residence Division	HHS			Family			Total		
	M	F	Sum	M	F	Sum	M	F	Sum
Rural	9966	1599	11565	30374	33294	63668	40340	34893	75233
Urban	1806	244	2050	3532	5512	9044	5338	5756	11094
Sum	11772	1843	13615	33906	38806	72712	45678	40649	86327

Source: (Lalo Assabi *woreda* Agricultural Office, 2014/15)

Agro-climatic condition of the *woreda* is woinadega and its dominant soil type is loamy soil. The maximum temperature of the *woreda* ranges from 25^{o}C to 30 ^{o}C, where as the minimum ranges from 18 ^{o}C to 25^{o}C. The major rain seasons of Lalo Assabi *woreda* are June, July and August with maximum and minimum rainfall of 1850 to 2200mm and 100 to 1800mm respectively. The main crops are coffee, maize, sorghum, finger millet and sweet potato. The livestock commonly available in the study area are cattle, sheep, goat, mules, horses, donkeys and poultries.

In Lalo Assabi *woreda* two markets, Innango and Dongoro, are two commonly known coffee marketing centers for the four selected *kebeles* for the study. Innango is *woreda's* capital city. There are 14 agricultural cooperatives in Lalo Assabi woreda. From these Dongoro Gebo and Dongoro Dissi kebeles are organized under agricultural cooperative called Burka Dongoro, Nabob Dalatti kebele is under Lalisa Lalo and Warra Jirru Bacho kebele is under Lata harrojji and Lalisa Bacho (Lalo Assabi *woreda* Trade and Market Development Office, 2014/15).

3.2. Sampling Procedure and Sample Size Determination

3.2.1. Sampling Procedure

Sampling procedure is employed in order to generate statistics and generalize findings to a larger population. Sampling refers to the process of selecting individuals from a larger group of people and drawing conclusion that are an accurate representation of how the larger group of people acts or what they believe (Frankel and Wallen, 2006).

For the current study, in order to select a representative sample, a two-stage random sampling technique was implemented to select coffee producing households. In the first stage, out of 27 *kebeles* of Lalo Assabi *Woreda*, 4 coffee producing *kebeles* were randomly selected based on the method of lottery method. All *kebeles* in the *woreda* produce coffee under similar agro-ecological zone. But, the amount of production is different among the *kebeles* in the *woreda* such that the selected *kebeles* can be used as strata. In the second stage, from the selected 4

rural *kebeles*, households were selected by simple random sampling method based on proportional allocation.

3.2.2. Sample Size Determination

In calculating sample size, if there is no previous related work, pilot survey is recommendable and will provide necessary information to fix the value of P. But, for the current study, due to budget and time constraint, the researcher couldn't carryout pilot survey. Therefore, the following assumption is used regarding the value of P. When calculating sample size for proportion, there are two situations to consider. First, if some approximation of P is known (example, from a previous study), that value can be used in the formula. Second, if no approximation of P is known, one should use P= 0.5. This value will give a sample size sufficiently large to guarantee an accurate prediction (Ott and Longnecker, 2010).

In this study, P is taken proxy to the proportion of households whose livelihood is improved by coffee production and marketing. Using the formula of sample size determination for stratified random sampling, the required sample size for this study is calculated as follows.

$$n = \frac{\sum\left(\frac{N_h^2 A}{W_h}\right)}{N^2 D^2 + \sum N_h A}, \text{ where } \quad D = \frac{C}{Z_{\frac{\alpha}{2}}} \text{ and } A = p(1-p),\ h = 1,...,4 \qquad 3.1$$

C- is a margin of error which a researcher tolerates in the estimation

P- is proportion of households whose livelihood is improved by coffee production and marketing

$Z_{\frac{\alpha}{2}}$- is the value of standard normal distribution for a given level of significance.

N- is population size and n is total sample size required for the study

W_h - is proportion of population of *kebele* h to the population of the selected *kebeles*

Using the above formula and inserting $C = 0.08, \alpha = 0.05, N = 1386 and\ P = 0.5$, the required sample size obtained is 141.

Table 2. Proportional allocation of samples from each selected *kebeles*

S.N	Selected *kebekes*	Household size (N_h)	Selected sample (n_h)
1	Dongoro Gebo	272	28
2	Dongoro Dissi	416	42
3	Warra Jirru Bacho	474	48
4	Nabbo Dalatti	224	23
Toatl		1386	141

3.3. Type of Data and Method of Data Collection

Primary data source was used to collect necessary information for the study and structured questionnaire was used to generate primary data from the selected households. The primary data was collected from December 16, 2014 to January10, 2014.

3.4. Methods of Data Analysis

Different descriptive and inferential statistical methods were employed to analyze the data. For the analysis of data, statistical software SPSS version 20 and STATA version 11 were used.

3.4.1. Descriptive Statistics

Descriptive statistics which is a summary calculation such as percentages, means and standard deviation is used in the data analysis whereas graphs and tables are used to present data wherever necessary.

3.4.2. Inferential Statistical Models

Inferential statistics consists of generalizing from sample to population, performing estimation and hypothesis testing, determining relationships among variables, and making predictions (Ott and Longnecker, 2010).

3.4.2.1. Multinomial logistic model

Multinomial logistic models are multi-equation models in which a response variable with K categories will generate K-1 equations. Each of these K-1 equations is a binary logistic regression equation comparing each category with the base or reference category. The multinomial logit model is analogous to a logistic regression model; except that the probability distribution of the response is multinomial (categorical) instead of binomial (binary) and thus we have K-1 equations instead of one equation. Multinomial Logistic model works if a decision between multiple independent alternatives is truly made simultaneously. That is, alternative categories must be independent or mutually exclusive**.** In this study, multinomial logistic model was used to identify factors affecting market outlet choice decision of coffee farmers.

A multinomial logit (MNL) model was applied to explain inter household variation in the choice of a specific marketing outlet. This study assumes that farmer's decision is generated based on utility maximization. This implies that each alternative marketing outlet choice entails different private costs and benefits, and hence different utility to household decision maker. The analytical model is constructed as follows. Suppose that the utility to a household of alternative j is U_{ij} where $j = 0,1,2,\ldots$. From the decision maker's perspective, the best alternative is simply the one that maximizes net private benefit at the margin. In other words, a household i will choose marketing outlet j if and only if $U_{ij} > V_{ik}, \forall j \neq k$. Based on the McFadden (1978), a household utility function from using alternative j can then be expressed as follows:

$$U(\text{Choice of j for household i}) = U_{ij} = V_{ij} + \varepsilon_{ij}$$

Where

U_{ij} is overall utility

V_{ij} is an indirect utility function and

ε_{ij} is a random error term

The probability that household i select alternative j can be specified as:

$$P_{ij} = \Pr(V_{ij} + \varepsilon_{ij} > V_{ij} + \varepsilon_{ik}) \quad 3.2$$

$$P_{ij} = \Pr(\varepsilon_{ik} < \varepsilon_{ij} + V_{ij} - V_{ik}) \ \forall j \neq k \quad 3.3$$

Following Greene (2000), the MNL model for multiple choice categories is specified as follows.

$$P_{ij} = \frac{e^{X_i \beta_j}}{\sum_{j=1}^{3} e^{X_i \beta_j}}, \ j = 0,1,2 \quad 3.4$$

Where,

P_{ij} = the probability representing the i^{th} farmers choice of market outlet j.

X_i = is predictor of probabilities

e = natural base of logarithms; and

β_j = parameters to be estimated by maximum likelihood estimate.

For identification of the model, normalize by assuming β_0=0 (Greene, 2000). Therefore, ith probabilities are given by:

$$prob\left(y_i = j / X_i\right) = P_{ij} = \frac{e^{X_i \beta_j}}{\sum_{j=1}^{J} e^{X_i \beta_j}}, \text{ for J>1} \quad 3.5$$

$$prob\left(y_i = 1 / X_i\right) = P_{ij} = \frac{1}{1 + \sum_{j=2}^{J} e^{X_i \beta_j}} \quad 3.6$$

The parameter estimates of the MNL model only provide the direction of the effect of the independent variables on the dependent variables. Thus, the estimates represent neither the actual magnitude of change nor the probabilities. Instead, the marginal effects are used to measure the expected change in probability of a particular technique being chosen with respect to a unit change in an independent variable from the mean (Greene, 2000). The marginal effect (δ_{ij}) of the characteristics on the probabilities are specified as:

$$\delta_{ij} = \frac{\partial P_{ij}}{\partial x_j} = P_{ij}\left[\beta_j - \sum_{j=0}^{J} P_{ij}\beta_j\right] = P_{ij}\left[\beta_j - \bar{\beta}\right] \quad 3.7$$

Where $\bar{\beta} = \sum_{j=0}^{J} P_{ij}\beta_j$ is a probability weighted average of the β_j.

Test of significance of coefficients: Individual regression coefficients are tested with the reported z-statistics and the corresponding p-values as usual. Likelihood ratio test (lrtest), to test model adequacy involves the following steps:

1. Estimate the full model including all of the variables and obtain the likelihood-ratio statistic LR^2_F.
2. Estimate the restricted model that excludes some explanatory variables , X_K and obtain LR^2_R
3. Finally compute the difference $LR^2_{RvsF}=LR^2_F-LR^2_R$, which is distributed as chi-squared with j−1 degrees of freedom.

Test of the Independence of Irrelevant Alternatives (IIA): Independence of Irrelevant Alternatives refers to the situation where the odds in one outcome do not depend on other outcomes that are available or odds are mutually exclusive. In this sense, these alternative outcomes are "irrelevant." What this means is that adding or deleting outcomes does not affect the odds among the remaining outcomes. This can be tested by either hausman test or likelihood ratio test.

3.4.2.2. Binary logistic model

Logistic regression is a statistical technique for predicting the probability of an event, given a set of predictor variables. The procedure is more sophisticated than the linear regression procedure. The binary logistic regression procedure empowers one to select the predictive model for dichotomous dependent variables. It describes the relationship between a dichotomous response variable and a set of explanatory variables. The explanatory variables may be continuous or discrete. The logistic model, as a non-linear regression model, is a

special case of generalized linear model where the assumptions of normality and constant variance of residuals are not satisfied.

Binary logistic regression is a form of regression which is used when the dependent variable is a dichotomous and the predictor variables are of any type. Multinomial logistic regression handles the case of dependent variables with more than two classes. Logistic regression can be used to predict the probability of the outcome of a dependent variable on the basis of continuous and/or categorical independent variables and to determine the magnitude of the independent variables on the dependent variable; to rank the relative importance of independent variables; to assess interaction effects; and to understand the impact of covariate control variables. The impact of predictor variables is usually explained in terms of odds ratios (Hosmer and Lemeshow, 1989). In this study, binary logistic regression was used to identify major determinants of livelihood outcomes as measured by housing condition proxy to wellbeing of coffee producing farmers.

Let π denote the probability of success, then $P(y_i = 1) = \pi_i$, $P(y_i = 0) = 1 - \pi_i$. The logistic regression function is given as:

$$\pi_i = \frac{e^{\beta_o + \beta_1 x_{i1} + \ldots + \beta_k x_{ik}}}{1 + e^{\beta_o + \beta_1 x_{i1} + \ldots + \beta_k x_{ik}}} = \frac{e^{x_i \beta}}{1 + e^{x_i \beta}} \qquad 3.8$$

The logistic regression equation can be written in terms of an odd ratio of success.

$$\pi = \frac{P(y = 1/x_i)}{1 - P(y = 1/x_i)} = \frac{\pi_i}{1 - \pi_i} = \exp(\beta_o + \beta_1 x_1 + \ldots + \beta_k x_k) \qquad 3.9$$

Or

$$\log\left[\frac{P(y = 1/x_i)}{1 - P(y = 1/x_i)}\right] = \log\left[\frac{\pi_i}{1 - \pi_i}\right] = \beta_o + \beta_1 x_1 + \ldots + \beta_k x_k = \sum_{j=0}^{k} \beta_j x_{ij} \qquad 3.10$$

Assumptions of logistic regression: Prior to running the binary logistic regression, the following basic assumptions are considered and checked.

1. Logistic regression does not assume a linear relationship between the dependent and independent variables.
2. The dependent variable must be a dichotomy (2 categories).
3. The independent variables need not be interval, nor normally distributed, nor linearly related, nor of equal variance within each group.

Based on the assumption mentioned above, the logistic regression uses maximum likelihood to estimate the unknown coefficients of logistic regression model.

Test of goodness-of-fit of logistic model: A number of measures have been proposed in logistic regression as an analog to R-square in multiple linear regressions. In logistic regression, there is no true R^2 value as there is in OLS estimation of linear regression. The maximum value that the Cox & Snell R-square attains is less than 1. The Nagelkerke R-square is an adjusted version of the Cox & Snell R-square and covers the full range from 0 to 1, and therefore it is often preferred (Bewick and Jonathan, 2005).

The Cox and Snell R square is computed as follows:

$$Cox\ and\ Snell\ Pseudo\ R^2:\ R^2 = 1 - \left[\frac{-2LL_{null}}{-2LL_{full}}\right]^{\frac{2}{n}} \qquad 3.11$$

Because this R-squared value cannot reach 1.0, Nagelkerke modified it. The correction increases the Cox and Snell version to make 1.0 a possible value for R-squared.

$$\text{Nagelkerke}\ Pseudo\ R^2: R^2 = \frac{1 - \left[\frac{-2LL_{null}}{-2LL_{full}}\right]^{\frac{2}{n}}}{1 - (-2LL_{null})} \qquad 3.12$$

Where: LL_{null} is log-likelihoods of the null model or the logistic model with just the constant null. LL_{full} is log-likelihoods of the full logistic regression model or the logistic regression model contains all the k predictors full.

Hosmer and Lemeshow Test: Hosmer and Lemeshow (H-L) test is an alternative test chi-square test for the fitting of the logistic model. If the Hosmer and Lemeshow goodness-of-fit test statistic is greater than 5% significance level, we fail to reject the null hypothesis that there is no difference between observed and model predicted values, implying that the model's estimates fit the data at an acceptable level. That is well fitting models show non-significance on the Hosmer and Lemeshow goodness-of fit test. This desirable outcome of non-significance indicates that the model prediction does not significantly differ from the observed (Hosmer and Lemeshow, 1989).

The Likelihood Ratio Test: The likelihood ratio chi-square (G^2) statistic is the test statistic commonly used for assessing the overall fit of the logistic regression model. The likelihood ratio test, also called log-likelihood test, it is based on -2LL (-2 times log likelihood). The likelihood ratio statistic is obtained by subtracting the two times log likelihood (-2LL) for the final (full) model from the log likelihood for the intercept only model. This log likelihood-ratio test uses the ratio of the maximized value of the likelihood function for the intercept only model L_o over the maximized value of the likelihood function for the full model L_l. The likelihood test statistic is given by

$$G^2 = -2\log\left(\frac{L_o}{L_1}\right) = -2\left[\log(L_o) - \log(L_1)\right] = -2\left[LL_o - LL_1\right] \qquad 3.13$$

Where, LL_o is the log likelihood value of the model which is the intercept term only and LL_l is the log likelihood value of the full model. The likelihood ratio statistic has a chi-square distribution and it tests the null hypothesis says all logistic regression coefficients except the constant are zero. The degrees of freedom are obtained by differencing the number of parameters in the both model. It compared with chi-square value at the difference between degree of freedom of both model. And p-value indicates that the probability of the deviance based on chi-square is greater than the tabulated chi-square. If p-value is less than 5 % level of

significant leads the rejection of the null hypothesis that all the predictor effects are zero. When this likelihood test is significant, at least one of the predictors is significantly related to the response variable (Hosmer and Lemeshow, 1989).

The Wald Test: In order to test for the significance of the model parameters one need to know the distribution of the estimates. Under certain regularity conditions the maximum likelihood estimates have an asymptotic multivariate normal distribution with expected value equal to the true parameters. A test procedure that uses this general result is the Wald test, which can be used to test for the significance of individual as well as several parameters at a time. The Wald statistic is an alternative test which is commonly used to test the significance of individual logistic regression coefficients for each independent variable. The hypothesis to be tested is H_o: $B_j = 0$ vs H_1: $B_j \neq 0$ $j = 1,2, ...k$ at α- level of significance. The Wald test statistic, Z, for this hypothesis

$$W = Z^2 = \left[\frac{\hat{\beta}}{Se(\beta)}\right]^2, \text{ or } Z = \frac{\hat{\beta}_j}{\sqrt{\text{var}(\hat{\beta}_j)}} \qquad 3.14$$

This statistic has approximately a standard normal distribution in large samples. Equivalently, the square of this statistic has an approximate chi-squared distribution with one degrees of freedom and this is the usual formulation of this statistical procedure. The Wald test is one of a number of ways of testing whether the parameters associated with a group of explanatory variables are zero. If the Wald test is significant for a particular explanatory variable then we would conclude that the parameters associated with these variables are not zero so that the variables should be included in the model otherwise the explanatory variables can be omitted from the model (Bewick and Jonathan, 2005).

Omnibus Test: Another interesting test in the binary logistic regression is Omnibus test which may be interpreted as a rest of the capability of all predictors in the model jointly to predict the response (dependent) variable. It tests if the model with the predictors is significantly different from the model with only the intercept. A finding of significance of Omnibus test corresponds to concluding that there is adequate fit of the data to the model. This means that at least one of the predictors is significantly related to the response variable.

Residual Analysis: The standardized and deviance residuals are the most commonly used statistic in identifying points for which the model fits poorly. Observations with absolute standardized and deviance residual values in excess of 3 may indicate lack of fit (Rawlings, 1998). Deviance residual is measures the disagreement between any component of the log likelihood of the fitted model and the corresponding component of the log likelihood that would result if each point were fitted exactly. Since, the logistic regression uses the maximum likelihood principle; the goal in logistic regression is to minimize the sum of the deviance residuals. Deviance residuals can also be useful for identifying potential outliers in the model. The deviance residual for the i^{th} case is defined as the signed square root of the contribution of that case to the sum for the model deviance as:

$$dri = sign(Y_i - \hat{\pi}_i)\{-2[Y_i \ln(\hat{\pi}_i) + (1-Y_i)\ln(1-\hat{\pi}_i)]\}^{\frac{1}{2}} \quad 3.15$$

3.4.2.3. Multiple linear regression

Multiple linear regression is selected for its practical applicability (Greene, 2000). In the current study, multiple linear regressions were employed to identify factors affecting livelihood outcomes as measured by schooling of children proxy to wellbeing and annual total income of coffee producers. Following (Greene, 2000), econometric model specification of the multiple linear regression models in matrix notation is:

$$\mathbf{y} = \mathbf{X}'\beta + \mathbf{U} \quad 3.16$$

Where:

y = Total annual income of farmers

X = Vector of explanatory variables

β = Vector of parameters to be estimated

U = disturbance term

Assumptions of Multiple Linear Regression Model: The validity of following basic assumptions of multiple linear regression are clearly tested before the model is used for analysis.

1. Variable U is a real random variable
2. The random variable U has zero mean for all the Xi values
3. Homoscedasticity: The variance of each Ui is the same for all the Xi's.
4. Ui's are normally distributed with mean zero and constant variance.
5. Independence of Ui and Xi
6. No errors of measurement in the X's
7. No perfect multicollinearity of X's

Estimation of model parameters: The method of Ordinary Least Squares estimation (OLS) can be used to estimate the regression coefficients ($\hat{\beta}$) by minimizing sum square of error term. Under this estimation, the assumption to be considered will be the error term normally and identically distributed. The least square estimator of population parameter (β) is $\hat{\beta} = (X'X)^{-1}X'y$.

Where; $\hat{\beta}$ - least square estimator of population parameter

X' -transpose of the explanatory variables

y- Dependent variable

$(X'X)^{-1}$ -inverse for product between transpose and non-transpose of explanatory variables

Test of goodness-of-fit of the regression model: The coefficient of multiple determinations is denoted by capital R^2 with subscripts the variables whose relationship is being studied. Generalization of the formula for R^2 for k-variables model is:

$$R^2_{y.x_1,x_2,\ldots,x_k} = \frac{\hat{\beta}_1 \sum yx_1 + \hat{\beta}_2 \sum yx_2 + \ldots + \hat{\beta}_k \sum yx_k}{\sum y^2} \qquad 3.17$$

The value of R^2 lies between 0 and 1. The higher R^2 the greater the percentage of the variation of y explained by the regression plane, that is, the better the goodness of fit of the regression plane to the sample observations. The closer R^2 to zero, the worse the fit is.

Test of Significance of Individual Parameter Estimates: In econometric application, researchers test the null hypothesis $H_o : \beta_i = 0$ for each parameter against the alternative hypothesis $H_1 : \beta_i \neq 0$. This type of hypothesis implies a two tail test at a chosen level of significance, usually at 5 percent.

The Standard Error Test: We print the standard errors $\left(se(\hat{\beta}_i) = \sqrt{\text{var}(\hat{\beta}_i)} \right)$ underneath the respective estimates and compare them with the numerical values of the estimates.

a) If $se(\hat{\beta}_i) > \frac{1}{2}\hat{\beta}_i$, we do not reject the null hypothesis and conclude that the estimate is not statistically significant for two-tailed test.

b) If $se(\hat{\beta}_i) < \frac{1}{2}\hat{\beta}_i$, we reject the null hypothesis and conclude that our parameter estimate is statistically significant for a two-two tailed test.

The Student's t Test: We compute the t-ratio for each β_i

$$t^* = \frac{\hat{\beta}_i}{se(\hat{\beta}_i)} \qquad 3.18$$

This is the observed or sample value of the t-ratio, which we compute with the theoretical value of t obtainable from the t- table with $n-k$ degrees of freedom.

The theoretical values of t (at the chosen level of significance) are the critical values that define the critical region in a two-tailed test, $n-k$ degrees of freedom.

1) If t^* falls in the acceptance region; that is, if $-t_{\frac{\alpha}{2}} < t^* < t_{\frac{\alpha}{2}}$ with $n-k$ d.f, we accept the null hypothesis that β_i is not significant and hence the corresponding regressor does not appear to contribute to the explanation of the variations in y.
2) If t^* falls in the critical region, we reject the null hypothesis and we conclude that $\hat{\beta}_i$ is statistically significant.

The greater value of t^* shows the stronger evidence for $\hat{\beta}_i$ to be significant. The other notation is that $t^* and\ se(\hat{\beta}_i)$ are inversely related. For a number of degrees of freedom higher than 8, the crucial value of t (at the 5 percent level of significance) for the rejection of null hypothesis is approximately 2.

Test of the overall significance of a regression: This test aims at finding out whether the explanatory variables $(X_1, X_2, ..., X_K)$ do actually have any significance influence on the dependent variable. Formally the test of the overall significance of the regression implies testing the null hypothesis:

$H_o : \beta_1, \beta_2, ..., \beta_k = 0$, against the alternative hypothesis

$H_a : not\ all\ \beta_i^{'} s\ are\ zero$

The test of the overall regression is carried out with the table of analysis of variance and the test statistic is given by:

$$F^* = \frac{SS_R / k}{SS_{\text{Res}} /(n-k-1)} = \frac{R^2 /(k)}{(1-R^2)/(n-k-1)} \qquad 3.19$$

The test statistic is compared with the theoretical F (at the chosen level of significance) $v_1 = k\ and\ v_2 = n-k-1$ degrees of freedom.

1. If $F^* > F_{k,n-k-1}$, we reject the null hypothesis and conclude that the regression is significant.

2. If $F^* < F_{k,n-k-1}$, we do not reject the null hypothesis and conclude that the regression is not significant.

Model Adequacy Checking and Diagnostics: Before estimating the models, diagnostic checking will be necessary if there is a problem in the assumption of multiple linear regressions. The following are some methods that used to check the adequacy of the model.

Standardized Residuals: It is scaling residuals which used to detect the outlier observation. It is the ratio of residual to the average variance a residuals and given as follows.

$$di = \frac{ei}{\sqrt{MS_{\text{Res}}}}, i = 1,2,...,n \qquad 3.20$$

The standardized residual have mean zero and approximately variance zero. A large $d_i \; that \; is \; (d_i > 3)$ potentially shows an outlier.

Studentized Residual: It is used to detect the outlier observation. Violation of model assumptions are more likely at remote points, and these violations may be hard to detect from inspection of the ordinary residual e_i because their residuals will usually be smaller. Therefore, studentized residual used to indicate outliers (large residuals and h_{ii}) and defined as:

$$r_i = \frac{e_i}{\sqrt{MS_{res}}()1-h_{ii}}, i = 1,2,...,n \qquad 3.21$$

Where h_{ii} is a measure of the location of the i^{th} point in X-space.

Cook's Distance: Cook's distance designed to measure the shift in $\hat{\beta}$ when a particular observation is omitted. It is a combined measure of the impact of that observation on all regression coefficients.

Cook's Di statistic is defined as:

$$D_i = \frac{r_i^2}{p}\left[\frac{h_{ii}}{1-h_{ii}}\right] \qquad 3.22$$

Where, r_i is the studentized residual and h_{ii} is the i^{th} diagonal element of H computed from the full regression and p is the number of unknown parameters. Cook's distance considers the influence of the i^{th} value on all n fitted values and not on the fitted value of the i^{th} observation. There are different opinions regarding what cut-off values to use for spotting outliers. If $D_i > 1$ then it is considered as potential outlier.

Normality Test: In order to test normality assumption, Shapiro-Wilk's W test is recommended for small and medium samples up to n=2000 whereas for large samples, Kolmogorov-Smirnov (K-S) test is recommended. For a given variable, whether the sample size is small, medium or large, the test statistic of respective test should not be significant if the variable's distribution is not significantly different from normal. A very simple method of checking the normality assumption is to construct a normal probability plot of the residuals. The straight line is usually determined visually with emphasis on central value rather than the extremes (Garson, 2012).

Test of Multicollinearity: The presence of multicollinearity among the variables seriously affects the parameter estimates of any regression model. The Variance Inflation Factor (VIF) technique will be employed to detect the problem of multicollinearity for the continuous variables (Gujarati, 2004). VIF can be defined as;

$$VIF(\beta_j) = \frac{1}{1 - R_j^2} \qquad 3.23$$

Where R_j^2 is the squared multiple correlation coefficient between X_i and other explanatory variables. The larger the value of VIF, the more troublesome it is. As a rule of thumb if a VIF of a variable exceeeds10, the variable is said to be highly collinear.

Test of Hetroscedasticity: Heteroscedasticity exists when the variances of all observations are not the same, leading to consistent but inefficient parameter estimates. More importantly, the biases in estimated standard error may lead to invalid inferences. The assumption of absence of heteroscedasticity was detected by using Breusch- Pagen test.

3.5. Hypothesis, Variable Selection and Definition

3.5.1. Dependent Variables

Market outlet choice (MKTOUTCH): It is a qualitative categorical dependent variable used in multinomial logit model and takes value 0 if farmers mainly choose end consumers outlet, 1 if farmers mainly choose private traders outlet and 2 if farmers mainly choose cooperatives outlet.

House type (HTYPE): Dichotomous variable used in binary logistic regression and takes value 1 if the main house of a farmer is corrugated iron sheet roofed and 0 otherwise. This variable is used as dependent variable proxy to wellbeing.

Mean Years of education (MYRSEDUC): It is a quantitative dependent variable used in multiple linear regressions and shows the mean years of education of school aged children in the family. It is used as dependent variable proxy to wellbeing.

Annual total income (ANTOINC): It is continuous dependent variable measured in birr (ETB) and used in the multiple linear regression model equation.

3.5.2. Independent Variables for Coffee Market Outlet Choice

Age of household head (AGE): It is a continuous variable measured in years. Aged households are believed to be wise in searching markets which provide high price. Anteneh *et al*. (2008) used age as the major farmers' characteristics that significantly affected the market outlet choice. In the current study, age of household head is expected to influence market outlet choice positively.

Education level of household head (EDUC): It is a continuous variable and refers to the number of years of formal schooling a household attended. Educated person make better use of their time and available resources. Anteneh *et al*. (2008) in the study of coffee market outlet

choice confirmed that level of education of household head significantly influenced market outlet choice of coffee producers. It is expected in this study that this variable has positive influence on coffee market outlet choice.

Household size (HHSIZE): This variable is a quantitative variable and refers to the total number of members of the household. According to the study by Kadigi (2015) household size is positively related to the probability of the choice of neighbor households as one of the milk marketing outlets. This may be due to the fact that larger household size represents labor resource. Household size is hypothesized to have positive impact on the coffee market outlet choice.

Cooperative membership (MCOOP): It is a dummy variable and takes the value 1 if the household is membership of any cooperatives, and 0 otherwise. Thus, cooperatives improve understanding of members about market and strengthen the relationship among the members. According to Berhanu *et al.* (2013), membership to cooperative positively and significantly affected accessing cooperative milk market outlet as compared with accessing individual consumer milk market outlet. Therefore, cooperative membership is expected to have positive impact on coffee market outlet choice.

Land size allotted to coffee production (COFLANDSIZE): It is a continuous variable and it represents the total area of land for coffee a household had in hectare. As the land of household allotted to coffee increases, the yield proportionally may increase, so that the amount of coffee sold increases or decreases based on the market efficiencies. Land size allotted to coffee positively influenced the probability of coffee marketing to cooperative outlet (Tinsea, 2008). In this study, land allotted to coffee production is expected to influence coffee market outlet choice positively.

Distance from the nearest market (MKTDIS): It is a continuous variable measured in hours. It refers to the distance of the nearest market from the farmers' house. If the distance to the nearest market increases, the transportation cost will also increase. Riziki *et al.* (2015)

confirmed that distance to the market is significant determinant of choice of marketing outlet. This variable is expected to have negative effect on coffee market outlet choice.

Quantity of coffee sold (QCOFFSOLD): It is a continuous independent variable measured in quintals and shows the quantity of coffee sold in a year prior to the survey year. A marginal increase in coffee production has obvious and significant influence on marketable supply of coffee. If the marketable supply of coffee increases, the ability of farmers to choose market increases. Daniel (2006) confirmed that the yield of *teff* has positive correlation with sales to cooperative as marketing agent. In this study, the one period lag value of quantity of coffee sold is considered and it is expected to have positive impact on coffee market outlet choice.

Transportation access (TRANSP): It is a dummy variable which takes a value 1 if the household owned transportation facility and 0 if do not own any form of transportation facility. The availability of transportation facilities helps to reduce long market distance constraint, offering greater depth in marketing choices (Jagwe, 2007). Transportation access is expected to influence coffee market outlet choice negatively.

Total livestock holding (TLU): This variable is a continuous variable and refers to the total number of livestock the household own in terms of TLU. It is assumed that the household with larger TLU can have a better economic strength and financial position to purchase coffee and hire labor during peak season. According to Rehima (2006) as cited in Abraham (2013), TLU has negative relationship with quantity of pepper sales through different market outlets. TLU is expected to have positive effect on coffee market outlet choice in this study.

Access to price information (INFOACC): It is dummy variable that takes a value 1 if obtained price information and 0 otherwise. According to Geoffrey (2015), access to price information had positive influence on the choice of local market outlet in the marketing of pineapple. It is clear that producers are severely constrained with regard to market information. Therefore, access to price information is hypothesized to have positive influence on the coffee market outlet choice positively.

Access to credit (ACRDT): This is a dummy variable which takes a value 1 if the farmer obtains credit from rural financing institution operating in the area, 0 otherwise. According to Kadigi (2013), access to credit had a negative influence on the choice of neighbor milk market outlet. Access to credit is hypothesized to have negative influence on coffee market outlet choice.

Access to extension service (EXTSER): This is a dummy independent variable takes the value 1 if a household had access to agricultural extension services and 0 otherwise. It is expected that agricultural extension service widens household knowledge with regard to use of improved agricultural technologies. Agricultural extension services are expected to enhance households' skills and knowledge, link households with technology and choice of markets (Lerman, 2004). Access to extension service is hypothesized to have positive influence on the coffee market outlet choice.

Access to training (TRAIN): This is variable a dummy independent variable which takes value 1 if coffee farmers attended formal agricultural training and 0 otherwise. Creation of awareness and skill development through training increases understanding of farmers toward modern system of coffee production. This can initiate farmers to produce more and choose market with high price to fulfill their needs. Ayelech (2011) found that access to training has positive and significant impact on the supply of avocado and mango through different channels. Access to training is expected to influence coffee market outlet choice positively.

3.5.3. Independent Variables for Housing Type

Sex of household head (SEX): This variable is a dummy variable which take a value 1 for male and 0 for female. Male household heads are expected to be more likely to increase the quality of the house than female household heads due to the general belief that males have more effort than females. According to Akerele and Adewuyi (2011), the housing condition of a household provide good indicators of welfare measure and they noted that there is a positive relationship between sex of household head and economic welfare or housing condition of the

household head. Therefore, sex of household head being male is hypothesized to influence house type positively.

Age of household head (AGEH): It is a continuous variable measured in years. As age increases the interest of having own house will increase. Ukuha and Beamish (n. d) showed that age of household head has significant influence on the housing satisfaction and they confirmed that older households have higher satisfaction in housing condition. In the current study, age of household head is expected to have positive influence on house type.

Household size (FAMSIZE): This variable is a quantitative variable and refers to the total number of families of the household. A household with large number of children may face with difficulty in having quality house since the income they spend will increase with the family size. According to Hulchanski (2005), household size is a significant predictor of house values. For the current study, household size is hypothesized to influence house type negatively.

Marital status of household (MASTH): It is a categorical variable which takes value 0 if household head is single, 1 if household head is married, 2 if household head is widowed and 3 if household head is divorced. Fiadzo (2004), in the study of estimation of determinants of hosing quality, showed that marital status has significant impact on the housing quality. Marital status is expected to influence house type positively.

Annual income of households (AIOHHS): It is a continuous variable measured in Birr (ETB). The yearly income of household is noted to be the most significant predictor of the house values. According to Egunjobi (2007), the majority of low income earners faced difficulty in securing loan or other form of assistance for building their own houses. Another study by Saddozai *et al.* (2013) revealed that there is positive correlation between grand income of household and quality of house. Therefore, annual total income is expected to have positive influence on house type.

Education level of household (EDUC): It is a continuous variable and refers to the number of years of formal schooling a household attended. Adem (2005) showed that the significant relationship between year of education of father and housing condition. He found that the probability of having corrugated iron sheet roofed house increases with year of education of father. Year of education of household head is expected to affect house type positively.

Number of dependents (NUMDEP): It is a continuous variable which shows number of family members who cannot depend on the family. Having large number of dependents in the family number creates competition over resources (Getnet and Baliyou, 2007). Therefore, variable is expected to influence both housing type negatively.

3.5.4. Independent Variables for Schooling of Children

Age of household head (AGEH): It is a continuous variable measured in years and refers to how old a household head is. According to Adem (2012), age of household head had negative relationship with literacy rate. In this study, age of household head is expected to have positive influence on schooling of children.

Level of education of household (EDUC): It is a continuous variable and refers to the number of years of formal schooling a household head attended. Mike *et al*. (2008) showed that academic attainment of parents is a key factor that influences the chances of a child dropping out of school in both rural and urban areas. This variable is expected to influence schooling of children positively.

Annual income of household (AIOPAR): It is a continuous variable measure in Birr (ETB). As the income of household increases, they also increase their expenditure on normal goods and services including house quality and education. Tullao and Rivera (2009) empirically showed that there is positive and significant relationship between household income and school participation. This variable is expected to have positive influence on schooling of children.

Distance to primary and elementary school (DPESCH): It is a continuous variable measured in hours and shows the distance of the nearest primary and elementary school from the homestead. According to Mani *et al*. (2009), distance to primary school in km has a statistically significant impact on relative grade attainment while distance to primary school has a negative impact. In the current study, this variable is expected to influence schooling of children negatively.

Distance to secondary and preparatory school (DISPSCH): It is a continuous variable measured in hours and shows the distance of the nearest secondary and preparatory school from the homestead. According to Chaudhury *et al*. (2006), distance to the nearest school from homestead negatively impacts school enrollment and completion probabilities in rural areas. This variable is expected to influence schooling of children negatively.

Household size (FAMSIZE): This variable is a quantitative variable and refers to the total number of family the household has. Based on empirical data, Mike *et al.* (2008) showed that children in larger households are less likely to drop out of school than children living in smaller households. Household size is hypothesized to influence schooling of children negatively.

School fee payment (SFPYM): It is a dummy variable which takes value 1 if school has monthly fee payment and 0 otherwise. If the school fee payment increases the number of school enrollment will decrease. According to Mike *et al*. (2008), the effect of fees payments is significant on dropout of female students in rural areas. School fee payment is expected to influence schooling of children negatively.

3.5.5. Independent Variables for Total Annual Income

Age of household head (AGE): It is a continuous variable measured in years. Aged households are believed to be wise in resource use, which in turn increases their total annual income. According to Amare and Belaineh (2013), age of household head has significant

negative relationship with non/off-farm self employment income. This variable is expected to have positive impact on the total annual income.

Sex of household head (SEX): It is a dummy variable which takes value 1 if household head is male and 0 if female. Sex of household head had negative and significant impact on the per capita household income (Aikaeli, 2010). Sex of household head is hypothesized to have negative coefficient on total annual income.

Household size (FAMSIZE): This variable is a quantitative variable and refers to the total number of family the household has. It will be assumed that household with larger family size consume more of what is produced in the house and little will remain to be marketed. Gezahagn (2010) found that family size has negative effect on the households' gross income from groundnut production. Therefore, family size is expected to have negative influence on total annual income.

Year of education of household head (EDUC): It is a continuous variable and refers to the number of years of formal schooling a household attended. Aikaeli (2010) found that the higher the education level of household, the higher the household's per capita income. Educated person make better use of their time and available resources. Year of education of household head is expected to have positive influence on total annual income.

Total livestock holding (TLU): This variable is a continuous variable and refers to the total number of livestock the household own in terms of TLU. Arega *et al*. (2013) in his study found that ownership of livestock is strongly and positively correlated to annual income of households. This variable is expected to influence total annual total income positively.

Access to credit (ACRDT): This is a dummy variable which takes a value 1 if the farmer obtains credit from rural financing institution operating in the area, 0 otherwise. According to Arega *et al.* (2013), access to credit has positive correlation with annual income of households. Therefore, access to credit is expected to have positive coefficient on total annual income.

Total land Owned (TLAND): It is a continuous variable and it represents the total land a household had in hectare. As the land of household for coffee increases, the yield proportionally may increase. Aikaeli (2010) confirmed that increasing acreage of farm land is more effective to earn more income. Therefore, total land owned is expected to influence total annual income positively.

Distance from the nearest market (MKTDIS): It is a continuous variable measured in hours. It refers to the distance of the nearest market from the farmers' house. Ayelech (2011) showed that poor market access has a significant and negative influence on quantity of avocado and mango supplied. This variable is expected to have negative effect on total annual income.

Access to improved seed (IMRVSEED): Seed is an essential agricultural input, which affects production. It is a dummy variable taking value 1, if a farmer has access to improved seeds and 0 otherwise. Improved seed can increase agricultural productivity by boosting overall production (LIPTON, 2005). Hence, this variable is expected to have positive association with total annual income.

Engagement in off/non-farm activities (ENNA): It is a dummy variable which takes value 1 if household engage in non-farm income and 0 otherwise. According to the study be Arega *et al*, (2013), there is positive relationship between off-farm activities and total annual income. Engagement in non-farm activities is expected to have positive impact on total annual income.

4. RESULTS AND DISCUSSION

This chapter presents the major findings of the study. It has two main sections. The first section deals with descriptive statistics including general characteristics of sampled households, resource ownership, housing condition, coffee production and marketing, coffee market outlet choice and market relating access, production and marketing of crops other than coffee, income distribution of households, means of livelihood improvement, and access to and utilization of resources. The second section presents inferential analysis including factors affecting market outlet choice, determinants of livelihood outcomes with particular emphasis on the housing condition and schooling of children proxies to wellbeing, and annual total income of households.

4.1. Descriptive Results

4.1.1. General Characteristics of Households

Table 3 presented demographic and socioeconomic characteristics of the sampled respondents based on the categorical variables. The total sample size of respondents handled during the survey was 141. Of the total sample respondents, 122 (86.5%) were male-headed households and 19 (13.5%) were female-headed. The distribution of marital status shows that out of the total samples, 3(2.1%), 115 (81.6%), 21 (14.9%) and 2 (1.4%) are single, married, widowed and divorced household heads, respectively.

Regarding cooperative membership, 98 (69.5%) of the sampled households are members of different agricultural cooperatives and 43 (30.5%) are not organized under any agricultural cooperatives. The cooperative membership distribution of sampled households shows 50 (35.5%), 22 (15.6%), 6 (4.3%) and 20 (14.2%) are a member of Burka Dongoro, Gudetu Bacho, Leta Harrojji and Lalisa Lalo agricultural cooperatives respectively. Coffee production is the main occupation and source of livelihood for all sample farmers 141 (100%). That means all sampled households generate income from coffee to run their livelihood.

Table 3. General characteristics of sample households (Categorical variables)

Variable	Item	Number of household	Percent
Sex	Male	122	86.5
	Female	19	13.5
Marital status	Single	3	2.1
	Married	115	81.6
	Widowed	21	14.9
	Divorced	2	1.4
Cooperative Membership	Yes	98	69.5
Cooperative Name	Burka Dongoro	50	35.5
	Gudetu Bacho	22	15.6
	Leta Harrojji	6	4.3
	Lelisa Lalo	20	14.2

Source: Computed from own survey, 2014/15

Table 4 showed demographic and socioeconomic characteristics of sampled respondents depending on continuous variables. The average age of the sampled respondents was 46.36 with standard deviation of 14.068. The educational status of the sampled households shows that the mean of years of education of household head was found to be 5.38 with standard deviation of 3.822. The average household size of the total sample respondents was found to be 6.26 with standard deviation of 2.551. The distance of the nearest market is also taken into account and the average distance of the nearest market from households' residence is found to be 0.7310 hours with standard deviation of 0.39573 hours.

Table 4. General characteristics of sampled households (Continuous variables)

Variables	Mean	St. dev
Age (years)	46.36	14.608
Year of schooling (years)	5.38	3.822
Household size (number)	6.26	2.554
Distance to the market (hour)	0.731	0.396

Source: Computed from own survey, 2014/15

4.1.2. Resource Ownership

Land: The total land owned by the sampled households was divided as cultivated land and coffee farm land and the unit of measurement was in hectare. From the survey result, the average size of total land owned by household head was found to be 0.951 hectares with standard deviation of 0.589. From this, the average size of cultivated land was found to be 0.540 with standard deviation of 0.446 and the average coffee land size was 0.420 with standard deviation of 0.251 (Table 5). Some of the respondents responded that they have a scarcity of coffee land as these figure shows and this has a great impact on their economic status because as coffee land size increases, the quantity obtained will increase thereby increases the annual total income.

Livestock: Livestock is the farmer's most important source of income, food and draught or traction power for cultivation of land. Hence, households with larger livestock holding have better access to draft power than those with less livestock holding. Livestock holding is also one of the main cash sources to purchase agricultural inputs. To assess the livestock holding of each household, the Tropical Livestock unit (TLU) per household was calculated. Table 5 depicted that the tropical livestock holding of sample households ranged from 0 to 16.93 implying small variation in tropical livestock holding. The average livestock holding of coffee producing farmers in the study area was 3.505 TLU with standard deviation of 2.699 TLU.

Table 5. Distribution of households by resource ownership

Variable	Min	Max	Mean	St. dev
Total land (hectare)	0.1	3.00	0.951	0.589
Cultivated land (hectare)	0.00	2.5	0.540	0.446
Land allotted to coffee (hectare)	0.06	1.50	0.420	0.251
Tropical livestock holding (TLU)	0.00	16.93	3.505	2.699

Source: Computed from own survey, 2014/15

4.1.3. Housing Condition

Information on housing condition is an important indicator of the well-being of household. Good quality houses usually are related to better income, which could be taken as an indicator of better economic well-being. Housing is a core element of people's material living standards. It is essential to meet basic needs such as for shelter from weather conditions and to offer a sense of personal security, privacy and personal space. Good housing conditions are also essential for promoting good health condition.

Regarding housing condition, this study considered age of the main house, number of rooms, construction material of wall and floor, roofing material and the presence of separate structure of room for livestock as characteristics to assess the housing condition of coffee farmers. The result of the study showed that average age of sampled households' main house was found to be 17.85 years with standard deviation of 13.290. The age of main house ranges from 1 to 50. Age of house has an impact on the quality of living, but they repair their house from time to time to maintain and or improve its quality. The mean number of rooms of the main house was computed to be 2.70 with standard deviation of 0.819. The minimum number of room of the main house of sampled household is one and the maximum is 5. The result of the study showed that mud is the dominant construction material for both wall and floor structure of house for all sampled households (Table 6).

Table 6. Distribution of housing condition by number of rooms

Variable	Min	Max	Mean	St. dev
How old your main house is?	1	50	17.85	13.290
How many rooms does your main house have?	1	5	2.70	0.819

Source: Computed from own survey, 201/15

Table 7 depicted that out of 141 sampled households, 131 (92.9%) have corrugated iron sheet roofed house and only 10 (7.1%) had grass or hut house. This shows that almost all sampled

households are better-off regarding housing condition which indicates a good economic wellbeing. The reason why a small number of sampled households do not have corrugated iron sheet roofed house include lack of own land including coffee farm size which the source of income in the study area, low income earning, high price of roof in the market. The increase in price of roof in the market highly influenced the wellbeing of households those who do not have corrugated iron sheet roofed house. Regarding living condition of livestock, out of the total sampled households, 105 (74.5%) have separate room or fence for their livestock and 36 (25.5%) have no separate structure for livestock (Table 7). For those who do not have separate room for livestock, the probable reasons are that owning small number of livestock and lack of awareness about the problem behind living together with livestock.

Table 7. Distribution of housing condition by roofing type

Variable	Item	Number of household	Percent
Type of living house	Corrugated iron sheet roofed	131	92.9
	Thatch roofed	10	7.1
Living condition of livestock	Separate room or fence	105	74.5
	In the living room	36	25.5

Source: Computed from own survey, 2014/15

4.1.4. Coffee Production and Marketing

As discussed above, coffee production is the main occupation and source of livelihood for all sampled farmers. That means all sampled households generate income from coffee production to run their livelihood. Table 8 demonstrated the type of seed used for production of coffee by sampled households. Out of the total sampled households, 94 (66.7%) used both local and improved coffee seed for production of coffee. Households who used local seed were 44 (31.2%), whereas only 3 (2.1%) used improved seed. These figures show that majority of the households used both types of coffee seed (local and improved) seed. The proportion of households who used improved coffee seed is very small.

Table 8. Distribution of sampled households by the type of coffee seed used for production

Variable	Item	Number of households	Percent
Type of coffee seed used by household	Local	44	31.2
	Improved	3	2.1
	Both	94	66.7

Source: Computed from own survey, 2014/15

Experience of production is important in increasing production and productivity of any crops because experienced farmers can easily access opportunities for their production. The respondents responded that the experience of coffee production made them more profitable from coffee production and/or marketing. But still the quantity obtained is not enough when compared with the experience of production. Table 9, depicted that the mean of coffee production experience of sampled households was found to be 20 years. In a given coffee year, on average, one household got 6.39 quintal of coffee and sell 5.525 quintal averagely. This result shows that the quantity obtained is not enough since the production experience is too high. The probable reason is that they are not well adapted with modern agricultural technology and improved coffee seed is used by small proportion of farmers.

Table 9. Coffee production experience and quantity of output

Variable	Mean	St.dev
Coffee production experience (years)	20.20	11.874
Quantity of obtained in a given coffee year (quintal)	6.39	4.091
Quantity sold in a given coffee year (quintal)	5.525	3.909

Source: Computed from own survey, 2014/15

4.1.5. Coffee Market Outlet Choices and Market Related Access

The market outlets used for marketing of coffee in the study area are private traders, cooperatives and direct sell to end consumers. Majority of the respondents reported that they mainly choose private traders because they can sell their coffee at any time they need to sell. Table 10 showed that coffee market outlet and market related accesses. The survey result

revealed that 73 (51.8%) 52 (36.9%) and only 16 (11.3%) of the respondents mainly choose private traders, cooperatives end consumers outlets, respectively to sell their coffee product.

Market related access such as transportation facility and market price information are the most important access to be more profitable from production and marketing of coffee. The majority of the respondents do not have any form of transportation facility. They carry their coffee crops by themselves to take to the market. Table 10 showed that 91 (64.5%) of the respondents do not have any form of transportation facility. The rest 50 (35.5%) of the respondents reported that they have their own transportation facility. But, none of the respondents have any form of transportation access other than transportation animals.

Market price information is another important market related access. From the survey result, it is revealed that out of 141 sampled households, 139 (98.6%) households had access of price information and the rest 2 (1.4%) did not have access of price information (Table 10). The sampled households get market price information from Development agents (DA), *woreda's* expert, *kebele's* administrator, radio and directly from the market. Development agents (DA) and radio are the most common source of market price information in the study area. The result shows almost all sampled households have market price information except those who do not have much coffee to sell in which they do not need further information about price.

Table 10. Coffee market outlet choice and market related access

Variable	Item	Number of household	Percent
Which market outlet do you mainly choose to sell your coffee?	End consumer	16	11.3
	Private traders	73	51.8
	Cooperatives	52	36.9
Have you your own transportation facility?	Yes	50	35.5
	No	91	64.5
Do you have access to market price information?	Yes	139	98.6
	No	2	1.4

Source: Computed from own survey, 2014/15

4.1.6. Production and Marketing of Crops Other than Coffee

There are different crops other than coffee commonly produced in the study area. The survey result (Table 11), revealed that 133 (94.3%) of the respondents participated in production of different crops in addition to coffee production. The study identified three dominant crops produced in addition to coffee production in study area. These are maize, *teff* and sorghum. Survey result showed that majority of these crops is used for consumption. From Table 11, it can be seen that out of the sampled households, 125 (88.7%) have not ever participated in marketing of these crops and only 16 (11.3%) have ever participated in marketing of these crops. From these results, we can see that these crops (maize, *teff* and sorghum) are not used as cash crops since the majority of the households used for consumption.

Table 11. Distribution of households by crop production and marketing other than coffee

Variable	Item	Number of household	Percent
Production crops other than coffee	Yes	133	94.3
	No	8	5.7
Marketing of crops other than coffee	Yes	16	11.3
	No	125	88.7
Engagement in non/off-farm activities	Yes	39	27.7
	No	102	72.3

Source: Computed from own survey, 2014/15

In addition to coffee and other crop production, some of the surveyed households reported that they participated in non/off-farm activities to generate income for their livelihood. Table 11 showed that out of the selected households, 102 (72.3%) are not engaged in any form of non/off-farm activities whereas the rest 39 (27.7%) do participate in off/non-farm activities. These non/off-farm activities include mining, selling of trees, handcraft selling and house construction.

4.1.7. Income Distribution of Sampled Households

Though the major source of income of all sampled households is coffee, a small number of sampled households generate income from livestock production and off/non-farm activities. Table 12 depicts the income distribution of sampled households. The average annual income of households was 8719.65 Birr with standard deviation of 5635.47 Birr. The average income of sampled households from coffee in a given coffee year was 6119.57 Birr with standard deviation of 4102.74 Birr and this is around 70% of their total income. This result supports the fact that the major source of annual income in the study area is from coffee production and marketing.

Table 12. Income distribution of sampled households

Variable	Mean	St. dev
Annual total income prior to survey (Birr)	8719.65	5635.471
Income from coffee (Birr)	6119.57	4102.742

Source: Computed from own survey, 2014/15

4.1.8. Means of livelihood improvement

The study also attempted to answer whether coffee farmers improve their livelihood by coffee production and sale or not. The survey result (Table 13) showed that out of the sampled households, 135 (95.7%) responded that they improved their livelihood by coffee marketing. Those who do not improve, 6 (4.3%), have scarcity of enough farm land for coffee production. The result confirmed that almost all coffee farmers improved their livelihood except those who had no enough farm land for production of coffee. Similarly, in order to access key roles of coffee production and sale on the improvement of livelihood, the respondents are asked to answer the question that what tangible thing (s) they have done in the last five years by coffee production and sale. Table 13 revealed that out of the total sampled households, 134 (95%) constructed house in rural area, 37 (26.2%) reported that they constructed house in urban area by coffee production and sale in the last five years and few of the sampled households (2.8%)

bought flour machine by coffee production and sale in the last five years to improve their livelihood.

Table 13. Means of livelihood improvements by coffee production and marketing

Variable	Item	No of household	Percent
Have you improved your livelihood by coffee production and sale?	Yes	135	95.7
To improve your livelihood, what have you done in the last five years tangibly?	Built house in rural area	134	95
	Built house in urban area	37	26.2
	Bought flour machine	4	2.8

Source: Computed from own survey, 2014/15

4.1.9. Access to and Utilization of Resources

Access to credit is one way of improving smallholder households' production and productivity. But majority of the sampled households for this study responded that they refused credit because it had interest rate while paying back. Table 14 revealed that out of the total sampled households, only 68 (48.2%) had access to credit and the rest 73 (51.8%) had no access to credit. The major sources of credit access in the study area were microfinance, cooperatives, NGOs and informal sources (*Iqub*, traders, friends, relatives and money lenders).

Coffee production training is another important access in order to develop knowledge of farmers in modern agricultural mechanization. Development agents and office of agriculture and rural development are the major source of training. Table 14 depicts that out of the total coffee producing sampled households 118 (83.7%) have access to coffee production training. The respondents responded that the training is organized by development agents and office of agriculture and rural development of the *woreda*.

Improved seed is also one of the most important inputs that determine production and productivity of coffee. Regarding improved seed, out of the total sampled households, 123 (87.2%) have access to improved coffee seed (Table 14). The major sources of improved

coffee seed for sampled households were local market, office of agriculture and rural development, and fellow farmers. Some of the respondents reported that they prepared improved coffee seed by themselves. But, the quality of improved coffee seed prepared by respective farmers is not pretested before using. This may create impact on their production as well as on the quality and quantity of product.

Access to agricultural extension services is expected to have direct influence on the production and marketing behavior of the farmers. The higher access to the extension service, the more likely that farmers adopt new technology and innovation. The government has been attempting to fill the required knowledge and achieve healthy and green environment by placing development agents in each *Kebele* administration and building a farmer training center (FTC). The *kebele* level development agents are the most important sources of extension services to transfer agricultural technologies and innovations to farmers. Table 14 depicted that out of the sampled households, 120 (85.1%) had access to agricultural extension service form development agents and rural development.

Table 14. Distribution of households by access to services

Variable	Item	Number of household	Percent
Access to credit	Yes	68	48.2
	No	73	51.8
Access to coffee production	Yes	118	83.7
training	No	23	16.3
Access to improved coffee seed	Yes	123	87.2
	No	18	12.8
Access to extension service	Yes	120	85.1
	No	21	14.9

Source: Computed from own survey, 2014/15

Schooling condition: Education is a fundamental human right as well as a catalyst for economic growth and human development (World Bank, 2005). Education is one of the livelihood outcomes which generates sustainable economic growth and plays a big role in poverty reduction and improving wellbeing. Any developing country aiming to have strong global economic, political and social competitiveness should maintain both increased

enrollment and high quality expansion in its educational system. Table 15 shows the literacy status and the mean year of education of school aged children in the study area. The average literacy rate of school aged children is 78.45 described as percentage. The result of the study demonstrated that more than three fourth of school aged children were at school or ever reached a school and this shows that schooling status is good in the study area. The average mean year of education of school aged children in the family was found to be 6.02 with standard deviation of 2.495.

Table 15. Literacy rate and mean year of education of school aged children

Variable	Min	Max	Mean	St. dev
Literacy rate	0	100	78.45	36.370
Mean year of education	0	13	6.02	2.495

Source: Computed from own survey, 2014/15

Distance to the nearest school from homestead impacts the enrollment and completion probabilities in rural areas. Pupils traveling long distances to school are more likely to drop out of school. In the study area, average distance to primary and elementary school, high school, and preparatory school are 0.47, 0.67 and 2.57 hours with standard deviation of 0.241, 0.285 and 0.977 hours respectively (Table 16). The figures show that distance to preparatory school is high relative to distance to primary and elementary school as well as high school. The reason here is that two of the selected study *kebeles* (Dongoro Gebo and Warra Jirru Bacho) do not have high school and preparatory school in which students are enforced to go neighbor *kebeles* to search high school and preparatory school

Table 16. Distribution of school by distance in hours

Variable	Mean	St. dev
Distance to primary and elementary school	0.47	0.241
Distance to high school	0.67	0.285
Distance to preparatory school	2.57	0.977

Source: Computed from own survey, 2014/15

4.2. Inferential Statistical Models Output Results

4.2.1. Factors Affecting Coffee Market Outlet Choices

The multinomial logistic regression was used to determine coffee market outlet choices with three categories, end consumers, private traders, and cooperatives. Prior to running parameter estimation of multinomial logistic model, the independence of irrelevant alternatives (IIA) assumption was tested based on the Hausman specification test. The hypothesis of difference in coefficients not systematic was tested. Under IIA assumption, we would expect no systematic change in the coefficients if we exclude one of the outcomes from the model. See Appendix I, Table 1.

The possible hetroscedasticity problem was corrected using a command robust in stata. Multicollinearity in the multinomial logistic regression analysis is detected by examining the standard errors for the coefficients. A standard error larger than 2.0 indicates numerical problems such as multicollinearity among the independent variables. None of the independent variables in this analysis had a standard error larger than 2.0 indicating that there is no numerical problem.

Table 17 presents the coefficients from multinomial logit regression on the existing alternative marketing outlets in the sample and the marginal effects. According to Greene (2012), the sign of the coefficient shows the direction of influence of the variable on the logit. It follows that a positive value indicates an increase in the likelihood that a household will change to the alternative option from the reference (base) group.

The result showed two variables, transportation facility and access to market price information were significant in both end consumer and cooperative market outlets compared to the reference (base) category. Compared to the base categories, quantity of coffee sold, access to credit and access to extension service significantly affected the main choice of end consumer coffee market outlet while the variables distance to the nearest market and access to training significantly affected the choice of cooperative outlet.

The results of the estimated marginal effects are discussed in terms of the significance and signs on the parameters. The positive estimated coefficients of a variables indicate that the probability of the coffee producers being in either mainly choosing end consumer or cooperative relative to choosing private traders outlet increase as explanatory variables increase. The implication is that the probability of the producers to be in these outcomes is greater than the probability of being in private trader market outlet (base category).

The negative and significant parameter indicates that the probability of using private trader is higher than the probability of being in the two outcomes (alternatives). The estimates not significantly different from zero indicate that the explanatory variable concerned does not affect the probability of the coffee producers decision to use private trader outlet outcome than to use the other two outcomes, end consumer and cooperative. The results of the MNL and marginal effect as well as their possible discussions are presented below.

Quantity of coffee sold (QCOFFSOLD): Quantity of coffee sold in a given coffee year negatively and significantly affected the main choice of end consumer coffee market outlet. The marginal effect depicts that the quantity of coffee sold decreases the likelihood of choosing end consumer coffee outlet by 1.5% being other things constant compared to private trader coffee outlet. The implication is that farmers' usage of end consumer market outlet is negatively related to quantity of coffee sold. If the quantity of coffee to be sold is low, farmers are not forced to search price and market information. But, if the quantity to be sold is high, they search a market outlet which buys with effective price. This result is contradictory with the result obtained by Daniel (2006) who found that farmers' usage of the cooperative as marketing agent is positively related to the yield of *teff*.

Transportation access (TRANS): Access to transportation access is positively and significantly related to the choice of end consumer and cooperative outlets. The marginal effects depict that having any form of transportation facility increases the likelihood of mainly choosing end consumer and cooperative outlets by 5.4% and 20.3%, respectively, compared to private trader outlet given that other things being constant. This can be attributed to the fact that those who have their own transportation facility were able to travel further distances in

order to sell coffee to markets that offer higher prices than the private trader outlet. The availability of transportation facility offers greater depth in marketing choices. This result is in line with Abraham (2013) who found that owning transportation facility positively related to the choice of collector outlet compared to wholesale outlet in marketing of vegetable.

Access to market price information (PINF): Access to market price information is positively and significantly associated with the choice of both end consumer and cooperative outlets. The implication is that getting coffee market price information most likely increases the likelihood of choosing both end consumer and cooperative outlets. The probable reason is that farmers those having price information would appropriately choose coffee market outlet with high price which fulfills their needs and which reduces transportation expense. Other things being constant, having market price information increases the likelihood of choosing end consumer and cooperative outlets by 4.45% and 38.7%, respectively. The result obtained is contradictory with the result obtained by Berhanu *et al*. (2013) who found that access to milk market outlet price negatively affected accessing cooperative milk market outlet as compared to individual consumer milk market outlet.

Access to credit (ACRED): Access to credit is positively and significantly associated with end consumer outlet. One of the reasons of accessing credit is to recruit transportation facility for supply of coffee to the market. Farmers who have access to formal credit have more possibility to choose coffee market outlet than those who have no access to formal credit. In the study area, access to credit is determined by availability of cash on hand. The finding of marginal effect depicts that, other things being constant, getting access to formal credit increases the likelihood of the main choice of end consumer outlet by 8.8% compared to private trader outlet. The implication is that if a farmer has access to credit he or she can easily access transportation facility which assists to greater depth of choosing market. The result obtained is contradictory with the result obtained by Kadigi (2015) who found the negative relationship between access to credit and neighbor milk market outlet.

Access to extension service (AEXTSERV): Access to extension service is negatively and significantly associated with the choice of end consumer outlet. Other things being constant,

the likelihood of choosing end consumer outlet drops by 14.4% as household gets extension service relative to choosing private traders outlet. Farmer's access to extension service increased the ability of farmers to acquire important market information as well as other related agricultural information which in turn increases farmer's ability to choose the best market outlets for their product. This result is in line with the result obtained by Abraham (2013) who found negative impact of agricultural extension service on the probability of choosing collector and retailer outlets compared to wholesale outlet in vegetable market outlet choice.

Access to training (TRAIN): The result indicated that access to agricultural training positively and significantly influenced the choice of cooperative outlet. The implication is that participation households in agricultural training most likely increase the likelihood of choosing cooperative relative to private trader outlets. The probable reason is that coffee production training given by cooperative leaders to coffee farmers enhances agricultural production skills, knowledge and experience of farmers. This situation helps farmers to get better production and this leads to obtain more income to fulfill their family requirements. The finding of the result depicts that, other things being constant, access to training increases the likelihood of mainly choosing cooperative outlet by 24.2% relative to choosing private traders. This result is in line with Ayelech (2011) who found the positive relationship between access to training and supply of avocado and mango marketing.

Distance to the nearest market (MKTDIST): Distance to the nearest market center positively and significantly affected the choice of cooperative outlet. The marginal effect indicates that, other things being constant, the likelihood of mainly choosing cooperative outlet increases by 39.2% for an hour distance away from the nearest market center relative to private trader outlet. The implication is that farmers who are nearer to the market have easy access to information and transportation facility to sell their coffee nearby. This result is contradictory with a result by Berhanu *et al*. (2013) who confirmed that distance to nearest urban center negatively affected accessing hotel or restaurant milk market outlet as compared to accessing individual consumer milk market outlet.

Table 17. Coefficients and marginal effects of MNL model for market outlet choice

Market chosen	B	Robust S.E	Z	P-value	Marginal effect
End consumer					
AGE	-0.026	0.277	-0.95	0.341	-0.001
EDUC	-0.220	0.144	-1.52	0.127	-0.009
HHSIZE	0.079	0.150	0.53	0.598	0.001
MCOOP (1=Yes)	-1.178	0.790	-1.49	0.136	-0.066
COFFARSIZE	0.6391	0.662	0.96	0.335	0.269
MKTDIST	-1.459	1.086	-1.34	0.179	-0.076
QCOFFSOLD	-0.404	0.239	-1.69	0.092	-0.015
TRANS (1=Yes)	1.606	0.903	1.78	0.075	0.054
TLU	-0.228	0.152	-1.50	0.133	-0.007
PINF (1=Yes)	15.484	1.681	9.21	0.000	0.044
ACRED (1=Yes)	2.106	0.799	2.63	0.008	0.088
AEXTSERV (1=Yes)	-2.101	0.860	-2.44	0.015	-0.144
ACCTRAIN (1=Yes)	-0.198	0.834	-0.24	0.812	-0.24
_Cons	-11.127	2.764	-4.03	0.000	
Private traders (base outcome)					
Cooperative					
AGE	0.009	0.020	0.45	0.654	0.02
EDUC	0.065	0.062	1.06	0.288	0.018
HHSIZE	0.143	0.090	1.59	0.112	0.031
MCOOP (1=Yes)	0.483	0.542	0.89	0.372	0.126
COFFARSIZE	-0.234	0.345	-0.68	0.497	-0.061
MKTDIST	1.665	0.559	2.98	0.003	0.392
QCOFFSOLD	-0.021	0.055	-0.39	0.697	0.000
TRANS (1=Yes)	1.017	0.483	2.11	0.035	0.203
TLU	-0.089	0.087	-1.02	0.310	-0.017
PINF (1=Yes)	15.667	1.006	15.57	0.000	0.387
ACRED (1=Yes)	0.240	0.449	0.53	0.593	0.020
AEXTSERV (1=Yes)	-0.422	0.619	-0.68	0.495	-0.034
ACCTRAIN (1=Yes)	1.298	0.694	1.87	0.062	0.242
_Cons	-19.941	1.723	-11.57	0.000	
N=141		Prob>Chi2 = 0.0012			
LR Chi2 (26) = 471.90***		Log likelihood = -108.04061			
Significance level is at 1%, 5% and 10%				Pseudo R^2 = 0.1981	

Source: Computed from survey result, 2014/15

4.2.2. Determinants of Livelihood Outcomes as Measured by Housing Condition

Housing condition is one of the livelihood outcomes which determine the wellbeing of coffee farmers. In order to access major factors affecting house type of coffee farmers in the study area which is considered as dichotomous as having corrugated iron sheet roofed house or otherwise, binary logistic regression was implemented. Prior to model parameter estimation and interpretation, different statistical techniques are carried out to overcome the numerical problems and misinterpretations.

The maximum likelihood method used to calculate logistic regression is an iterative fitting process that attempts to cycle through repetitions to find an answer. The implausible results can be produced by multicollinearity. The clue that we have numerical problems and should not interpret the results are standard errors for some independent variables that are larger than 2.00. From the proposed explanatory variables, marital status and number of dependent were found to have standard error greater than 2.00. By following the fact that these produce multicollinearity, marital status and number of dependent variables were omitted from the model.

The recommended test for overall fit of binary logistic regression model is the Hosmer and Lemeshow test. This test is more robust than traditional chi-square test, particularly if continuous covariates are in the model or sample size is small. A finding of non-significance of Hosmer and Lemeshow statistic corresponds to concluding the model adequately fits the data. The result shows that the H-L statistic has a significance of 0.667 which means that it is not statistically significant and therefore our model adequately fitted the data.

In addition to Hosmer and Lemeshow test, the standardized and deviance residual analyses were conducted to identify points for which the model fits poorly. Observations with absolute standardized and deviance residual values in excess of 3 may indicate lack of fit. In our analysis, the absolute values of both residuals of all observations are less than 3 indicating well fit of the model. The overall percent of cases that are correctly predicted has increased

from 92.9 for the null model (model without predictor) to 94.3 for the full model (model with predictors).

Another interesting test in the binary logistic regression is Omnibus test which may be interpreted as a test of the capability of all predictors in the model jointly to predict the response (dependent) variable. From Table 18, a finding of significance of Omnibus test (P=0.003) corresponds to concluding that there is adequate fit of the data to the model. This means that at least one of the predictors is significantly related to the response variable.

Table 18. Omnibus tests of binary logistic model coefficients

	Chi-square	d.f	P-value
Step	21.776	7	0.003
Block	21.776	7	0.003
Model	21.776	7	0.003

Source: Computed from survey result, 2014/15

In fact, housing type of coffee producers can be a function of many factors. Sex of household head, age of household head, marital status of household head, year of education of household head, number of dependents, family size, annual total income, area of land allotted to coffee and cooperative membership were taken as explanatory variables. Annual total income is transformed using square root transformation to minimize its variance. The binary logistic result shows household size and annual total income had significant influence on the house type of coffee farmers (Table 19).

Household size (FAMSIZE): Household size negatively and significantly affected housing type**.** The probability of the Wald statistic for the variable household size was 0.097. The null hypothesis that the coefficient for household size was equal to zero was rejected. This supports the relationship that coffee farmers with small household size were more likely to have corrugated iron sheet roofed house. The odd of household size is 0.704 (the value of Exp (B)) which implies that household heads who have smaller household size (less than the sample mean household size) are 0.704 times as likely to have corrugated iron sheet roofed house than those having more household size (more than the sample mean household size).

Square root of annual total income (ATTINC): Square root of annual total income is positive and significant determinant of housing type. The probability of Wald statistic for the square root of annual total income was 0.012. The null hypothesis that the coefficient of square root of annual total income is zero was rejected. This supports the relationship that coffee farmers with high annual total income were more likely to have corrugated iron sheet roofed house. The value of Exp (B) of square root of annual total income is 1.087 which implies households who have more annual total income (more than sample mean square root of annual total income) are 1.087 times as likely to have corrugated iron sheet roofed house than those having less annual total income (less than sample mean square root of annual total income). Since the major source of income of these farmers is coffee, it plays indispensable role in the improvement of housing condition and thus their wellbeing. The result obtained is in line with the result reported by Saddozai *et al.* (2013) who confirmed that there is positive relationship between grand income of household head and quality of houses.

Table 19. Coefficients and odds of logistic regression of determinants of housing condition

Variable	B	S.E	Wald	d.f	P-value	Exp(B)
SEX(1=Male)	0.875	1.237	0.500	1	0.479	2.399
AGE	0.026	0.038	0.476	1	0.490	1.026
EDUC	0.096	0.133	0.518	1	0.472	1.101
HHSIZE	-0.351	0.211	2.760	1	0.097	0.704
SQRTINC	0.084	0.033	6.385	1	0.012	1.087
COFFARSIZE	-0.298	2.774	0.012	1	0.915	0.743
MCOOP(1=Yes)	-0.662	0.874	0.574	1	0.449	0.516
Constant	-2.680	2.477	1.171	1	0.279	0.069
N= 141	-2 Log likelihood = 50.421		Cox & Snell R^2 =0.143		Nagelkerke R^2 =0.357	
Significance level is at 1%, 5% and 10%						

Source: Computed from survey result, 2014/15

4.2.3. Determinants of Livelihood Outcomes as Measured by Schooling of Children

Multiple linear regressions were employed to investigate livelihood outcomes of coffee farmers as measured by schooling of children proxy to wellbeing and annual total income. The analysis was undertaken for schooling of children and annual total income independently.

Mean year of education of school aged (>= 7 years) children in the family was used as dependent variable to access major determinants of schooling of children. Explanatory variables thought to have relationship with mean year of education were sex of household head, age of household head, year of education of household head, family size, annual total income of parents but its log was considered since its variance was high, distance to primary and elementary school, distance to high school, distance to preparatory school and monthly school fee payment.

Prior to running the OLS estimation of regression model, different statistical methods and plots have been employed to check assumptions of multiple linear regression models. The overall goodness of fit of the regression is measured by the coefficient of determination, R^2. It tells what proportion of the variation in the dependent variable is explained by the dependent variable. The value of Coefficient of determination lies between 0 and 1, and the better is the fit. The result conveyed that 70.9% of the mean year of education of school aged children is explained by the explanatory variables under consideration.

Normal distributions take the form of a symmetric bell-shaped curve. To check normality of the data, both statistical and graphical methods have been applied. From statistical methods of normality checking, Shapiro-wilks W test which is recommended for a small and medium samples up to n= 2000 was used. For larger samples Kolmogorov-Smirnov test is recommended (Garson, 2012). For the current study, Shapiro-Wilk W test was used to test whether the data came from normal population.

Hypothesis:

H_o = Normality vs H_a = Non-normality

Decision: If p<0.05, reject the null hypothesis and if P>0.05, do not reject the null hypothesis and conclude that the data is normal. P-value for Shapiro-Wilk W test statistic shows non-significance (P=0.745) which is greater than 0.05. Therefore, we do not reject the null hypothesis and conclude that the data of mean year of education of school aged children in the family has normal distribution. See appendix I, Table 2.

In order to check the assumption of linearity, a plot of standardized residuals against standardized estimates was used. A plot of standardized residuals against standardized estimates (fitted values) of the dependent variable should show random pattern when non-linearity is absent. In regression, as a rule of thumb, an indicator of possible non-linearity is when the standard deviation of the residuals exceeds the standard deviation of the dependent. For this study, it can be inspected from a plot of standardized residuals against standardized estimates (fitted values) that the mean year of education of school aged children showed random pattern. See Appendix I, Figure 1.

Normally distributed errors are another assumption of multiple linear regressions. In order to test this assumption, statistical tests Kolmogorov-Smirnove and Shapiro-Wilks normality test are used. In this test for residuals to be normally distributed both tests should be non-significant. In our case both tests are non-significant implying that the residuals are normally distributed. See Appendix I, Table 2.

All hypothesized explanatory variables were checked for the existence of multicollinearity problem. This was done by using variance inflation factor (VIF). The multicollinearity problem was corrected for number of dependents since it is highly correlated with family size. Therefore number of dependent was omitted from the analysis. The result of VIF values for the rest of explanatory variables are less than 10 and range from 1.133 to 1.881. See Appendix I, Table 3.

Simple outliers are cases with extreme values with respect to a single variable. It is common to define outliers as cases which are more than three standard deviations from the mean of the variable. Box plots are the common means of identifying simple outliers. For these study box plot of mean years of education of school aged children in the family shows no outlier exists since all observation are within rectangular part of the plot. See Appendix I, Figure 2.

Multivariate outliers are cases with extreme values with respect to multiple variables. Multivariate outliers are operationally defined as cases having a cook's distance greater than

some cutoff (some use a cutoff 1, some use $[4/(n-k-1)]$, where n is number of cases and k is number of independents). In this study, cutoff 1 is used and the minimum value of cook's distance is 0 and maximum is 0.347 which lies between 0 and 1 and proved that the existence of no multivariate outliers in the data.

The second method to define outliers is Leverage. If the value leverage is greater than some cutoff (some use 0.5, others use $2p/n$, where p is number of parameters including the intercept). In this study, the cutoff 0.5 is used and the minimum value of leverage is 0.01 and maximum is 0.316 which is between 0 and 0.5 implying no multivariate outliers in the data set. See Appendix I Table 4.

The assumption of homoscedasticity means the relationship under investigation is the same for the entire range of dependent variable. Lack of homoscedasticity known as hetroscedasticity is shown by higher errors (residuals) for some portions of the range compared to others. The statistical method called Breusch-Pagan or Cook-Weisberg test for heteroskedasticity using stata command "estat hottest" was used.

Hypothesis:

H_o : Constant variance (Homoscedasticity) versus

H_a : Error variances are a multiplicative function of one or more variables (hetroscedasticity).

Decision: A large chi-square value would indicate that heteroscedasticity is present. The result shows that the chi-square value was small (2.11), indicating heteroscedasticity was probably not a problem (or at least that if it was a problem, it was not a multiplicative function of the predicted values).

Estimates of the parameters of the variables expected to determine factors affecting schooling of children are displayed in Table 20. Among a total of nine explanatory variables included in the regression model, five explanatory variables were found to have significant relationship with mean year of education of school aged children. These are sex of household head, age of household head, year of education of household head, square root of annual total income of

parents and distance to preparatory school. The remaining four variables were found to have no significant effect on mean year of education of school aged children.

Sex of the household head (SEX): The sign of the coefficient of sex on schooling of children was not hypothesized. However, sex of household head influenced schooling of children negatively and significantly. The negative sign implies that if the household head is male, the mean year of education of children will decrease by 1.079. This finding is contrary to the general belief that female headed households are not more likely to experience school participation of their children. This could be attributed to the fact that school education is largely free in the study are.

Age of household head (AGE): Age of household head positively and significantly influenced schooling of children and the result suggests that as the age of household head increases by one year, the mean of year of education of children enrolled in school increases by 0.055. Since age of household head and schooling of children have positive relationship, the result of the study is agreed with the hypothesized one. Aged parents often appreciate the importance of education and influence their children to stay at school. But, as children grow, they begin to take on their own decision and the influence of parents tends to be reduced. This result is contradictory with the result by Adem *et al.* (2012) who noted the negative relationship between age of household head and literacy rate.

Year of education of household head (EDUC): Year of education of household head is another important variable determining schooling of children. In the current study, year of education of household head is highly significant and has positive relationship with schooling of children as hypothesized. The result shows that for one year increase in year of education of household head, the mean year of education of children increases by 0.33. The result obtained is in line with the result obtained by Chaudhury *et al*. (2006) who noted that households with better educated adults and those living in better educated communities are more likely to have children enrolled in school.

Square root of annual income of parents (SQRTATTI): Annual total income was transformed using square root transformation to minimize the variance. It is empirically verified that the magnitude of square root of household annual income positively and significantly affected schooling of children as hypothesized. Economically active parents are more likely to send their children to the school than economically inactive parents. The result conveyed that for one unit increase of square root of annual income of parents, the mean year of education of school aged children increases by 0.013. The result obtained is in line with the result by Tullao and Rivera (2009) who found positive relationship between household income and school participation.

Table 20. OLS estimation of coefficients of MLR of determinants of schooling of children

Model	B	S. E	t	P-value
-Const	0.029	1.118	0.026	0.979
SEX (1=Male)	-1.079	0.575	-1.878	0.063
AGE	0.055	0.017	3.212	0.002
EDUC	0.330	0.058	5.671	0.000
HHSIZE	0.034	0.085	0.408	0.684
SQRTINCOME	0.013	0.007	1.837	0.069
DISTPES	0.446	0.878	0.507	0.613
DISTHIGHS	0.228	0.699	0.326	0.745
DISTPREP	0.332	0.197	1.683	0.095
SCHFPAY	1.353	1.168	1.158	0.249
Dependent Variable: Mean year of education of school aged children				
N= 141	R^2=70.9%		F= 6.509	
Significance Level is at 1%, 5% and 10%				

Source: Computed from survey, 2014/15

Distance to preparatory school (DISTPREP): Distance to preparatory school was hypothesized to have negative impact on the schooling of children. But, the result conveyed the positive relationship between distance to preparatory school and schooling of children. For one unit increase in distance to preparatory school the mean year of education of children will increase by 0.332. The probable reason may be having interest in learning without considering the challenge of distance. The result is contradictory with the result obtained by Chaudhury *et al.* (2008) who noted negative relationship between distance to the school and school enrollment.

4.2.4. Determinants of Livelihood Outcomes as Measured by Annual Total Income

For the analysis of the determinants of annual total income of coffee farmers in the study area, the annual total income of selected households was taken as dependent variable. From the survey result, the variance of annual total income is found to be high and logarithmic transformation was implemented to reduce the variance. Explanatory variables under consideration were sex of household head, age of household head, year of education of household head, household size, TLU, access to improved coffee seed, access to credit, market distance, total land owned and engagement in non–farm activities.

Prior to running the OLS estimation of regression model, different statistical methods and plots have been employed to check assumptions of multiple linear regression models. Procedures of diagnostic checking such as normality, linearity, normality of error terms, multicollinerity and outliers were briefly undertaken. See appendix I for annual total income.

Estimates of the parameters of the variables expected to identify determinants of annual total income of selected households were displayed in Table 21. Among total of ten explanatory variables included in the multiple linear regression model, five explanatory variables are found to have significant relationship with log of annual total income. These are age of household head, tropical livestock unit, access to improved coffee seed, access to credit and total land owned. The remaining five variables are found to have no any impact on log of the annual total income. Coefficient of determination shows that 63.6% of the variation of log of annual total income of coffee farmers is explained by explanatory variables under consideration.

Age of household head (AGE): The age of household head is found to have positive and significant effect on the log of annual total income. The result suggested that a unit increase in the age of household head increases the log of total annual income by 0.003 and the result is agreed with the hypothesized one. The implication of this result is that aged households are wise in resource use and in search high income for the future need. That is, as age of household increases the awareness of accumulate capital will be increased in a sense that he or she can use the accumulated capital at the time he or she becomes dependent (non-working

age). The result obtained is contradictory with the result obtained by Amare and Belaineh (2013) who found the negative relationship between age of household head and self employment income.

Livestock holding (TLU): Tropical livestock unit positively and significantly influenced the total annual income and the result is agreed with the hypothesis. The parameter estimate of TLU suggested that an increase of TLU by one unit will increase log of total annual income of coffee farmers by 0.025. Households owning large livestock unit have the capacity to build up capital and handle cash constraints for participation in coffee production and/or marketing as compared to those with small or no livestock holding. The result obtained is in line with Arega *et al.* (2013) who found that ownership of livestock is strongly and positively related to total annual income of households.

Access to improved coffee seed (IMPSEED): Improved seed is also one of the most important inputs that promote production and productivity of coffee. Improved coffee seed would increase the quality and quantity of output thereby increases the annual total income. But, the result of the current study revealed that improved coffee seed is negative and significant determinant of log of total annual income. The parameter estimate conveyed that one unit increase in access to improved coffee seed will decrease the total annual income by 0.288. This result is contradictory with the hypothesized influence of improved seed on the total annual income of coffee farmers. This condition may occur where the farmers do not use improved seed properly. In the study area, majority of the farmers prepare coffee seed by themselves which is not pretested. The other probable reason is that improved coffee seed is used by small proportion of farmers. The result is contradictory with LIPTON (2005) who found that access to improved seed can increase agricultural productivity by boosting overall production thereby increases total annual income.

Access to credit (ACRED): Access to credit positively and significantly influenced log of total annual income. The parameter estimate was agreed with the hypothesized effect of access to credit on the annual total income. The result conveyed that one unit increase in access to credit will increase log of annual total income of coffee farmers by 0.117. The implication is

that access to credit would enhance the financial capacity of the farmers to purchase the agricultural inputs, thereby increasing the coffee production and market share size. The result obtained is in line with Arega *et al.* (2013) who noted that access to credit has positive and significant correlation with total annual income.

Total land owned (TLAND): Total land owned positively and significantly influenced log of total annual income of coffee farmers. The sign of parameter estimate is agreed with the hypothesized one. The result conveyed a unit increase in total land owned will increase the log of total annual income by 0.152. Increasing land owned is more effective to earn more income if complemented by improvements in inputs such as the mechanization of agriculture and use improved seed. A household owning large size of land has the possibility to produce more income generating productions than a household owning small size of land. The result is in line with Aikaeli (2010) who identified that increasing acreage of farm land is more effective to earn more income.

Table 21. OLS estimation of coefficients of MLR of determinants of total annual income

Model	B	S.E	t	P-value
(Constant)	3.692	0.098	37.515	0.000
SEX (1=Male)	0.005	0.054	0.088	0.930
AGE	0.003	0.002	1.893	0.065
EDUC	0.008	0.006	1.493	0.138
HHSIZE	-0.004	0.008	-0.478	0.633
TLU	0.025	0.007	3.449	0.001
AIMRVSEED (1=Yes)	-0.288	0.054	-5.283	0.000
ACRDT (1=Yes)	0.117	0.035	3.386	0.001
MKTDIS	-0.036	0.046	-0.770	0.443
TLAND	0.152	0.034	4.479	0.000
ENNA (1=Yes)	-0.047	0.041	-1.147	0.254
Dependent variable: Log of total annual income				
N=141	R^2= 63.6%		F= 10.097	
Significance level is at 1%, 5% and 10%				

Source: Computed from survey 2014/15

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter has three sections. The first section presents summary of the study which briefly reflects the overall summary, the second section deals with conclusion of the findings of the study and the last section forwards recommendation or policy implication emanated from the findings of the study.

5.1. Summary

The study was aimed at assessing the determinants of coffee market outlet choice and livelihood outcomes of coffee farmers in Lalo Assabi *woreda* of Oromiya region. The specific objectives of the study include identifying key roles of coffee marketing on the livelihood of coffee farmers; identifying major factors affecting coffee market outlet choice of coffee farmers; and identifying determinants of livelihood outcomes with particular emphasis on the housing condition and schooling of children proxies to wellbeing, and annual total income of coffee farmers in the study area. The data were generated from primary source and 141 households were randomly selected from four *kebeles*.

The analysis included both descriptive statistics and econometric models using SPSS and STATA statistical software packages. Econometric models such as multinomial logistic, binary logistic and multiple linear regressions models are applied. The result of descriptive statistics showed that the majority of selected coffee producing households were male headed households compared to female headed. The average year of coffee production experience of the farmers was around 20 years. The result of the study depicted that almost all of the selected households improved their livelihood by coffee production and/or marketing. The improvement of their livelihood was identified by what tangible thing(s) coffee producers did in the last five years by coffee production and sale. The finding of the study revealed that most of the households built house in rural area, some of them built house in urban area and few of them bought flour machine by coffee marketing in the last five years.

Coffee producers in the study areas supply product through different coffee market outlets based on their main choice. It was found from the result of the study that majority of the households mainly choose private trader to sell their coffee. The multinomial logistic model was run to identify factors affecting coffee market outlet choice decision. The study result indicated that the probability of choosing end consumer market outlet was significantly affected by quantity of coffee sold, access to transportation facility, access to market price information, access to credit and access to agricultural extension service compared to private traders outlet. Similarly, the probability of choosing cooperative coffee market outlet was significantly affected by distance to the nearest market center, access to transportation facility, market price information and access to agricultural training compared to private trader outlet. Therefore, these variables require special attention if farmers margin from coffee production is to be increased.

The study also identified major determinants of livelihood outcomes with particular emphasis on the housing condition and schooling of children proxies to wellbeing, and total annual income of coffee producers. The result of binary logistic regression showed household size and square root of total annual income significantly affected the likelihood of having corrugated iron sheet roofed house and thus wellbeing. Therefore, special attention should be given to these variables if the probability of having corrugated iron sheet roofed is to be raised. Additionally, the result of multiple linear regression revealed sex of household head, age of household head, year of education of household head, square root of total annual income of households and distance to preparatory school significantly influenced schooling of children and thus wellbeing of coffee producers. Similarly, the result of multiple linear regressions showed age of household head, tropical livestock holding, access to improved seed, access to credit and total land owned significantly affected log of total annual income of coffee producers. Thus, these variables need special attention if the total annual income is to be increased.

5.2. Conclusions

Majority of the annual total income of the farmers is generated from coffee marketing and the farmers have high coffee production experience in the study area. In the marketing of coffee, the choice of end consumer outlet increases with the increase in the transportation access, access to market price information and access to credit compared to private trader outlet where as the quantity of coffee sold and distance to the nearest market decrease the main choice of end consumer outlet. The choice of cooperative outlet increases with the increase in the transportation access, access to market price information, distance to the nearest market and access to extension service compared to private trader outlet. Access to transportation and access to market price information are vital for the marketing of coffee through both end consumer and cooperative outlets.

Housing condition of the households increases with the increase in annual total income. A farmer with better economy can build better quality house for better economic wellbeing. But, as household size increases, the probability of having corrugated iron sheet roofed house decreases. The reason is that large household size share large proportion of total annual income for consumption expenditures and clothing in addition to necessary facilities for schooling. Schooling of children increases with the increase in the age of household head, year of education of household head and total annual income of parents. Matured households with better level of education and better economic status are more advantageous to send their children to the school at the right school age than young households with low level of education and less economic status.

Total annual income is vital to increase the livelihood of the household. The log of total annual income increases with the increase in the age of household head, tropical livestock unit, access to credit and total land owned by farm households where as decreases with access to improved seed. Matured households with large ownership of livestock and those having large size of farm land are more beneficiary in generating income than those with small ownership of livestock and small farm land.

5.3. Recommendations

The recommendations or policy implications to be made from this study are based on the significant variables for all dependent variables under consideration.

Firstly, expanding equal accessibility of infrastructures such as road and transportation facilities needs government intervention to promote the effective marketing of coffee through all outlets. It is good if the government provide long term loans for the farmers which enable them to access agricultural inputs which promote the quantity of output and manage their coffee marketing and/or production more effectively. The concerned bodies and information centers should be able to disseminate market price information at the appropriate time for the farmers in which they can equally get the accessibility.

Secondly, households should seek other means of generating income in addition to coffee production to increase their annual total income in which they can improve the quality of their house. Local authority should be able to schedule area specific and efficient extension service in order to increase housing quality of farmers which in turn increases wellbeing status.

Thirdly, the concerned authority should be able to increase the awareness of households about the importance of education and about the school age at which their children should join the school. Government intervention should be needed for the expansion of schools in which the communities would be equally benefited.

Lastly, extension agents should increase the understanding of households about the importance of agricultural inputs such as improved coffee seed and the concerned authority should be able to increase its accessibility with cost effective. Households should be able to increase the source of their total annual income such as livestock production to earn more income for the improvement of their livelihood outcomes.

6. REFERENCES

Abraham Tegegn. 2013. Value chain analysis of vegetables: The Case of Habro and Kombolcha *Woredas* in Oromia Region. M.Sc Thesis, Haramaya University, Haramaya, Ethiopia.

Abu Tefera. 2012. Coffee annual report. *Journal of Global Agricultural Information Network,* Gain report number ET 1202, Addis Ababa, Ethiopia.

Adem Kedir. 2005. Socioeconomic impact of export oriented agricultural production on farmers in Eastern Ethiopia. Retrieved on December 12, 2014.

Adem Kedir Gelato, Bezabih Emana, Wassie Birhanu and Jemma Haj. 2012. Education poverty among the rural households in Arsi zone, Oromiya, Ethiopia. School dropout and Literacy rate in focus. *Universal Journal of Education and General Studies, ISSN-0984, 1(9): 7-8,* available online at http://www.universalresearchjournals.org/ujegs. Accessed on April 27, 2014.

Aikaeli, J. 2010. Determinants of rural income in Tanzania, research on poverty alleviation. An empirical approach, Research report 10/4.

Akerele, D and Adewuyi, S. A. 2010. Analysis of poverty profiles and socioeconomic determinants of welfare among urban households of Ekiti state in Nigeria. Abeokute, Ogun state, Nigeria. *Current Research Journal of Social Sciences 3(1): 1-7.*

Aliyu, A. A., Kasim R. and Martin D. 2011. Factors affecting housing development in Makama, Jahun area of Bauchi Metropolis, Nigeria. *International Journal of Trade, Economics and Finance*, volume 2, No. 4.

Amare Demissie and Belaieh Legesse. 2013. Determinants of income diversification among rural households: The case of smallholder farmers in Fedis district, Eastern hararghe zone, Ethiopia. *Journal of Development and Agricultural Economics,* 5(3): Available online at http://www.academicjournals.org/JDAE. Accessed on October 22, 2014.

AMA (American Marketing Organization). 2007. Definition of Marketing, Downloaded from www.marketingpower.com on November 26, 2014.

Anteneh. A., Muradian, R. and Ruben, R. 2011. Factors affecting coffee farmers market outlet choice in Ethiopia. Centre for International Development Issues Nijmegen, Radboud University, the Netherlands.

Arega Bezazew, Woldeamlak Bewket and Nicolau, M. 2014. Rural households' livelihood assets, strategies and outcomes in drought-prone areas of the Amhara Region, Ethiopia: Case study in Lay Gaint District. *African Journal of Agricultural Research*, 8(46): Available online at http://www.academicjournals.org/AJAR. Accessed on October 22, 2014.

Ayelech Tadesse. 2011. Market chain analysis of fruits for Gomma *woreda*, Jimma zone, Oromiya national regional state. M.Sc Thesis, Haramaya University, Haramaya, Ethiopia.

Balestra, C. and Sultan. J. 2013. Home Sweet Home: The determinants of residential satisfaction and its relation with well-being. *OECD Statistics working papers*, 2013/05, available online at http://dx.doi.org/10.1787/5jzbcx0czc0x-en. Accessed on September 23, 2015.

Berhanu Kuma, Derek, B., Kindie Getnet and Belay Kassa. 2013. Factors affecting milk market outlet choices in Wolaita zone, Ethiopia. *African Journal of Agricultural Research*, 8(21): Available at http://www.academicjournals.org/AJAR. Accessed on October 29, 2014.

Best, R., Ferris, S. and Schiavine, A. 2005. Building linkages and enhancing trust between small-scale rural producers, buyers in growing markets and suppliers of critical inputs. Westminster, London.

Chaudhury, N., Asadullah, M. and Chritiaenseh, L. 2006. Schools, households, risk and gender: Determinants of Child Schooling in Ethiopia, The World Bank.

Clark, J. and Carney, D. 2008. Sustainable livelihood approaches. A review of DFID's experience with sustainable livelihoods: An evolutionary approach to economic growth, London.

Daniel Belay. 2006. Performance of primary agricultural cooperatives and determinants of members' decision to use as marketing agent in Ada'a Liban and Lume Districts of Ethiopia. M .Sc Tesis. Haramaya University. Haramaya, Ethiopia.

Demeke Tilahun. 2007. Performance of coffee marketing cooperatives and members' satisfaction in Dale district, Southern Ethiopia. M.Sc Thesis, Haramaya University, Haramaya, Ethiopia.

DFID (Department for International Development). 2006. Sustainable rural livelihoods guidance sheet, UK, London.

ECEA (Ethiopian Commodity Exchange Authority). 2013. Coffee export marketing in Ethiopia, Addis Ababa, Ethiopia.

ECXA (Ethiopian Commodity Exchange Authority). 2008. Analysis of coffee supply, production, utilization and marketing issues and challenges in Ethiopia. Addis Ababa, Ethiopia.

Ellis, F. and Freeman, H. A. 2007. Rural livelihoods and poverty reduction strategies in four African countries. *Journal of Development Studies,* 40 (4).

ERD (European Report on Agriculture). 2010. Livelihoods strategies and household resilience to food insecurity. An empirical analysis to Kenya, Nairobi, Kenya.

Farrington, J., Ramasut, T. and Walker, J. 2002. Sustainable livelihoods approach in urban Areas: General lessons, with illustrations from Indian cases, London, UK.

Fiadzo, E. (2004). Estimating determinants of housing quality: The case of Ghana. Joint Center for Housing Studies. Harvard University.

Frankel, J.R., and Wallen, N.E. 2006. How to design and evaluate research in education. Newyork, McGaw-Hill.

Gambo, Y.L., Idowu, O.B. and Anyakora, I. M. 2012. Impact of poor housing condition on the economy of the poor: Makoko, Lagos state in view. *Journal of Emerging Trends in Economics and Management Sciences, 3(4): 3.2-30:* Available online at jetems.scholarlinkresearch.org.

Garson, D. G. 2012. Testing statistical assumptions. North Carolina State University, Statisrical Associates Publishing, Blue Book Series.

Geoffrey, S.G. 2015. Factors influencing the choice of marketing outlets among small-scale pineapple farmers in Kericho country. Egerton University, Kenya.

Getinet Hailu and Beliyou Hailu. 2007. Child labor and child schooling in Ethiopia. Columbia University, Colombia.

Gezahagn Kudama. 2010. Value chain analysis of groundnut in Eastern Ethiopia. M.Sc thesis. M.Sc Thesis, Haramaya University, Haramaya, Ethiopia.

Greene, W. 2000. *Econometric Analysis*. 4th *Edition*, NJ, Prentice Hall, Englewwod Cliffs.

Greene, W.2012. Econometric Analysis. 7th edition. NJ, Prentice Hall, Pearson.

Guibert, N. 2006. Network governance in marketing in marketing channels. *British Food Journal*. 4(108).

Hamman, A.U. 2006. The distribution of better life programs and beneficiaries in Maiduguri and Bama local government areas, University of Maiduguri.

Hansson, O.S. 2005. Decision theory. A brief introduction. Royal Institute of Technology. Stockholm.

HDR (Human Development Report). 2013. The rise of the south: *Human progress in a diverse world*. Ethiopia.

Hosmer, D.W. and Lemeshow, S. 1989. Applied logistic rehression. John Wliey and Son, Inc.

Hulchanski, J., D. 2005. The concept of housing affordability. University of Toronto, Toronto.

ITC (International Trade Center). 2011. *Ethiopian Coffee Quality Improvement Project.* Addis Ababa, Ethiopia.

Jagwe, J., Ouma and Machethe, C. 2007. Transaction costs and smallholder farmers Participation in Banana markets in the Great Lakes Region, South Africa.

Jari, B. and Fraser, G.C.G. 2009. Analysis of institutional and technical factors influencing agricultural marketing among smallholder farmers in Kat River Valley. Rhodes University, South Africa. *African Journal of Agriculture*, 4.

Kadigi, L.M. 2013. Factors influencing choice of milk outlets among smallholder dairy farmers in Iringa municipality and Tanga city. M.Sc thesis submitted to Sokeine University of Agriculture. Morogoro, Tanzania.

Kanji, N., Mac Gregor, J. and Tacoli, C. 2005. Understanding market-based livelihoods in a globalizing world: combining approaches and methods. *International Institute for Environment and Development.*

Levin, J. and Milgrom, J. 2004. Introduction to choice theory.

LIPTON, M. 2005. The Family Farm in a globalizing world: The role of crop science in alleviating poverty. Washington D.C, USA.

Lundy, M., Felipe, C. and Best, R. 2002. Value adding, agro-enterprise and poverty reduction: *A territorial approach for rural business development and rural agro-enterprise development project*, Colombia.

Mani, S., Hoddinott, J. and Strauss, J. 2009. Determinants of schooling outcomes: Empirical Evidence from rural Ethiopia. University of South California.

Mamo Girma and Degnet Abebaw. 2012. Patterns and determinants of live stock farmers' choice of marketing channels: micro-level evidence. Ethiopian Economics Association Research, Addis Ababa, Ethiopia.

Mike, O., Nakajjo, A. and Isoke, D. 2008. Socio-economic determinants of primary school. *Research series No. 54*, Kampala, Uganda.

Moloughney, J. 2004. Housing and population health: The state of current research knowledge, University of Toronto.

Muhammed Urgessa, 2011. Market chain analysis of *teff* and wheat production in Halaba special *woreda,* southern Ethiopia. M.Sc thesis, Haramaya University, Haramaya, Ethiopia.

Nyaupane, P.N and Gillespie, J.M. 2010. Factors influencing producers' marketing decisions in the Louisiana Crawfish industry. Louisiana State University, Bolton Rounge.

Ott, L.R. and Longnecker, M. 2010. An introduction to statistical methods and data analysis. Sixth edition.

Padulosi S., Noun J. and Giuliani, A. 2004. Realizing the benefits in neglected and underutilized plant species through technology transfers and human resources development. Trondheim.

Rao, M., O., Elizaphan and Matin, Q. 2010. Supermarkets, farm household income and poverty: insights from Kenya. Contributed paper presented at the Joint 3rd African Association of Agricultural Economists. Cape Town, South Africa.

Raymon, V.A. 2003. Vertical cooperation and marketing efficiency in the aquaculture products marketing chain. A national perspective from Vietnam, Rome , Italy.

Rehima Mussema, 2006. Analysis of red pepper marketing: The case of Alaba and Silte *woredas* in SNNP region of Ethiopia. M. Sc Thesis, Haramaya University, Haramaya, Ethiopia.

Riziki, J., M., Mlongo, P., M., Mwanarusi, S., Agnes, N. and Ipomai. 2015. Determinants of choice of marketing outlets for African Indigenous Vegetables among the agro-pastoral Maasai of Narok and Kajiado countries of Kenya. *Journal of Economics and Sustainable Development*, ISSN 2222-2855, 8 (6).

Saddozai, R., M., Hussain, I., Shah, M. and Mana, A. 2013. Descriptive analysis of quality of housing in Pakistan. Gomal University journal of research, 29(2).

Shilpi, F. and Umali-Deininger, D. 2008. Where to sell? Market facilities and agricultural marketing policy, research working paper series 4455, The World Bank.

Tasie, C.M., Offor, U.S. and Wilcox, G.I. 2012. Determinants of off-farm income diversification in rivers state, Nigeria.

Tinsae Demmisse. 2008. Marketing performance of primary coffee Cooperatives in Wonago and Yirgacheffe *woreda*, SNNP. M.Sc. Thesis, Haramaya University, Haramaya, Ethiopia.

Tullao and Rivera. 2009. Economic, demographic, and other factors affecting school Participation among children in urban and rural households: The Case of Pasay and Eastern Samar. II (6).

Ukuha, O.M. and Beamish, J.O. (n. d). Predictors of housing satisfaction in Abuja, Nigeria. 3(23).

USHSP (United States Human Settlement Program). 2012. Sustainable housing for sustainable cities, Nairobi, Kenya.

Wangui, N.F. 2014. Determinants of access to affordable housing in Nairobi country. M. Sc Thesis, University of Nairobi.

World Bank. 2005. World development report: Investment, Climate, Growth, and Poverty. World Bank Publications.

7. APPENDICES

Appendix I. Tables and Graphs

Table 1. Hausman test of independence of irrelevant alternatives (IIA) of MNL model

a) When "end consumer" outcome is excluded from the model

	--------- Coefficients -------			
	(b)	(B)	(b-B)	sqrt (diag (V_b-V_B))
	Mkt	.	Difference	S.E
AGE	-0.0264	-0.017	0.001	-
EDUC	-0.220	-0.216	-0.004	-
FAMSIZE	0.0793	-0.001	0.081	-
MCOOP	-1.178	-1.094	-0.084	-
COFFARSIZE	0.639	0.409	0.230	-
MKTDIST	-1.459	-0.974	-0.485	-
QCOFFSOLD	-0.404	-0.364	-0.039	0.032
TRANS	1.605	1.613	-0.007	-
TLU	-0.228	-0.200	-0.028	-
PINF	15.484	14.786	0.698	2141.495
ACRED	2.106	2.045	0.061	-
AEXTSERV	-2.101	-1.923	-0.1782	-
ACCTRAIN	-0.198	-0.0982	-0.099	-
_Cons	-11.127	-11.105	-0.022	2141.494

b = consistent under Ho and Ha; obtained from mlogit

B = inconsistent under Ha, efficient under Ho; obtained from mlogit

Test: Ho: difference in coefficients not systematic

χ^2 (3) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 0.80

Prob > χ^2 = 0.8483

(V_b-V_B is not positive definite)

b) When "cooperative" outcome is excluded from the model

	--------- Coefficients -------			
	(b)	(B)	(b-B)	sqrt (diag (V_b-V_B))
	Mkt	.	Difference	S.E
AGE	0.009	0.0106	-0.001	0.002
EDUC	0.065	0.069	-0.003	-
FAMSIZE	0.143	0.143	-0.001	-
MCOOP	0.483	0.402	0.081	0.058
COFFARSIZE	-0.234	-0.195	-0.039	0.134
MKTDIST	1.664	1.662	0.003	-
QCOFFSOLD	-0.021	-0.026	0.0047	-
TRANS	11.017	0.993	0.024	0.051
TLU	.-0.089	-0.082	-0.007	0.019
PINF	15.667	14.679	0.988	1277.078
ACRED	0.240	0.212	0.028	0.0318
AEXTSERV	-0.422	-0.534	0.112	-
ACCTRAIN	1.298	1.248	0.050	-
_Cons	-19.941	-18.840	-1.1009	1277.078

b = consistent under Ho and Ha; obtained from mlogit

B = inconsistent under Ha, efficient under Ho; obtained from mlogit

Test: Ho: difference in coefficients not systematic

$\chi^2(1)$ = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 0.00

Prob> χ^2 = 0.9993

(V_b-V_B is not positive definite)

Table 2. Shapiro Wilk test of normality of mean year of education of school aged children

Variable	Kolmogorov-Smirnov			Shapiro-Wilk		
Mean years of education	Statistic	Df	P-value	Statistic	df	P-value
school aged children	0.046	141	0.200*	0.993	141	0.745

Figure 1. Scatter plot of mean year of education of school aged children

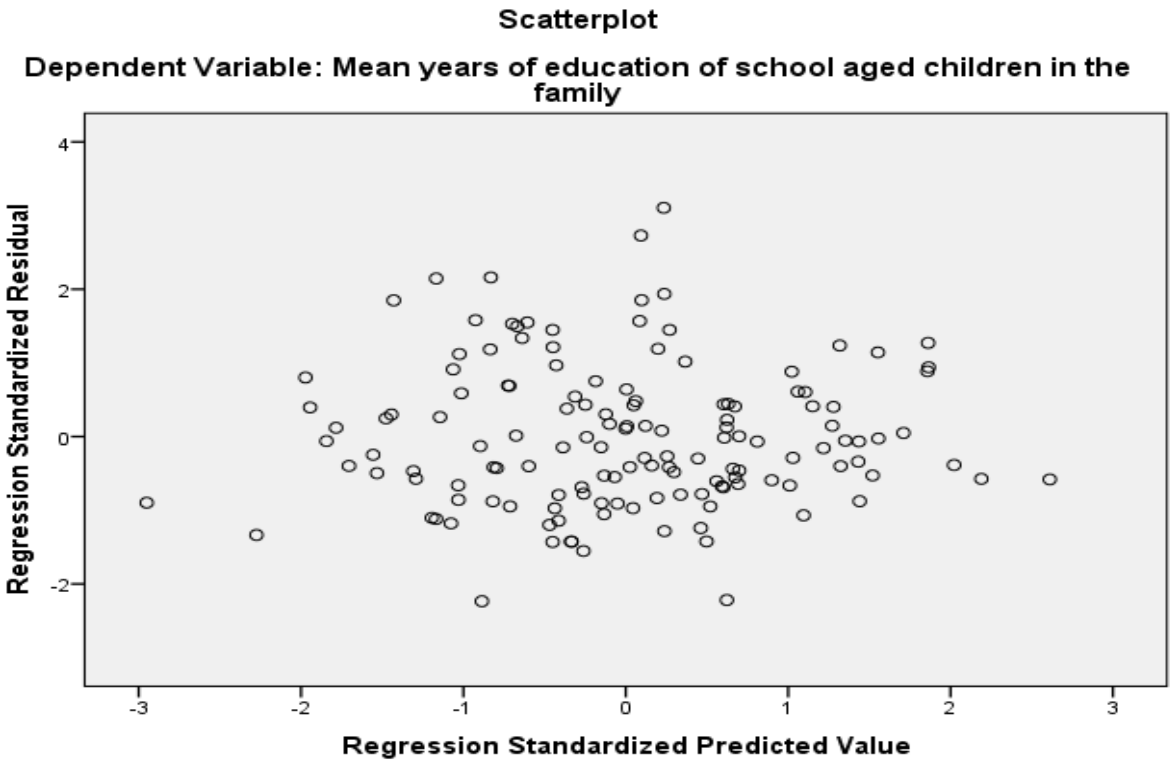


Table 3. VIF test of explanatory variables of schooling condition

Explanatory Variables	Collinearity Statistics	
	Tolerance	VIF
SEX	0.847	1.181
AGE	0.532	1.881
EDUC	0.662	1.510
FAMSIZE	0.705	1.419
SQRTATTINC	0.879	1.137
DISTPES	0.735	1.361
DISTHIGHS	0.823	1.215
DISTPREP	0.883	1.133
SCHFPAY	0.866	1.155

Figure 2. Box plot of mean years of school aged children

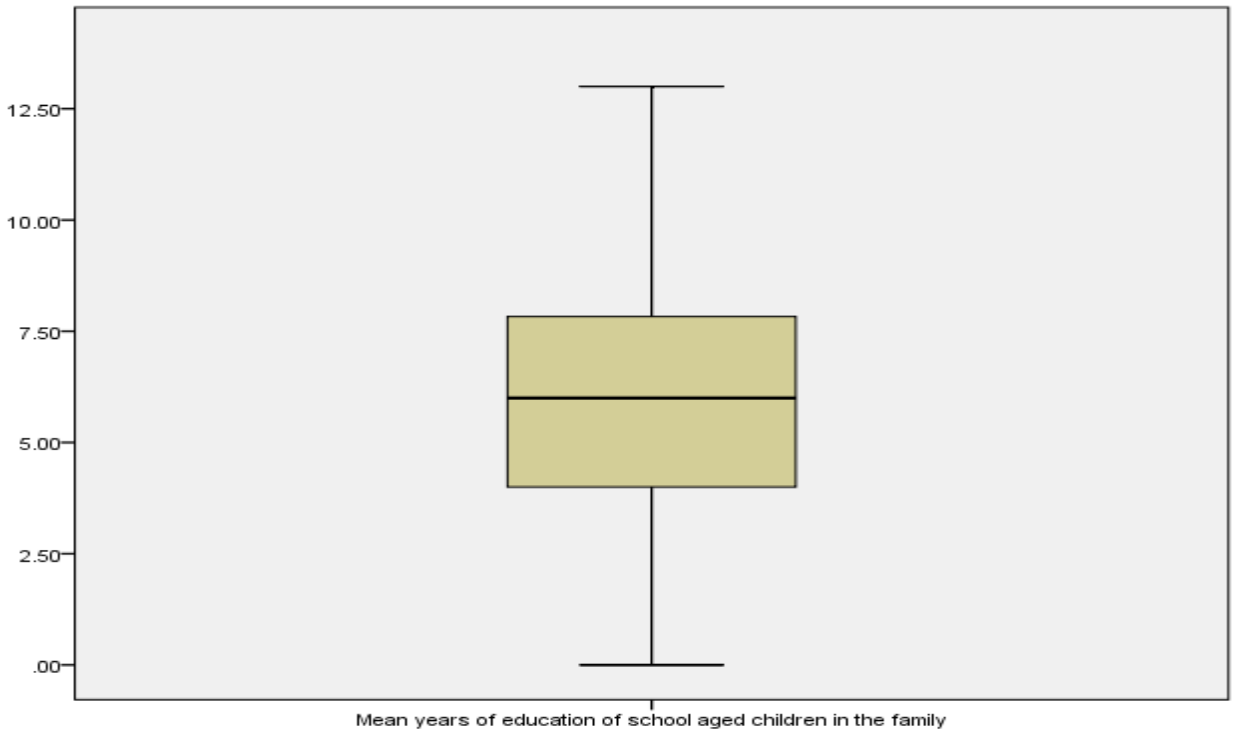


Table 4. Test of multivariate outliers for mean years of education of school aged children

Residual Statistics

	Minimum	Maximum
Predicted Value	1.925	9.646
Std. Predicted Value	-2.951	2.611
St. Error of Predicted Value	0.284	1.219
Adjusted Predicted Value	2.122	9.820
Residual	-4.791	6.654
Std. Residual	-2.235	3.001
Stud. Residual	-2.697	3.005
Deleted Residual	-7.026	7.004
Stud. Deleted Residual	-2.764	3.303
Mahal. Distance	1.459	44.262
Cook's Distance	0.000	0.347
Centered Leverage Value	0.010	0.316

Table 5. Shapiro Wilk test of log of annual total income

Variable	Kolmogorov-Smirnov			Shapiro-Wilk		
Log of annual total income	Statistic	Df	P-value	Statistic	Df	P-value
	0.085	141	0.014	0.989	141	0.349

Figure 3. Scatter plot log of annual total income

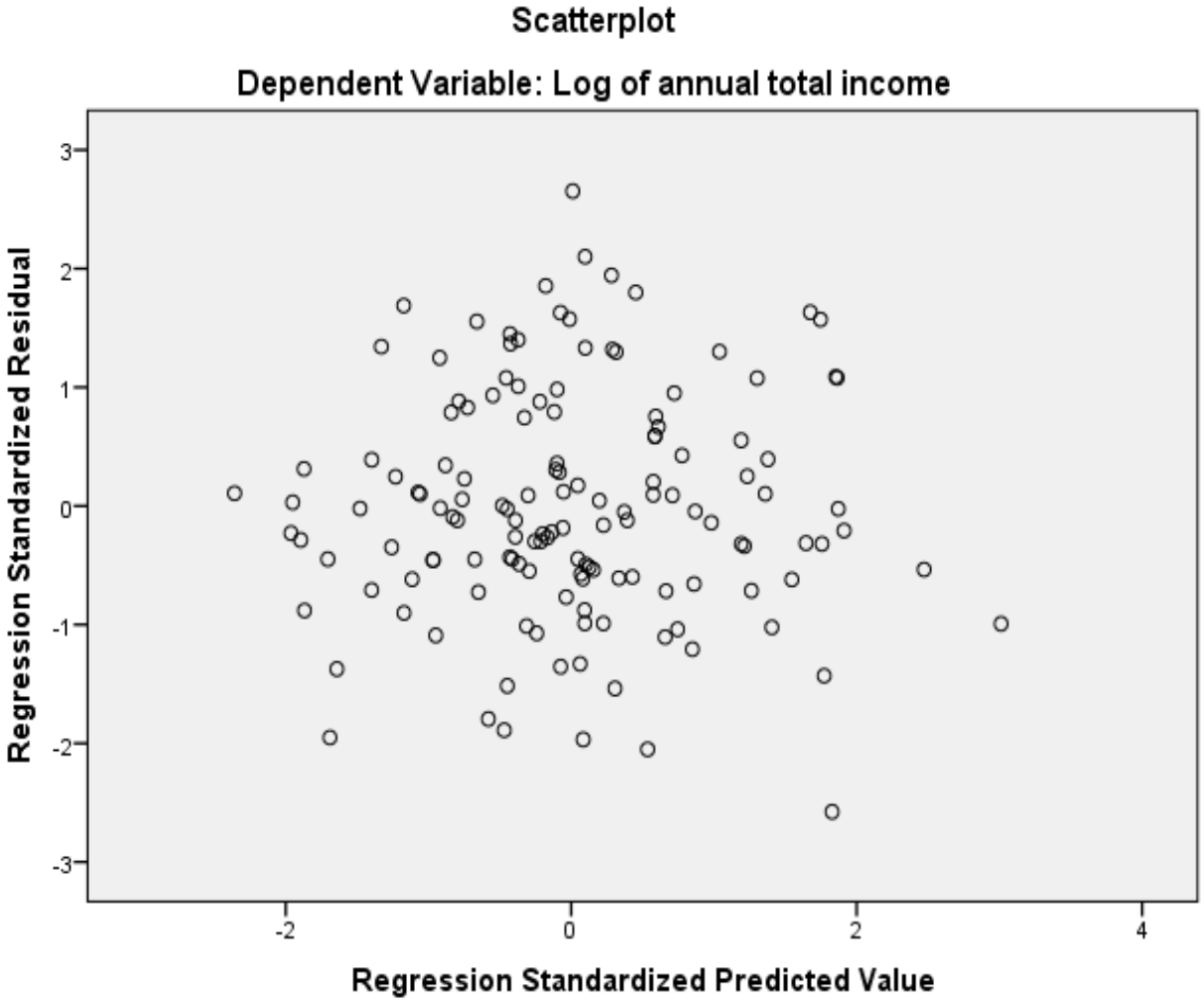


Table 6. VIF test of explanatory variables of Log of total annual income

Explanatory Variables	Collinearity Statistics	
	Tolerance	VIF
SEX	0.860	1.163
AGE	0.481	2.077
EDUC	0.647	1.545
FAMSIZE	0.663	1.508
TLU	0.785	1.273
IMRVSEED	0.877	1.140
ACRDT	0.968	1.033
MKTDIS	0.876	1.141
TLSIZE	0.743	1.346
ENNA	0.852	1.174

Figure 4. Box plot of log of total annual income

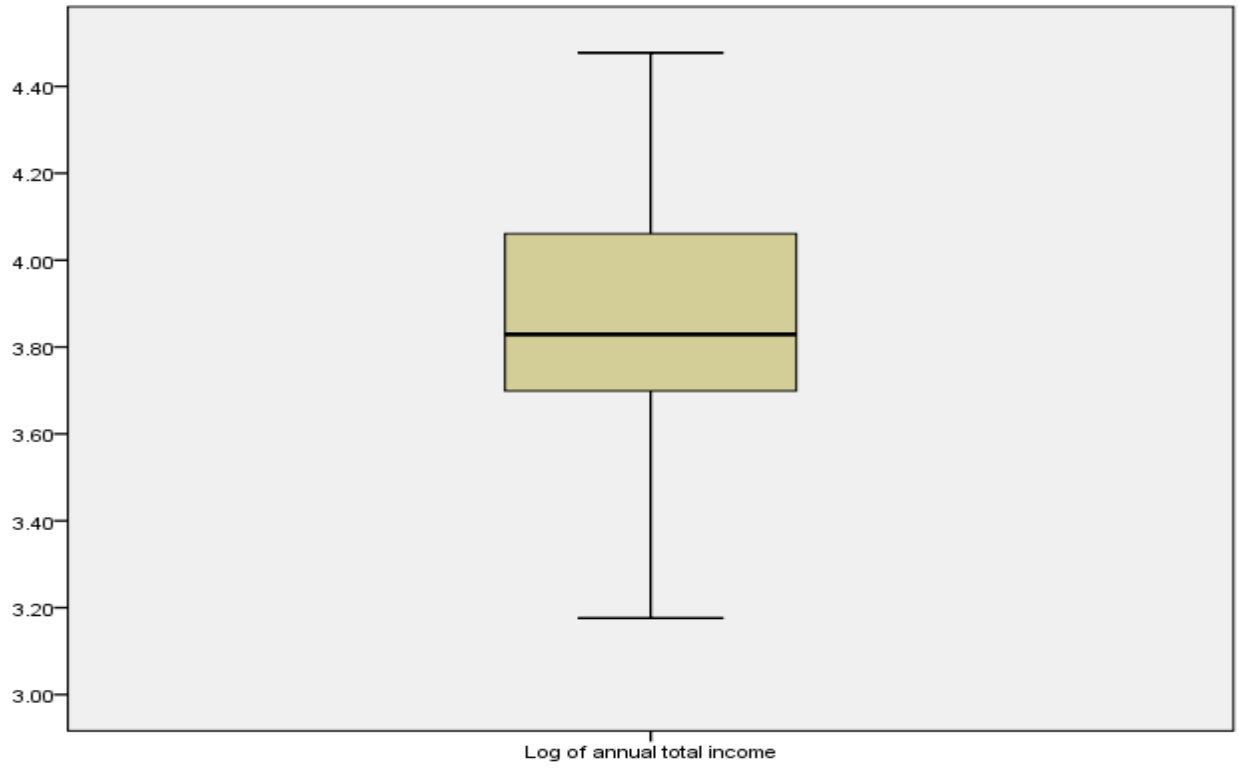


Table 7. Test of multivariate outliers for log of total annual income

Residuals Statistics

	Minimum	Maximum
Predicted Value	3.4586	4.376
Std. Predicted Value	-2.337	3.004
Standard Error of Predicted Value	0.034	0.097
Adjusted Predicted Value	3.4566	4.416
Residual	-0.518	0.539
Std. Residual	-2.568	2.675
Stud. Residual	-2.731	2.757
Deleted Residual	-0.586	0.573
Stud. Deleted Residual	-2.802	2.831
Mahal. Distance	3.006	31.484
Cook's Distance	0.000	0.089
Centered Leverage Value	0.021	0.225

Appendix II. Interview schedule

Interview Schedule on the *Determinants of Market Outlet Choice and Livelihood Outcomes of Coffee Farmers: The Case of Lalo Assabi Woreda of Oromiya*

General Household characteristics

1. Name of the respondent: _____
2. Zone: West Wollega, Woreda: Lalo Assabi, Kebele: _____
3. Age of household head: [_____] years.
4. Sex of household head: (√) 1. [ ] Male 2. [ ] Female
5. Year of education of household head: [_____]
6. Marital status of household head: (√)
   1. [ ] Married 2. [ ] Unmarried 3. [ ] Divorced 4. [ ] Widowed
7. Family size: The following table contains information regarding family size.

S.N	Family member	Sex		Age	Year of educatio	Working Person	Not working Person	Dependent or Independent
		M	F					
Name of husband								
1								
Name of wife/wives (no 2 is if any)								
1								
2								
Name of children								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
Total								

8. What is your major means of income generation? (Put the amount of income generated from each per a year)
   1. [ ] Coffee production
   2. [ ] Honey production
   3. [ ] khat
   4. [ ] crop production and sales
   5. [ ] Handcraft selling
   6. [ ] Livestock production and sales
   7. [ ] Livestock by-products
   6. [ ] Other (Specify) _____

   ETB: 1. ____ 2. ____ 3. ____ 4. ____ 5. ____
9. Are you a member of any cooperative? (√) 1. [ ] Yes 2. [ ] No
10. If your answer for Q9 is yes, what is the name of the cooperative? _____ .

Land size

1. Total land owned: _____ ha or _____ timad (*Note 1 ha=8 timad or 1 timad= 0.125 ha*)
2. Cultivated land size: _____ ha or _____ timad.
3. Area of land allotted to coffee: _____ ha or _____ timad.

Data on Housing condition

1. Type of the main house you are currently living in: (√)
   1. [ ] corrugated iron sheet roofed
   2. [ ] Thatch roofed
   3. [ ] Other, specify _____
2. If you do not have corrugated iron sheet roofed house, what is the reason? (√)
   1. [ ] do not have enough money to build
   2. [ ] high price of roof
   3. [ ] do not have own land
   4. [ ] other (specify): _____
3. When did you build your house? [_____] years ago.
4. Number of class of your house: [_____]
5. Structure of your main house: (Multiple response is possible) (√)

1. [ ] wall mud 2. [ ] wall cement 3. [ ] floor mud 4. [ ] floor cement

6. Have you ever repaired your house to improve its quality? (√) 1. [ ] Yes 2. [ ] No
7. If your answer for Q6 is yes, what is the estimated amount of cost you paid to repair? [_____] birr.

Coffee production and marketing

1. How long have you practiced production of coffee? _____ Years.
2. What type of seeds of coffee do you use for production? (√) 1. [ ] Local
   2. Improved 3. [ ] Both
3. What is the estimated quantity of coffee you obtain in a given coffee year? _____ Quintals.
4. What are the overall production constraints on your farm? (Rank vertically)

S.N	Constraints	S.N	Rank
1	Lack of labor (man power)	1	
2	Insects	2	
3	Drought	3	
4	Weeds	4	
5	Flood	5	
6	Frost	6	
7	Seed shortage	7	
8	Lack of pesticides	8	
9	Other (Specify)	9	

5. Distance of your residence from the nearest market center: [ ] hours walk.
6. Distance of your residence from cooperative store: [ ] hours walk.
7. To sell your coffee products, which market outlet do you use? (multiple response is possible) (√)
   1. [ ] private traders 3. [ ] direct sell to end consumers
   2. [ ] cooperative 4. [ ] Other (Specify) _____

8. Which market outlet do you mainly choose to sell your coffee to? (only one response is expected) (√) 1. [ ] Private traders 2. [ ] Cooperative 3. [ ] direct sell to end consumers
9. Why do you choose the fore mentioned market outlet to sell your coffee to?

   _____

10. Do you have your own transportation facilities? (√) 1. [ ] Yes 2. [ ] No
11. If your answer for Q9 is yes, what type? (√)
    1. [ ] Vehicle 2. [ ] Transport animal 3. [ ] Cart
12. How many quintals did you sell in a given coffee year? [_____] quintals.
13. What is the estimated amount of income you obtain from coffee production and sale in a given coffee year? _____ Birr.
14. Did you get market information at the right time? 1. [ ] Yes 2. [ ] No
15. If your answer for Q14 is yes, from where did you mainly get market information? (√)
    1. [ ] DA workers 4. [ ] Market
    2. [ ] Woreda experts 5. [ ] Radio
    3. [ ] Kebele administration 6. [ ] Other (Specify)
16. What type of information did you get? (√)
    1. [ ] price information 3. [ ] buyer's information
    2. [ ] market place information 4. [ ] Other (Specify)
17. At what time interval did you get the information? (√)
    1. [ ] daily 3. [ ] monthly
    2. [ ] weekly 4. [ ] Other (Specify) _____
18. Did you participate in non-farm or off-farm activities to generate income? (√)
    1. [ ] Yes 2. [ ] No
19. If your answer for Q18 is yes, what were these sources and amount of income?

    _____ _____

    _____ _____

    _____ _____

20. What is the estimated amount of income you obtain from non-farm or off-farm activities annually? _____ Birr.
21. Have you improved your livelihood (life style) by coffee production and sale? (√)

1. [ ] Yes 2. [ ] No

22. If your answer for Q21 is No, why?

_____

_____.

23. If your answer for Q21 is yes, what are the tangible things you already did in the last five years by marketing of coffee? (multiple response is possible) (√)

1. [ ] Built house in rural area 3. [ ] Repairing of previously owned house
2. [ ] Built house in urban are 4. [ ] Consumption expenditure
5. [ ] Bought flour machine 6. [ ] Bought car
7. [ ] Other (Specify): _____

Production and marketing of other crops

1. Do you participate in production of crops other than coffee? (√) 1. [ ] yes 2. [ ] No
2. If your answer for Q1 is No, is coffee production alone is enough to run your livelihood?

   (√) 1. [ ] yes 2. [ ] No
3. If your answer for Q1 is yes, what are those crops? (Multiple response is possible) (√)

   1. [ ] Teff 3. [ ] Barley 5. Sorghum
   2. [ ] Maize 4. [ ] Wheat 6. [ ] Other (Specify) _____
4. What is the estimated amount of each crop you obtain per a year?

S.N	Crop type	Amount in quintal per a year
1	Teff	
2	Maize	
3	Barley	
4	Wheat	
5	Sorghum	
6	Sweet potato	
7	Finger millet	
8	Other (Specify)	

5. Have you ever marketed the above mentioned crops? 1. [ ] yes 2. [ ] No

6. If your answer for Q5 is yes, what is the estimated income you obtain from each type of crops per a year?

S.N	Crop type	Estimated income per a year
1	Teff	
2	Maize	
3	Barley	
4	Wheat	
5	Sorghum	
6	Sweet potato	
7	Finger millet	
6	Other (Specify)	

Livestock ownership

1. Do you have Livestock? (√) 1. [ ] Yes 2. [ ] No
2. If your answer for Q1 is yes, livestock number:
   1. [ ] Cattle 4. [ ] Horses
   2. [ ] Sheep 5. [ ] Donkey
   3. [ ] Goat 6. [ ] Poultries

   Total _____
3. Living condition for your livestock: (√)
   1. [ ] in the living room of your main house 2. [ ] in the separated room or fence
4. Do you participate in livestock sales? (√) 1. [ ] yes 2. [ ] No
5. If yes for Q4, what is the estimated amount of income you obtain from livestock marketing per a year? _____ Birr.
6. Do you participate in sales of livestock by-products such as butter?
7. If your answer for Q5 is yes, what is the estimated amount of income you obtain from livestock marketing per a year? _____ Birr.

Access to and utilization of resources

1. Have you ever used agricultural input such as improved coffee seed? (√)
   1. [ ] Yes 2. [ ] No
2. If your answer for Q1 is No, what was the main reason?_____

3. If your answer for Q1 is yes, from where did you get? (multiple response is possible) (√)
   1. [ ] Local market 2. [ ] Office of agriculture and rural development
   3. [ ] Research center (Specify) _____
   4. [ ] NGOs (Specify) _____
   5. [ ] Fellow farmers
4. Do you always get improved coffee seeds at the right time? (√) 1. [ ] yes2. [ ] No
5. If your answer for Q4 is No, what are the reasons? (√)
   1. [ ] Unavailability 2. [ ] Far distance 3. [ ] Other (Specify _____
6. Did you borrow money for any reason before? (√) 1. [ ] Yes 2. [ ] No
7. If your answer for Q6 is yes, from where and for what purpose did you collect the credit? (multiple response is possible)

No	Source	Purpose (write codes)	Codes
1	Microfinance		1. Purchase of fertilizer and seed 2. Schooling of children 3. Building of house 4. Repairing of house 5. Purchase of transportation 6. Other (Specify)
2	Cooperative/Union		
3	NGOs (Specify)		
4	Bank (Specify)		
5	Relatives		
6	Trader		
7	Iqub/Iddir		
8	Other (Specify)		

8. If your answer for Q6 is yes, have you paid the loan? 1. [ ] Yes 2. [ ] No
9. If your answer for Q8 is No, what is the reason? _____
10. Have you participated in coffee production system training in the last five years? (√)
    1. [ ] Yes 2. [ ] No
11. If your answer for Q10 is No, why? _____
12. If your answer for Q10 is yes, on which aspect and by whom you got the training?

No	Training type	By whom
1	Coffee seed production	
2	Crop management	
3	Coffee sales	
4	Fertilizer and compost application	
5	Other (Specify)	

13. Did you get extension service such as advisory service from extension agents before? (√) 1. [ ] Yes 2. [ ] No
14. If your answer for Q13 is No, why? (√)
    1. [ ] No service provider nearby 3. [ ] Do not have time to get the service
    2. [ ] Possessed the required information 4. [ ] Other (Specify) _____
15. If your answer for Q13 is yes, from where did you get service? (√)
    1. [ ] Agricultural workers 3. [ ] Both
    2. [ ] Health workers 4. [ ]Other (Specify) _____
16. Distance of your residence from extension service: [ ] hours walk
17. Distance of your residence from primary and elementary school: [ ] hours walk.
18. Distance of your residence from high school: [ ] hours walk.
19. Distance of your residence from preparatory school: [ ] hours walk.
20. Does the school have fee payment? (√) 1. [ ] Yes 2. [ ] No
21. I f your answer for Q20 is yes, monthly school fee payment: [_____] birr.
22. Has/Have your child/children ever left the school due to school fee payment? (√)
    1. [ ] Yes 2. [ ] No
23. If your answer for Q22 is yes, how did you solve the problem?

    _____

    _____
24. How frequently do you visit school teachers/managers to follow your child/children in the school? (√)
    1. [ ] Never visit 3. [ ] weekly 5. [ ] Other (specify): _____
    2. [ ] daily 4. [ ] monthly

Thank you for your Patience!!

The Researcher

Name of data collector: _____

Signature: _____