

***Determinants of Participation in Off-farm Employment among Small
Holder Farmers of Jimma Arjo District, East Wollega Zone, Oromia***

*A Thesis Submitted To The School Of Graduate Studies Of Jimma University,
College Of Business and Economics In Partial Fulfillment Of The Requirements
For The Degree Of Masters Of Science In Economics(Economic Policy Analysis)*

By

TEKLE TAMIRU YADETA



JIMMA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

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BY:

TEKLE TAMIRU YADETA

Under the Guidance of

Advisor: Mr. Fikadu G. (Ph.D. Scholar)

And

Co-Advisor: Mr. Dereje A. (MSc)



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Science in Economic Policy Analysis

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CERTIFICATE

This is to certify that the thesis entitles “Determinants of Participation in Off-farm Employment among Small Holder Farmers of Jimma Arjo District, East Wollega Zone, Oromia, Ethiopia”, submitted to Jimma University for the award of the Degree of Master in Economic Policy Analysis and this thesis work carried out by Mr. Tekle Tamiru Yadeta, under our guidance and supervision.

Therefore, we hereby declare that no part of this thesis has been submitted to any other university or institution for the award of any degree or diploma.

Main Advisor’s Name	Date	Signature
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Co-Advisor’s Name	Date	Signature
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Examiner's Name	Date	Signature
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DECLARATION

I hereby declare that this thesis entitled “Determinants of Participation in Off-farm Employment among Small Holder Farmers of Jimma Arjo District, East Wollega Zone, Oromia, Ethiopia”, has been carried out by me under the guidance and supervision of Mr. Fikadu G. (Ph.D. Scholar) and Mr. Dereje A. (MSc). All sources of materials used for this thesis work have been duly acknowledged. I surely declare that this thesis work is original and has not been submitted for the award of any degree or diploma to any university or institution.

Researcher’s Name

Date

Signature

ABSTRACT

Diversifying the sources of income for subsistence farmers beyond agriculture plays a significant role in uplifting the living standards of the poor through reducing poverty, slowing down rural-urban migration, provision of income, and absorbing rural surplus labor. The objective of this study was to analyze the determinant of smallholder farmer's participation in Off-farm employment and its intensification in the case of Jimma Arjo district of East Wollega Zone. The study used data from 323 respondents, from three selected villages of Jimma Arjo district through a structured questioner. The descriptive statistics and Heckman two-stage econometric methods were employed to analyze data collected from a sampled household. The significance of the coefficient of inverse Mill's ratio (λ) indicates the presence of selection bias and the effectiveness of applying the Heckman two-stage model. In the 1st stage of probit regression results of the study show that the participation in Off-farm employment was driven by factors such as age, sex, family size, household labor, land size, fertility of the land, education, livestock, access to finance, agricultural shocks, and distance to reach the market place. In the second stage, the amount of earning from Off-farm activities was influenced by age of the household head, total family size, household labor, education status, agricultural shock, training, and time spent to reach the market. Policies for smallholder farming systems that support the improvement of soil quality and restoration of degraded and marginal land instead of expanding cropland through deforestation, education, and capacity-building for farmers and the development of specific financing schemes were recommended.

Keywords: Heckman two-stage, Household, Off-farm, Jimma Arjo, Participation

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ACRONYMS

CC = Contingency Coefficient

CSA = Central Statistical Authority

ERSH = Ethiopian Rural Household Survey

FAO = Agriculture and Food Organization

LR = Likelihood Ratio

LSMA= Living Standard Measurement Study- Integrated Survey on Agriculture

NFE = Non – Farm enterprise

OLS = Ordinary Least Square

SSA= Sub- Saharan Africa

TLU =Total Livestock Unit

VIF = Variance Inflation Factor

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Diversification of income sources, assets, and occupations is a common practice for individuals or households in different parts of the world (Adugna, 2017). The majority of the world poor live in rural areas of Sub-Saharan Africa (SSA) by depending on agriculture and related activities as a source of livelihood (Jerusalem, 2016; Davis et al., 2016). Agricultural production in this region is dominated by subsistence-based smallholder farmers, whose production and incomes from the sector are constrained by socio-economic, institutional, resource, weather conditions, and environmental factors (Jerusalem, 2016). Hence they are characterized by poverty, food insecurity, and unemployment, lack of important socio-economic services, low yields & income variability (Paloma et al., 2020).

Diversifying the sources of income for subsistence farmers beyond agriculture plays a significant role and viewed as a means for reducing rural-urban income gap, poverty reduction, slowing down rural-urban migration, building local industry, improvement of food security status, provision of off-season income, reducing risk at the advent of declining agricultural output, absorbing surplus labor for youths and women (Asfaw *et al.*, 2017). Farmers diversify their economy into different activities for example - farm agricultural production, unskilled on-farm or Off-farm wage employment, and non-farm earnings from trade, commerce, and skilled employment to improve their living standard (Pastusiak, Jasiniak, and Soliwoda, 2017).

Off-farm activities are an important component of livelihood strategies among rural households in most developing countries (Nagler and Naudé, 2017); they have been recognized to play an increasingly essential role in sustainable development and poverty reduction particularly in rural areas (Anang, Nkrumah-Ennin and Nyaaba, 2020). Off-farm employment is defined as activities from which the farmers earn income apart from their farm work and it incorporates agricultural wage work on other people's farms, non-agricultural wage employment, or self-employment in commerce, transport, service sector, mining, and manufacturing (Loison, 2015). According to Bila et al (2015) Off-farm activities are supplementary or complementary activities that are farmers participate in either during the off-season or non-season to support themselves such as in casual labor, transportation business, traditional dancing, wine taping, petty trading, etc.

Accordingly, Off-farm income is an income gained from activity that takes place away from the farm. Typically it includes all incomes from the non-farm category; it refers to wage or exchange labor on other farms, and labor payments in kind such as harvest sharing and other non-wage labor contracts take place in rural or urban, local or foreign (Loison, 2015). Income from Off-farm work supplements farm income and supports increasing economic activity and employment opportunities in rural areas (Anang and Yeboah, 2019). For the agricultural sector, income from Off-farm activities is an alternative source of income that may be used to finance agricultural production (Anang, Nkrumah-Ennin, and Nyaaba, 2020).

The recent figure by the World Bank's Living Standard Measurement Study- Integrated Survey on Agriculture (LSMA) conducted by the world bank in collaboration with National statistical offices in six Sub-Saharan Africa (Ethiopia, Malawi, Niger, Nigeria, Tanzania & Uganda) shows that 42% of the rural households of these countries involved in Off-farm activities, and 27% of households derive 50% or more of their income from Off-farm activities. Besides, this survey indicated that many households engaged in self-employment activities such as sales and trades, compared to those entering into activities that require higher starting costs, like transport service, or that require educational investment, such as professional services (Nagler and Naudé, 2017). This implies that on average, the participation of poor households is higher in low earning activities due to the existence of an entry barrier and unable to overcome start-up costs to join higher-earning activities. Thus, pushed to join into minor earning activities.

The majority of Ethiopian rural households make a living through agriculture; it is the country's number one employer (Diriba, 2018; Zerssa et al., 2021). In addition to farm production, rural households are participating in a broad range of income-generating activities like Off-farm wage work and self-employing activities (Bekele, 2016). Demeke & Zeller (2012) have reported that although 42.8% of households are involved solely in their own farm's production (do not participate in any Off-farm activity), indeed 57.2% of the households have at least one member who involves in a variety of wage work, self-employment, or a mixture of the two. Regarding wage work, around 30.3% of households are employing in wage employment. Major wage activities include working as laborers on other farms, food-for-work, and working as unskilled casual workers. Apart from wage employment, about 38.8% of households are involved in and derive income from self-employment activities such as grain and livestock trade, selling of firewood, making dung cakes and straw, weaving, pottery, and handicrafts like making and selling farm implements.

Farmers in the Jimma Arjo district have been and are participating in various Off-farm activities such as working for wage, weaving, pottery and handicrafts, sale of firewood and charcoal, fattening animals, livestock trading, and selling their labor service to surrounding industries. Opposing to this, other farmers do not participate in any activity outside their farm. However, there was no empirical research that supports the existing Off-farm employment opportunities practiced by the farmers in the district. Besides, the relative importance of factors that affect rural livelihood diversification in general and the Off-farm employment activities, in particular, was not well documented in rural Ethiopia, and hence there is a huge knowledge gap that needs further critical investigation (Kassa, 2019). Well-designed policies and strategies that promote rural households, especially poorer ones, access to Off-farm income-earning opportunities, which in turn improves their income and well-being, depends on location-specific knowledge (Babatunde et al., 2010). Thus, this study would fill the gap by addressing the potential demographic, and socio-economic determinant factors enhancing and/or hindering the smallholder farmer's participation in and amount of earning from Off-farm employment in the Jimma Arjo district.

1.2 Statement of the Problem

Households in sub-Saharan Africa, whose livelihood heavily depends on agriculture and related activities, often diversify by participating in farm and Off-farm activities (Paloma et al., 2020). However, the significance of the sub-sector is widely recognized in scholarly works even more so than in the policy-making arena (Diriba, 2018). Although many scholars agree on the significance and importance of Off-farm activities in rural Africa, there is no consensus concerning the most important factors that drive the participation and intensity of Off-farm activities. Regarding factors driving Off-farm activities, one of the hypotheses is that households engage in Off-farm activities out of necessity; the other is that participation in Off-farm activities is a choice to maximize profit. Still others argue that farmers engage in Off-farm activities in response to policy shocks (Adugna, 2017).

In the context of rural Ethiopia where subsistence farming is dominant, Off-farm activities serve as an alternative outlet to cope with unexpected crop failure and income shortfalls (CSA, 2019). Given limited arable land, and low agricultural productivity to accommodate the high population growth, the significance of Off-farm activities cannot be exaggerated (Adugna, 2017). For example, more than 60% of the households send at least one or more of their members to the Off-farm sector for payment, but it is a forgotten sector, and participation is driven more by livelihood challenges (push factors) than by opportunities in the sector or pull factors (Bekele, 2016).

A significant body of literature found that human, financial, social, natural, and physical capital/assets have a significant effect on rural livelihood diversification in general and Off-farm employment participation in particular (Demeke & Zeller, 2012; Yesuf, 2015; Eshetu & Mekonnen, 2016; Bekele, 2016; Fentie & Rao, 2016; Zewdie & Sivakumar, 2017; Kassa, 2019; Bekele et al., 2019). However, there is a dearth of research that examines the effect of these variables on the amount of Off-farm earning. The goal for rural development is not directly focused on participation but mainly to improve the living standard of the rural society, which can be targeted through better earning. Hence, it needs empirical analysis to verify the consequence of the factors responsible for participation in Off-farm activities on the number of earnings separately.

Being part of the country, rural households in the Jimma Arjo district are mainly dependent on subsistence farming activity as a major means of livelihood. The farming practice of the district has been and is facing challenges such as rising rural population resulting in shrinking land size and reduced access to land, declining soil fertility, and limited capacities of urban areas to absorb rural job seekers, insects, and pests which results in a decline in agricultural production, animal diseases, and low agricultural income (Dugassa, Kebede and Yobsan, 2021; Agricultural office of Jimma Arjo district, 2021). To cope up with these challenges, rural households in the district participate in Off-farm activities which are used to generate additional income and improve their wellbeing. However, there was no empirical research that supports the existing Off-farm employment opportunities practiced by the farmers in the district. Therefore, from the existing challenges concerning the study district and deficiency of previous studies on the determinants of Off-farm earning, this study was designed to identify demographic, institutional, and socio-economic factors that determine the smallholder participation in Off-farm employment and amount of earning in the Jimma Arjo district of East Wollega Zone.

1.3 Research Questions

In the end, this paper would answer the following research questions:

- What Off-farm activities are there in the Jimma Arjo district?
- What are the roles of Off-farm activities in the Jimma Arjo district?
- Which variables determine participation in Off-farm employment in the Jimma Arjo district?
- Do factors that affect participation can also affect the level of income from Off-farm activities in the Jimma Arjo district?

1.4 Research Objectives

The general objective of the study is to analyze the determinants of Off-farm employment Participation and amount of earning among smallholder farmers of Jimma Arjo district

1.4.1 Specific Objectives

The Specific objectives of the study are to:

- To examine the activities of Off-farm employment in the Jimma Arjo district
- To examine the roles of Off-farm activities in the Jimma Arjo district
- To identify the determinant factors of Off-farm employment in the Jimma Arjo district
- To identify factors that determine the amount of earning from Off-farm activities in the Jimma Arjo district

1.5 Significance of the Study

It is hoped that the findings of the study may particularly be useful in providing additional knowledge to existing and future institutions on determinants of Off-farm employment participation. It will add awareness to the factors that determine the amount of Off-farm earning. It will also give the knowledge on the roles of Off-farm employment and various activities undertaken by farmers apart from their farming based on their specific socio-economic conditions. The study can be a source of reference material for future researchers on other related topics; it can also help other academicians who undertake the same and similar topic/s in their studies. The study hopes in addition to the above, to be useful to stakeholders, financiers, entrepreneurs, and investors in formulating and planning areas of intervention and support. The generated information will be relevant to decision-makers since there is a need to support official acceptance to justify funding for additional research and development geared towards the improvement of rural livelihood.

1.6 Scope and Limitation of the Study

The research limits itself to determinants of rural households' Off-farm employment participation in Jimma Arjo district, East Wollega Zone, Oromia regional state, Ethiopia. The data for the research was obtained from both secondary and primary sources. Primary data were collected from households who are residents of the Jimma Arjo district from both participants and non-participants randomly and proportionally. While secondary data were collected from different bodies (offices) that this study concerns them.

1.7 Organization of the study

This study is organized into five chapters. Chapter one deals with the introductory part that includes the background of the study, statement of the problem, the objective of the study, research questions, and scope of the study, and the organization of the study. The second chapter deals with a literature review that contains the theoretical related review of literature, an empirical related review of the literature, and a conceptual framework. The third chapter deals with research methodology which contains a description of the study area, data sources and data type, data analysis, model specification, the definition of variables, and estimation strategy. Chapter four includes data description and analysis. Lastly, chapter five includes a summary, conclusion, and recommendations. At the end of the paper bibliography, appendix and questionnaire were attached.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Conceptual Definitions

Diversification into Off-farm employment activities is defined as a course of action by which rural households make a diverse group of activities intending to survive and get better of their standard of living.

Off-farm employment: Refers to activities from which the farmers earn income apart from their farm work. It may comprise agricultural wage work on other people's farms, non-agricultural wage employment, or self-employment in commerce, mining, manufacturing, transport, and services sectors. It also involves remittances and other income such as capital earnings and pensions. Thus, unlike non-farm employment Off-farm employment, is a broader concept worn to denote all works (agricultural or non-agricultural) performed apart from the own farm. Non-farm employment includes all income-generating economic activities other than the production of primary agricultural commodities such as mining, manufacturing, utilities, construction, commerce, transport, government services, among others. It also includes agro-processing, transport, or trading of unprocessed crops, livestock, forest, and fish products (Loison, 2015).

Agricultural wage refers to one of the Off-farm activities in which rural households obtain income from agriculture-related work but not on their land. This is income obtained from involvement in the farm labor market whereas, the non-agricultural wage is defined as part of Off-farm activities in which farm operators obtain income from non-agricultural activities. These incorporate an income a household obtain from employing on, for instance, food-for-work, construction, and masonry. Self-employment refers to one type of Off-farm employment activity in which households make an income from their business activities. Self-employment includes activities such as petty trading, transporting by pack animals, fuel and wood selling, charcoal making, selling fruits, making pottery and handicrafts, and stone mining (Weldahana, 2000)

Off-farm income is defined as income earned from activity that takes place away from the farm in rural or urban, local or foreign. Farm income is the income gained from the farm households own farm or rented in the plot, which consists of net income from crops and animals. Crop income is the income obtained/gained by farmers from various types of crops. Livestock income is the income obtained from livestock production consisting of net income from sold live animals and both consumed and sold raw animal products: including meat, milk, egg, skin, etc (Bihon, 2015).

Rural household incomes: Rural household incomes are divided into two: (Babatunde and Qaim, 2009). These are income from agriculture (crop and livestock production) and Off-farm income (Davis et al., 2016). It is the sum of income from the farm (net farm income from crop and livestock production: value obtained by deducting total cash outlays excluding family labor from total revenue); non-farm self-employment (value obtained from the deduction of the total cost incurred from total enterprise earnings); non-farm wage (income from salaried jobs in the non-farm sector); agricultural wage (income from salaried jobs on other people's farms) and others which include remittance income(value of income received in cash and in-kind gift received converted into cash (Woineshet, 2010)

Participation refers to the act of taking part or sharing in some activities. Household is defined as people living under the same roof and eating food from the same pot. It means that a household part did not live separately during the period of survey time as a minimum of six months. A rural household is a household that lives in the countryside and that may involve in both farm and Off-farm activities (Bihon, 2015)

2.2 Theoretical Review

2.2.1 Motives to Diversify to Off-farm Economic Activities

Due to various reasons rural households participate in Off-farm activities. Drivers are all about the factors that motive households positively and push them negatively to diversify their activities and these drivers are called pull and push factors respectively. Pull factors are positive and these may attract farm households to pursue additional livelihood activities to improve their living standards and these factors provide incentives for people to expand their range of income activities outside farming by increasing the returns from Off-farm activities on the other hand push factors are negative factors that may force farm households to seek additional livelihood activities within or outside the farm (Loison, 2015)

Diversification is the norm. Very few people earn or obtain all their income from any single source, hold all their wealth in the form of anyone asset, or use their assets in just single activity. Several motive quick individuals and households to diversify activities, incomes, and assets. The first set of motives comprise what is traditionally termed “push factors”: risk reduction, response to diminishing factor returns in any given use, such as family labor supply in the existing shortage of land resulting from population pressure and fragmented landholdings, liquidity constraints, or reaction to the crisis, high transactions costs that provoke households to self-provision in numerous goods and services, etc. The next set of motives contain “pull factors”: recognition of strategic complementarities among activities, for example, milling or crop-livestock integration and hog production, specialization as comparative advantage accorded by better technologies, endowments, or skills (Barrett et al., 2001)

Push factors relate to minimizing risks, in particular those associated with a high dependency on agriculture, managing the aftermath of shocks, or use of surplus family labor, in particular during the farm calendar off-season. Pull factors, such as individual and household level capabilities, including educational attainment and assets, as well as institutional features (Nagler and Naudé, 2017)

Pulling and Pushing factors are associated with the traditional agricultural sector of household, rural non-farm, and other external constraints. Pull factors are: education level, skills, knowledge, Positive attitude towards working and/or living in town, Existence of social networks facilitating diversification by reducing cost, higher wage rate in off-farm sector, labor demand in off-farm sector, optimistic rural business environment, appropriate infrastructure, e.g. road, schooling and vocational training network, information availability, efficient land, and credit market, the existence of rural development plans/projects/programs. Push factors are insufficient access to land and low land productivity, small farm size, low farm labor productivity, lack of self-financing capability for farm investments, inefficient land, and credit market, large family size with many dependent family members, negative attitude towards farming and rural livelihoods, generation conflict, natural disasters, shocks and constraints to distress-push diversification are less favored market structures and high unemployment rates, lack of infrastructure, inefficient institutions, legal and cultural barriers, norms and lack of livelihood capital assets (Buchenrieder, 2006)

Furthermore, literature raised the factors that push and pull households to diversify their activities. For example, population growth, increasing scarcity of arable land and decreasing access to fertile land, declining farm productivity, declining returns to farming, lack of access to farm input markets, a decline of the natural resource base, temporary events, and shocks, absence or lack of access to rural financial markets are among the factors that push household towards Off-farm activities whereas the higher return on labor in the RNFE, higher return on investments in the RNFE, lower risk of RNFE compared to on-farm activities, generation of cash to meet household objectives, economic opportunities often associated with social advantages offered in urban centers and outside of the region or country, the appeal of urban life, in particular to younger people are the factors that attract or pull rural households to diversify their economic activities (Davis, 2001)

2.3 Theoretical Model

The rural farm household model is designed for analysis of family or peasant agriculture, where farm household production, consumption, and labor allocation decisions are non-separable due to market imperfections. The farm household's production decisions depend on their consumption requirements, resource endowment, agro-ecological conditions, socio-economic contexts, and policy environments. In the meantime, their consumption decisions are understood to be largely driven by the income obtained from agricultural activities, the number of household members, Off-farm income, and their preferences. Both production and consumption sides heavily depend on local prices, which in turn are affected by international markets and trade, infrastructure, and market efficiency (Paloma et al., 2020)

2.3.1 The Sample Selection Model

A two-stage Heckman sample selection model was employed in the examination of determinants of Off-farm employment participation and intensity of participation among smallholder farmers of the Jimma Arjo district. Certainly, Heckman's (1974, 1978, 1979) sample selection model is amongst the more significant work in 20th-century program evaluation and using an econometric framework for handling limited dependent variables. The sample selection model generated both a rich theoretical discussion on modeling selection bias and the development of new statistical procedures that address the problem of selection bias. Heckman's crucial contributions to program evaluation embrace the theoretical framework that underlined the importance of modeling the dummy endogenous variable; his model was the first effort that estimated the likelihood (i.e., the propensity score) of a partaker being in one of the two situations indicated by the endogenous dummy variable, and then used the estimated tendency score model to estimate coefficients of the regression model; he treated the unobserved selection factors as a problem of specification error or a problem of omitted variables and corrected for bias in the estimation of the outcome equation by explicitly using information gained from the model of sample selection, and he developed a creative two-step procedure by using the simple least-squares algorithm.

There are two forms of the selection bias problem. In the normal case of selection bias, information on the explained variable for a portion/part of the respondents is missing. In the other forms of the selection bias problem, information on the explained variable is available for all respondents, but the distribution of respondents over groups of the independent variable we are interested in has taken place in a selective way (Smits, 2003). For example, if we want to estimate the effect of sex, age, education, family labor, land size, and others characteristics of farmers on their Off-farm earning, we meet the problem that many farmers do not participate in Off-farm employment and hence have no Off-farm earning. Therefore, running a regression with Off-farm earning as an explained variable and sex, age, education, family labor, land size, and others as the explanatory variables may lead to biased estimates of the effect of these explanatory variables on Off-farm income.

In the other form of the selection bias problem, evidence/data on the dependent variable is available for all respondents, however, the distribution of respondents over groups of the independent variable we are attentive to has selectively taken place. For example, we may want to study the effect of Off-farm participation on income, using a random sample of the population for which we know the income and whether or not they participate in Off-farm employment. If we simply run a regression with income as an explained variable and a dummy indicating whether or not the respondent participates in Off-farm employment as one of the explanatory variables, we may acquire a biased estimate of the participation effect because the distribution of respondents over the groups of participants and non-participants was not random. People who choose to participate may differ in many (measured and unmeasured) characteristics from people who don't. If these characteristics are related to income, the coefficient of the participation dummy may catch up with these effects and be biased because of this. Controlling for these differences would solve the problem. However, this is generally not possible, because in any data set the number of control factors is limited, whereas the number of possible differences among individuals is infinite (Smits, 2003).

As a result of censoring and truncation, limited dependent variables are known in social and health data. Truncation, which is a consequence of data collecting rather than data generation, happens when sample data are taken from a subclass of a larger population of our concern. Thus, a truncated distribution is a body of a larger untruncated distribution. Censoring arises when all values in a certain range of a dependent variable are transformed into a single value (Heckman, 1979). Under this circumstance, researchers may estimate a regression model for a larger population using both the censored and the uncensored data.

The essential task of analyzing limited dependent variables is to use the truncated distribution or censored data to assume/infer the untruncated or uncensored distribution for the entire population. In the perspective of regression analysis, we usually assume that the dependent variable follows a normal distribution. The problem then is to develop moments (mean and variance) of the truncated or censored normal distribution. In these theorems, moments of truncated or censored normal distributions include a key factor called the inverse Mills ratio, or hazard function, which is usually denoted as λ . Heckman's sample selection model uses the inverse Mills ratio to estimate the outcome regression.

A notion closely related to truncation and censoring, or a combination of the two concepts, is incidental truncation. Certainly, it is frequently used interchangeably with the term sample selection. Thus, sample selection or incidental truncation means a sample that is not randomly selected (Heckman, 1979). It is in conditions of incidental truncation that we face the key challenge to the whole process of evaluation, that is, the departure of evaluation data from the classic statistical model that assumes a randomized experiment (Smits, 2003). This problem underscores the need to model the sample selection process explicitly.

2.4 Empirical Review

Various studies are evident for determinants of rural households' Off-farm employment participation in different countries, which vary from one area to another, even it is different between households and between individuals within households according to the contexts, asset holdings, local setting, etc.

By their study on determinants of Off-farm income of smallholder rice farmers in northern Ghana using a double-hurdle model (The first hurdle associated with the factors influencing participation in Off-farm work whereas the second hurdle associated with the estimation of the amount of income earned from Off-farm employment) (Anang and Yeboah, 2019) found that human capital has a significant role in Off-farm income determination. Education had a direct influence on both the decision to participate in Off-farm work and the amount of income gained from Off-farm employment. Thus, educated farmers have a superior tendency to participate in Off-farm work and have a propensity to earn higher incomes from Off-farm activities. Conversely, the farming experience had an indirect or negative influence on the amount of Off-farm income and a positive or direct influence on Off-farm employment. This indicates that less experienced farmers are less probable to participate in Off-farm work, but if they participate, they will have a propensity to earn a higher income than more experienced farmers. Besides, the study underlined that income from Off-farm work differs across regions. Northern Region has a better agricultural perspective than the Upper East Region in terms of rich or fertile lands for crop production. The land shortage also characterizes agricultural production in the Upper East Region, which may persuade the trading of agricultural labor for Off-farm income. Households facing the challenge of land scarcity are therefore more probably to trade agricultural labor for non-agricultural wage employment, which may outcome in higher income from Off-farm work.

The results of (Adeoye *et al.*, 2020) indicate that males have the smallest index of diversification, showing that females are less diversified than their male counterparts probably because females are caregivers at home and could be more engrossed with household chores than males. Farm household heads less than 35 years of age have a small level of diversification. The Farmers whose age is between 35 and 50 years have a higher level of diversification compared to farmers less than 35 years. The level of diversification for farmers above 50 years is a bit higher; perhaps

their asset base provides more opportunity to participate in other Off-farm sectors. Having additional educational qualifications greater than primary school is likely to increase income concentration and reduce the extent to which farmers diversify their income sources. This could imply that the more educated farmers specialize in some activities and are less likely to engage in other Off-farm activities such as low remuneration jobs.

To explore the nature of the non-farm businesses owned by rural households in Tanzania, by using Tanzania's first nationally representative survey of micro, small, and medium-sized enterprises. (Diao, Magalhaes and Mcmillan, 2018) have reported that Roughly 20 percent of these businesses operate in the manufacturing sector, more than double the share in urban areas, the rest of the businesses operate in the services sector. Labor productivity among these businesses is extremely heterogeneous with roughly half having labor productivity lower than average labor productivity in agriculture. Using a probit specification they found that operating full time, keeping written accounts, and using electricity to run the business are all positively correlated with labor productivity. The heads of 'non-farm only' rural households tend to be younger and more educated, Education of the household head is a determinant of the likelihood that a household participates in the non-farm sector; a primary and a secondary education increases the probability of the likelihood of engaging in the non-farm sector. Among a set of selected community-level variables, households in communities with access to daily public transportation or a weekly market are more likely to participate in rural non-farm activities. Consistent with these results, they found that rural households with non-farm activities are less likely to be poor. The connotation or the logic behind is that various non-farm activities must be very fruitless or unproductive.

According to (Oduniyi et al., 2020) farm households diversified their livelihood strategies from on-farm activities dependency into various choices of livelihood strategies which were categorized into Off-farm and non-farm income activities. The factors significantly influencing the choice of livelihood diversification in the study area were: education, age, household size, and farming experience. Education was statistically significant which indicates that education raises the choice of livelihood diversification strategies of the households. This is better explained that an educated household has the awareness to diversify from farming to other

alternatives of livelihood strategies to sustain livelihood compare to the non-knowledgeable household; age was statistically significant and negatively influences the households' choice of livelihood diversification strategies. The reason is not unbelievable from the fact that most young people in the study area find other opportunities in the mine and some neglect farming with a stigma of 'meant for the old'. The result shows that an increase in the household size resulted in to increase in the opportunity for livelihood diversification strategies. A large household size tends to diversify and find other sources of livelihood strategies to maintain the family. An increase in household size may strengthen labor availability, which will form it easier for the household to let some members participate in Off-farm and other income-generating activities. In the matching approach, the farming experience was found statistically significant and the coefficient was negative which explained that farming experience reduces the choice of livelihood diversification strategies.

2.4.1 Empirical Literature Review from Ethiopia

By using the bivariate probit model to analyze the determinants of Off-farm employment participation decisions of farm households in Ethiopia (Beyene, 2008) found that human capital variables such as health and training have a positive effect on the Off-farm participation decisions of male members of farm households. The education status of the household head has no significant impact on the participation decisions of the members of the family as most of the Off-farm activities do not require formal education. The availability of credit and transfer income is the other factor that has a positive impact on the decisions of male members to participate in Off-farm activities. The effect of farm characteristics (farm size) also shows that farmers are participating in Off-farm activities for push reasons. The large farm size forces them to look for other sources of income. Therefore, poor and landless households may be benefited from the sector. The Off-farm participation behavior of farmers is found to differ in different places in the country. It is higher in areas affected by drought and lowers in relatively self-sufficient areas.

By using linear fixed effect and logit random effect to estimate determinants of Off-farm participation (Woineshet, 2010) found that Pull factors such as the existence of more labor power in the household, human capital, and access to financial sources motivate a household to make a participate decision. On the other hand, the incidence of the idiosyncratic shock increases the

likelihood of participation as a push factor. But, covariant or aggregate shock decreases participation by decreasing the economic capacity of a community. The regional disparity was also another determining factor in making participation decisions. The finding also exposed that wealth is required for making participation decisions particularly in high-earning activities but the rate of participation decreased amongst the wealthiest households. The female household head that has fewer burdens on reproductive workings has a better opportunity in participating in Off-farm employment. In a broad sense, a household in rural Ethiopia participates in Off-farm activities in case they have excess labor power, personal capacity, financial source, regional opportunity, and when farming output decreases due to shock, lesser agricultural productivity, or wealth.

Regarding factors affecting effectiveness or profitability of rural Off-farm activity (Woineshet, 2010) used Heckman selection and linear fixed effect models and household those have further know-how, wealth, labor authority, cash crops that were not practiced market failure and households talented to work in their community are receiving superior Off-farm income. Besides, female and children's participation in Off-farm employment allows a household to earn a better income. Therefore, on the whole, households with better resources are receiving more income from Off-farm activity. Finally, they estimated the outcome of participation on the whole total income of a household per expenditure and land size quintiles by using OLS, linear fixed, and random effect models. Involvement in Off-farm activities increases the whole income of a household positively. The consequence of Off-farm involvement in increasing household overall income is considerable for poorer households. It testifies that participating in Off-farm payback more the poorer segments of rural society.

(Tewelde, 2012) has used both bivariate probit and univariate probit models to estimate the Off-farm wage and Off-farm self-employment participation. The result shows that age and formal education of the household head, number of children 10 years old or under, and district where the households live significantly affects participation in Off-farm wage work. In opposing participation in Off-farm self-employment is determined by the sex of the household head, the number of adult males in the household, per capita non-labor income, credit use, per capita

livestock holding, district, and distance to the nearest all-weather road and distance to the nearest major market.

By using Probit Model with four distinct but related dependent variables namely: participation in Off-farm activities, participation in non-farm activities, participation in self-employment, and participation in wage employment, Off-farm incorporate all three (Eshetu and Mekonnen, 2016) found that the coefficients related to the age of the household head and the household age composition index are inverse and statistically significant in all of the regression results indicating that age has a great role for participation in Off-farm likewise in non-farm activities. Rural-based activities frequently need physical strength and, for this reason, the results indicate that relatively younger people have the comparative advantage in terms of physical fitness to engage in those activities. As a result, the superior participation of such households in Off-farm/non-farm activities can be in use as an answer to the existing landlessness problem amongst youth in rural Ethiopia. Livestock is a significant source of income in rural Ethiopia and for this reason, they can have a substitution or a complementary outcome on Off-farm activities. Their regressions results indicate that livestock has a substitution effect on the Off-farm economy; this means as the size of livestock holding increases the likelihood of participation in Off-farm activities would decline. It implies that households with many livestock can come across lower financial constraints and, for this reason, they are less rushed to use the Off-farm sector as an option source of income. Again households with many livestock can face a more severe labor restraint to take part in Off-farm activities resulting from the fact that more livestock requires more labor force.

Also, they found that Per capita land holding is significantly associated with the dependent variables in all of the regressions, this means as per-capita land holding rises households have a propensity to have lesser demand for Off-farm activities, whether in the form of wage employment or the form of self-employment. The land is a key resource for agriculture and, therefore, households having bigger landholding can generate higher income from agriculture than those with lesser landholding. In other words, a bigger land size indicates higher demand for farming labor given that farming is a labor-intensive activity in Ethiopia. Even as households with better landholding have a propensity to favor farming more than Off-farm activities, the

quality of land also important in such decisions. Low land quality results in low per-unit profit in farming, and for this reason, households working on low-quality lands are pushed to participate.

By Employing Multinomial Logit Model to Analyze Determinants of Off-farm income diversification and its effect on rural household poverty in Gamo Gofa Zone (Eshetu and Mekonnen, 2016) found that years of schooling, access to credit, household income, and location dummy are positively and statistically significantly manipulate the likelihood or probability of households' participation in local Off-farm income diversification activities. These imply that better years of schooling, higher household income, and better access to credit increase the probability of households' participation in local Off-farm activities while tropical life stock units and distance from all-weather roads negatively and statistically significantly influence the probability or likelihood of rural households' participation in local Off-farm income diversification activities.

By Employing Logit Regression Model the result of (Yesuf, 2015) shows that family size is significant and positively influences households to participate in Off-farm activities in the Tigray region at less than five percent probability level. The positive sign of the coefficient of family size indicates that the odds ratio in favor of the likelihood of participating in Off-farm increases as family size increases holding other variables is constant. Regarding Total livestock, he found that it is positively and significantly associated with the probability of participating in Off-farm activities at less than one level of significance. The positive association is explained by the fact that total livestock owned being a proxy for farmer's resource endowment, those sample farmers with large herd sizes have a superior chance to gain more income from livestock production and enabled them to participate in Off-farm participation.

Furthermore, the result of the logit model showed that access to credit has a significant and positive influence on Off-farm participation in the study area at less than one percent level of significance. This was because households that have the chance to receive credit would build their capacity to participate in Off-farm and education is found positively and significantly correlated to Off-farm participation at less than five percent probability level. Regarding age, is found to be significant and positively influences household to participate in Off-farm

employment at less than ten percent probability level and it indicates that the odds ratio in favor of the probability of participating in Off-farm increases as age increases. Also, distance from the main market in a minute is found to be significant and negatively influences households participating in Off-farm employment at less than one percent probability level and the negative sign of the coefficient shows that odds ratio in favor of the probability of participating in Off-farm decreases as the distance from main market increases. Regarding the household asset, he found that it is positively and significantly related to the probability of participating in Off-farm employment at less than one level of significance. This positive association is explained by the fact that total household-owned being a proxy for farmers' resource endowment, those households with large assets have a superior chance to earn more income and able to participate in Off-farm participation.

By using a binary logistic regression model to investigate the determinant factors of Off-farm participation in the Shebedino district of Sidama (Zewdie and Sivakumar, 2017) found that among the sample of factors, Off-farm training, credit service, household saving, education status, presence of draft animals, size of farmland were most significant determinants to manipulate Off-farm participation of the households. Skill upgrading training provided for farmers has a significant role to attract farm households to participate in the Off-farm sector. Households having own saving were involved more in Off-farm activities than households who did not have their saving and also it is used as collateral to guarantee loan service. Draft animals particularly donkeys and horses found to be major contributors to the household's supplementary income. Draft animals which pull carts were better important than other animals that transport loading on their back. The education of the household head is one of the determinants of Off-farm participation. Households who have attended at least primary education more probable participate in Off-farm income-generating activities. Literate farmers could participate in every aspect of their life actively than illiterates. It was found that farm households with a small size of farmland faced financial limitations because of low farm income. The productivity of land is very low so that they did not get surplus income to save and or invest in Off-farm activities.

(Fentie and Rao, 2016) conducted the study in the East Gojjam Zone of Amhara region, with the main objective of analyzing the determinants of Off-farm participation of rural farm households based on a binary logistic regression model. The finding of the study shows that among the sample of factors, household head sex, Family size, education level, Labor family, and shortage of food were significantly and positively influenced Off-farm participation; however, age, land size, and distance to the main markets were the variables that affected rural farm households Off-farm participation negatively and significantly.

As highlighted in these empirical reviews, the majority of the researchers have been focusing on identifying the determinant factors of Off-farm employment by employing binary logit, binary probit, and multinomial logit, and multinomial probit models. However, in this case, the Heckman two-step model would be employed to identify the determinant factors of off-farm employment participation and its intensity in the Jimma Arjo district of East Wollega Zone.

2.5 Conceptual Frame Work

As several studies explain the conceptual framework to support the research work, a conceptual framework is important to provide an analytical basis for determinants of rural farm households' participation in Off-farm employment activities. The literature provides ample evidence for the researcher in favor of the explanations for farm households,' motivations and pushes to diversify the activities into Off-farm employment. Based on the above empirical review the researcher prepared the conceptual framework that shows the major determinant factors that are expected to determine rural households' participation in Off-farm activities and income.

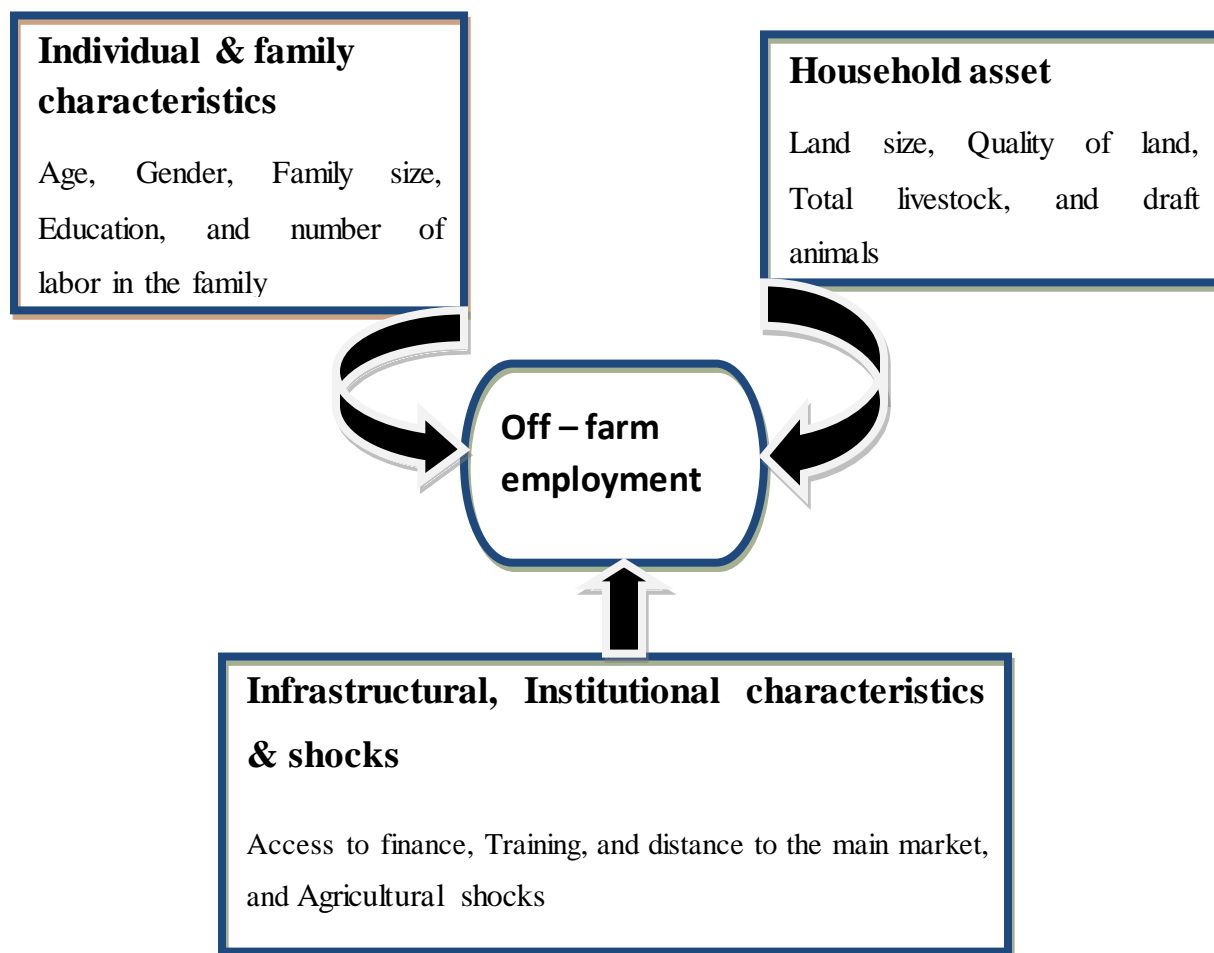


Figure 2.1: The conceptual framework for the determinants of participation in Off-farm employment and incomes from it.

CHAPTER THREE

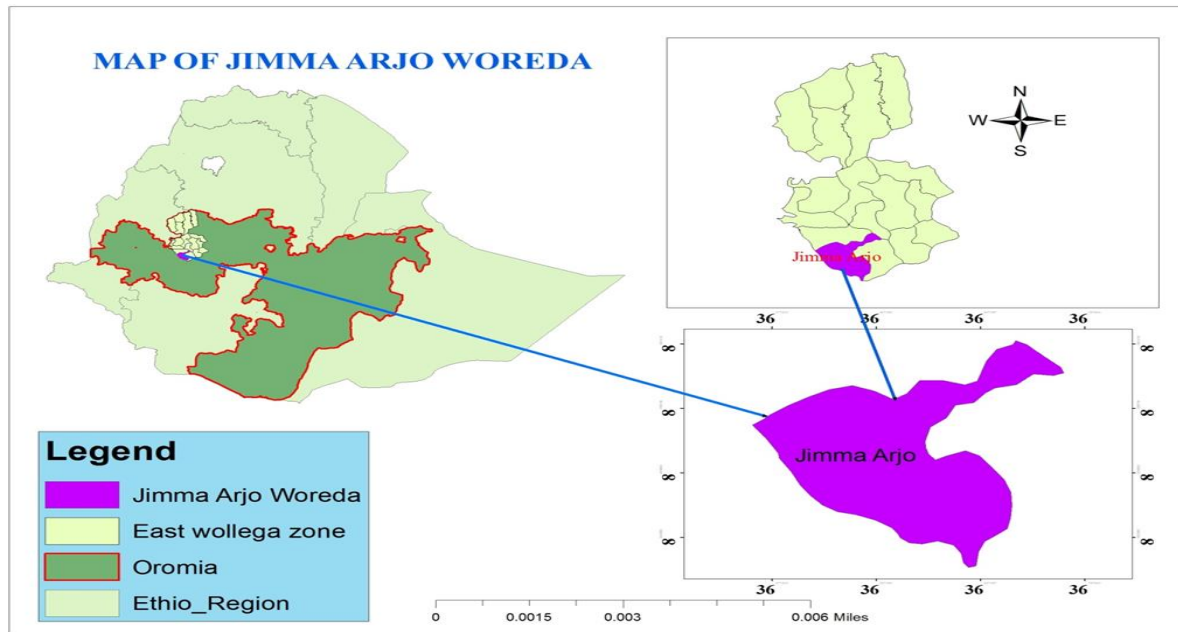
RESEARCH METHODOLOGY

3.1 Description of the Study Area

The study was conducted in Jimma Arjo District, East Wollega Zone of the Oromia Regional State, which is located in the Western part of Ethiopia. It is one of the 17 districts of the East Wollega Zone. Arjo is the administrative center of the district. It is located 379 km to the West of the capital, Addis Ababa, and 48 km south of the Zone capital, Nekemte. Jimma Arjo is bordered on the South by Buno Bedelle zone, on the West by Leka Dulacha district, and Ilu Abbabor zone, on the North by Leka Dulacha and Wayu Tuka districts, on the East by Nunu Kumba district.

The 2007 national census reported a total population of this district is 86,329, of whom 42,093 were men and 44,236 were a woman; 9,172 or 10.63% of its population are urban dwellers. Jimma Arjo is covering 5.3% of the East Wollega zone total area. The majority of the inhabitants observed Protestantism, with 48.85% reporting that as their religion, while 45% observed Ethiopian Orthodox Christianity, and 5.59% were Muslims.

The agroecology of the district is divided into three: Highland (dega) 15%, middle land (weyna dega) 80.5%, and Lowland (kola) 4.5%. The major markets of the district are Arjo, Mole, Jimate, Hunde gudina, and Kumba. Rural households nearest to those markets are highly participate in trade activity as the source of income (Agricultural Office of Jimma Arjo district, 2021).



Source: Jimma Arjo District Agricultural Office, 2021

Figure 3. 1 Map of the Jimma Arjo district, taken from

3.2 Research Design

To research the study area, the researcher adopted a cross-sectional survey. The study population constitutes farm household heads in the Jimma Arjo district of the East Wollega zone. For sampling techniques, a multistage sampling technique was used to select the representative samples for the study. Data were analyzed using descriptive statistics and an econometric model. Among econometric models, Heckman's two-stage model was used. Thus, this research employed a cross-sectional survey research type.

3.3 Data sources and method of data collection

For this study, primary and secondary data were utilized. The data employed for the study were collected from sample respondents of the study area, managers of selected villages, and district experts of the agricultural office. Data were collected from the sample group through a developed interview questionnaire. An interview questionnaire is the main method of collecting data from the rural households of the peasant association. It was developed on the types and

patterns of Off-farm activities existing in the study area, determinants of farm households' participation in Off-farm employment, amount of off-farm earning, the roles and opportunities for Off-farm rural diversification in sustaining the livelihood of the rural district.

To make clear and simplify for respondents, the questionnaire was translated into the language they can speak and read. Enumerators were appointed for data collection based on their experience and level of education. All field assistants/data collectors would obtain enough information from the researcher for the administration of the questionnaire to the respondents. The interview would also be held with selected villages' managers, and district administrative offices on the issues. The researcher is fully participated in the interview with village and district administration and closely supervised and in guiding the enumerators during the period of data collection. The study would also be supplemented by secondary sources. Secondary sources were obtained from published and unpublished documents, obtained from Jimma Arjo administrative office, relevant literature, and other relevant organizations. After this, quantitative and qualitative data were collected to respond to the raised questions in the study area.

3.4 Sampling techniques and procedures

To make the study efficient, reliable, flexible, and representative, an appropriate sampling technique was employed. Jimma Arjo district rural households were used as the target population for the study. From a total population of this district, the sample was taken from selected villages' farm households, since it is not applicable to study the whole population due to the time and cost to select the sample from all villages of this district. A multi-stage sampling technique would be used to meet the requirements of intended sample households. Accordingly, the study area (Jimma Arjo district) was selected randomly from 17 districts of the East Wollega Zone. In the second stage, based on the information of the district office of agriculture, three strata or agro-ecological zones containing homogenous populations each (lowland, medium land, and highland) were formed. In the third stage, three villages (one from each stratum) were selected by using simple random sampling. Then proportional sampling technique was employed to select a sample size from each villages.

3.4.1 Sample size determination

The required sample size for collecting quantitative data is determined by using kothar's formula (1977). Assume there is a large population but that we do not know the variability in the proportion that will adopt the practice (Cothari, 2004), in this case, the population that participates in the Off-farm employment. The sample size would be made by assuming that 70 percent of the individuals included in the study would be participating in the Off-farm activity, with a marginal error of 5 percent and a 95% confidence interval. The formula to calculate a representative sample size is shown as;

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

Where

n =the desired sample size

Z=the standard deviation at the required confidence level

P=the estimated proportion of an attribute that is present in the population

q=1 - p

e=the margin of error

Thus, the calculation for required sample size is as follows,

p =0.70 and hence

q =1-0.70 =0.30;

e =0. 05; z =1.96;

$$n = \frac{0.70*0.30*1.96^2}{0.05^2} = \frac{0.21*3.8416}{0.0025} = 322.69 \approx 323 \dots \dots \dots (2)$$

Based on the stated formula, the sample size was determined to be 323 households. To determine the sample size of each village, the researcher employed a proportional Sampling technique. That is if N_i represents the proportion of the population (household) included in stratum I, and n represents the total sample size, the number of elements selected from stratum i is n_i . A sample of size $n = 323$ was drawn from a household of size $N = 4681$ which is from three villages of size Wayu Kumba (N_1) = 1433, Meta (N_2) = 1852, and Hara Keku (N_3) = 1396

Table 3. 1 Sample size from each village

Villages	Total households in selected villages	Sample households in selected villages
		$n_i = n \frac{N_i}{N}$ where $i=1, 2\&3$
Wayu kumba	$N_1 = 1396$	$n_1=323*1396/4681= 96$
Meta	$N_2 =1852$	$n_2 =323*1852/4681= 128$
Hara keku	$N_3 =1433$	$n_3= 323*1433/4681= 99$
Total	$N =4681$	$N = 323$

3.5 Methods of Data Analysis

In this study, both descriptive and inferential methods of data analysis were employed. The descriptive statistics such as frequencies, percentages, means, mean difference values, a t-test for continuous variables, and χ^2 test for categorical variables were used in analyzing the data. The t-test would be used to test the significance of the mean value of continuous variables of the two groups of participants and non-participant. Likewise, the potential discrete (dummy) explanatory variables would be tested using the chi-square (χ^2) distribution. Before running the regression analysis, the diagnostic tests, such that, the existence of multicollinearity and the problem of heteroscedasticity of variables included in the model were checked both for the continuous and discrete explanatory variables. Then, the Heckman selection (two-step) model with the help of Stata version 14 was employed to identify the determinants of the rural households' participation in Off-farm employment and income from Off-farm activities.

3.6 The Heckman two-step model procedure

The dependent variable in this model is a dummy variable consisting of two outcomes, participant and non-participant because, among the representative, not all households participate in off-farm employment. In this case, the use of the OLS/Ordinary Least Square method for such variables poses inference problems, and thus not applicable for examining limited dependent or dichotomous variables. In such situations, maximum likelihood estimation procedures such as logit or probit models are generally more efficient (Gujarati, 1995). Several investigators used different models such as binary logit, binary probit, multinomial logit, and multinomial probit to estimate the determinant variables of Off-farm employment participation. However, it is conceivable to use Heckman's (1979) two-step procedure in case of the anticipated problem of selection bias in the sample (Deresse & Tekilu, 2019).

In the first stage of the Heckman method, the selection procedure which is a cause for selection bias problems is considered or studied by the selection model. The bias is raised by the presence of differences between participant and non-participant farmers which are related to their income. So, it is necessary to compare the participant and non-participant households to find out what the differences are. For this purpose, generally, a probit model is estimated because the error term of this model is normally distributed, one of the assumptions underlying the Heckman model. The first stage Heckman two steps or the probit model that analyzes the factors determining the probability of participation in Off-farm employment specified as:

$$\Pr(Y1i = 1/X1i, \beta1i) = \Phi(f(X1i, \beta1i)) + \varepsilon i \dots \dots \dots (3)$$

Where; $Y1i$ is an indicator variable that is equal to unity for participant households; Φ is the standard normal cumulative distribution function; $X1i$ is a variable that affects Off-farm participation and was described in table 3.2; $\beta1i$ is a coefficient to be estimated. The variable $Y1i$ takes the value 1 if the household participates in Off-farm activities and zero otherwise. To make more clear, the specification could be:

$$\begin{aligned} HHLPA = & \beta_0 + \beta_1 Sex + \beta_2 Age + \beta_3 Literacy + \beta_4 Edu1 + \beta_5 Edu2 + \beta_6 HHsize + \\ & \beta_7 Adult + \beta_8 Lansize + \beta_9 Lanfrtly + \beta_{10} TLU + \beta_{11} Drfta + \beta_{12} Finance + \\ & + \beta_{13} Distance + \beta_{14} Training + \beta_{15} Agrishocks + \varepsilon i \dots \dots \dots (4) \end{aligned}$$

In the probit analysis, we estimate the effects of explanatory variables on the participation decision. What we want to know is the effect of the unmeasured characteristics of the respondents on the participation decision. Evidence on the effect of these unmeasured characteristics is not existing in the coefficients of the independent variables, but in the residuals of the probit analysis, it is. Finally, the deviation which remains in the explained variable after eliminating the effect of the known factors can only be caused by the impact of unknown factors.

In the Heckman procedure, the errors of the selection equation are used to build a selection bias control factor, which is known as Lambda and which is equivalent to the Inverse Mill's Ratio. This factor is a summarizing measure that reveals the effects of all unmeasured characteristics which are related to participation. The value of this lambda for each of the respondents is saved and added to the data file as a supplementary variable. This method is used to control the selectivity bias and endogeneity problem and to get consistent and unbiased parameter estimates (Greene, 2000). In the selection model procedure, sample bias is determined by the relationship between the residuals of the two stages (stage 1 and stage 2).

In the second stage of the Heckman procedure, the analysis is made in which we are interested in the first place, in this situation, an OLS regression is used to analyze the effects of explanatory variables on income. In this analysis, the selection bias control factor Lambda is used as an additional independent variable since this factor reflects the effect of all the unmeasured characteristics which are related to the participation decision in this case (Heckman, 1979). The coefficient of this factor catches the part of the effect of these characteristics which is related to income. Now have a controlling or monitoring factor in the analysis for the consequence of the income-related unmeasured characteristics which are also associated with the participation decision, the other forecasters in the equation are freed from this influence and the regression analysis creates unbiased coefficients for them.

In the second stage, parameters can consistently be estimated by OLS by incorporating an estimate of the inverse Mills ratios denoted as λ_i from probit regression model as additional explanatory variable as specified below:-

$$\ln Y_{2i} = \beta_0 + \beta_1 X_{2i} + \mu_i \lambda_i + v_i \dots \dots \dots (5)$$

Where:

$\ln Y_{2i}$ is the ln of amount Off-farm earning in Birr,

X_{2i} implies the explanatory variables influencing the household to participate in Off-farm employment, β_0 = is the Constant term in OLS regression model, β_i = is the Parameters to be estimated in the second stage, λ_i = is the inverse mills ratio computed from the first-stage estimation,

μ_i = implies the Correlation between first and second stage error terms or corr (ε_i, v_i),

v_i = is the error term in the second stage. To make more clear the specification is:

$$\ln Y_i = \beta_0 + \beta_1 \text{Sex} + \beta_2 \text{Age} + \beta_3 \text{Literacy} + \beta_4 \text{Edu1} + \beta_5 \text{Edu2} + \beta_6 \text{Famsize} + \beta_7 \text{Adult} + \beta_8 \text{Lansize} + \beta_9 \text{Lanfrtly} + \beta_{10} \text{TLU} + \beta_{11} \text{Drfta} + \beta_{12} \text{Finance} + \beta_{13} \text{Distance} + \beta_{14} \text{Training} + \beta_{15} \text{Agrishocks} + \mu_i \lambda_i + v_i \dots \dots \dots (6)$$

Off-farm earning can only be experiential for a participant household. This leads to a sample selection problem (Wooldridge, 2015) which expresses a need to account for the resulting non-random nature of the sample for estimating eq. (6). This is for the reason that the estimation drops households that choose not to participate as their data on the number of earnings are missed. Although replacing the missing values with zero enables to use of all the existing information, it would underestimate the gain from Off-farm activities and vice versa. Thus, using normal OLS estimation leads to biased and inconsistent results. According to (Heckman, 1979), the IMR (λ_i) is a variable for controlling bias due to sample selection. This term is constructed using the model in the probit regression (first stage) and then incorporate into the model of the second stage (OLS) as an independent variable. It could be obtained:-

$$\lambda_i = \frac{\phi(\beta_0 + \beta_1 X_{1i})}{\Phi(\beta_0 + \beta_1 X_{1i})} \dots \dots \dots (7)$$

Where ϕ denotes the standard normal probability density function and Φ denotes the cumulative distribution function for a standard normal random variable.

However, the value of λ_i is not known, the parameters β_0 and β_{1i} can be estimated using a probit model, based on the observed binary result. Then the estimated IMR calculated as:-

$$estimated\lambda_i = \frac{\phi(estimated\beta_0 + estimated\beta_1X1i)}{\Phi(estimated\beta_0 + estimated\beta_1X1i)} \dots \dots \dots (8)$$

From the Heckman two-step estimation, the significance of the selectivity variable (mills lambda) confirms the existence of selectivity bias. From equation (4&6)

Where $\epsilon_i \sim N(0, \delta)$, $v_i \sim N(0, 1)$, and $corr(\epsilon_i, v_i) = \mu_i \dots \dots \dots (9)$

The fourth equation is the participation equation, where Y takes the value 1 if a household participates in Off-farm activities and 0 if not participate. The sixth equation is the selection equation. When $\mu_i = 0$, OLS regression provides unbiased estimates, when $\mu_i \approx \neq 0$ the OLS estimates are biased. The Heckman selection model allows us to use evidence from non-participating households to improve the estimates of the parameters in the Off-farm income regression model. The Heckman selection model provides consistent, asymptotically efficient estimates for all parameters in the model (Greene, 2000). Thus, equation 6 is estimated using the Heckman selection (two-step) model. The result is interpreted as indicating the effect of a unit change in the independent variable on the percentage change in the amount of earning.

3.8 Hypothesis and Justification of Explanatory variables

The major variables expected to influence the household's participation in Off-farm activities are explained below.

Dependent variable

1. Participation or labor allocation is a binary or dichotomous variable outcome. It is represented by 1 in the model for those who participate in Off-farm activities either in self-employment or wage work and 0 for those who do not participate in Off-farm activities.

2. Off-farm revenue: it shows the amount of total earning in local currency ‘Eth Birr’ (ETB) from wage work and self-employment activities. Off-farm revenue is a dependent variable on the specification that determines factors that affect the amount of Off-farm earning.

Independent Variables

The independent variables expected to have a relationship with those who participate in Off-farm activities are selected based on available literature. These are identified as individual and family characteristics, household assets, infrastructural and institutional characteristics, and shocks that are relevant and feasible in the farming sectors are selected and identified as follows:

A) Individual and Family characteristics

- 1. Sex of household head (Sex):** This dummy variable represents the gender segregation between men and women on the household head, concerning farming experience and other additional works outside of their home. Males, are better than female farmers (Woineshet, 2010). Thus, sex is expected to have a positive influence on Off-farm participation.
- 2. Age of the household head (Age):** It is a continuous variable representing a general experience that increases the marginal value of time in each activity and representing the period from the respondent's birth to the data collection time and is measured in years. At a younger age, the probability of working Off-farm will increase. At older ages, the overall labor hours will diminish and the demand for leisure will increase (Demeke and Zeller, 2012). The variable predicted parameter is expected to have a negative sign to indicate that after a certain age, the tendency to participate will decline.
- 3. Family size (Famlysize):** It is a continuous variable measured by the number of individuals living together within one home. The presence of a large number of family members with limited resources could affect the decision to participate in Off-farm activities of the household due to the increasing demand for food with a limited food supply. But those households, which have labor abundant, would send more members to Off-farm activity and have higher opportunities to generate income from other sources.

apart from farming (Bekele, 2016). Family size, as an indicator of labor availability, is expected to have a positive influence on Off-farm participation and hence on amount earning.

4. **Education (Literacy, Educ1 & Edu2):** is a human capital endowment. In this case, education is represented by a household head's literacy and the presence of a household member who completed at least primary and secondary school. Evidence in different kinds of literature shows that education has a positive impact on Off-farm participation (Eshetu & Mekonnen, 2016; Zewdie & Sivakumar, 2017). Hence, education is expected to have a positive impact on Off-farm participation and on the amount of earning.
5. **The number of working-age adults (Adult):** Number of people whose age from 16 to 65 and not attending school. A larger number of working-age adults in the family will lead to a higher probability of taking Off-farm jobs since the amount of time needed for the farm is almost fixed (Bekele, 2016). Many working adults are also expected to have a positive influence on the income from Off-farm employment.

B) Household Assets

6. **Size of cultivated land in hectare (Lansize):** this is the size of any farmland owned by the household, in hectares. It is assumed that small farm size is related to a poor farm household and vice versa (Bekele, 2016; Bekele et al., 2019), depending on this the researcher expected that it has a negative influence.
7. **Quality/ fertility of the land (Lanfrlty):** it is the farmer's perceptions about the soil quality and its productivity to that of their neighbor farmer's land (Kassa, 2019). Low land quality results in low per-unit profit in farming, and for this reason, households working on low-quality lands are pushed to participate in off-farm activities (Eshetu and Mekonnen, 2016). The more farmers perceive good quality soil the less will the likelihood to participate in Off-farm activities.

- 8. Total livestock owned in tropical livestock unit (TLU):** it is the total number of livestock holding of the household measured in livestock unit. Livestock plays a major role in rural livelihood (Yesuf, 2015). Therefore, it is expected that livestock holding has a positive impact on the participation in Off-farm activities and helps to start trading.
- 9. Draft animals (Drfta):** is a dummy for draft animals used for transportation such as donkeys, horses, and mules to help farmers by carrying materials, crops, and others on their back (Zewdie and Sivakumar, 2017). Thus, it is expected to have positive relationships with Off-farm participation

C) Infrastructural, Institutional characteristics and Shock

- 10. Access to Finance (Finance):** The variables indicate access to formal and informal financial sources. Access to formal financial institutions controlled by a dummy variable showing if a household has a bank account or not. The presence of informal financial sources controlled by variables indicating if a household is a member of 'Idir' and whether a household received a loan or not. In addition, variables showing if a household received remittance or not included as another source of informal financing (Woinishet, 2010). Access to financial sources is expected or anticipated to increase participation by enabling a household to cover initial costs to start up Off-farm activities.
- 11. Access to the urban market center (Distance):** Urban center encourages Off-farm activities by serving as the center for input sales and presenting a demand for products (Kassa, 2019). Thus, proximity to urban market centers gives rise to diversified rural Off-farm activities and higher Off-farm earning. Therefore it is expected to positively affect the Off-farm activities and hence the amount of earning.
- 12. Access to training (Training):** is the training given to farmers as a means of improving their skills (Yesuf, 2015). It is expected to have a positive effect on households in Off-farm employment opportunities and generating Off-farm income.

13. Agricultural shocks (Agrishocks): is composed of variables showing a reduction in agricultural output such as unavailability of oxen, unable to buy fertilizer, crops suffered from animal eating, damage by pests and weed infestation, and externalities. The researcher expected that those households suffered from these problems would participate in Off-farm activities to generate additional income to feed their family. Thus, it is expected to have a positive impact on Off-farm employment participation and income obtained from it.

Table 3. 2 Summary of variables with their expected relation

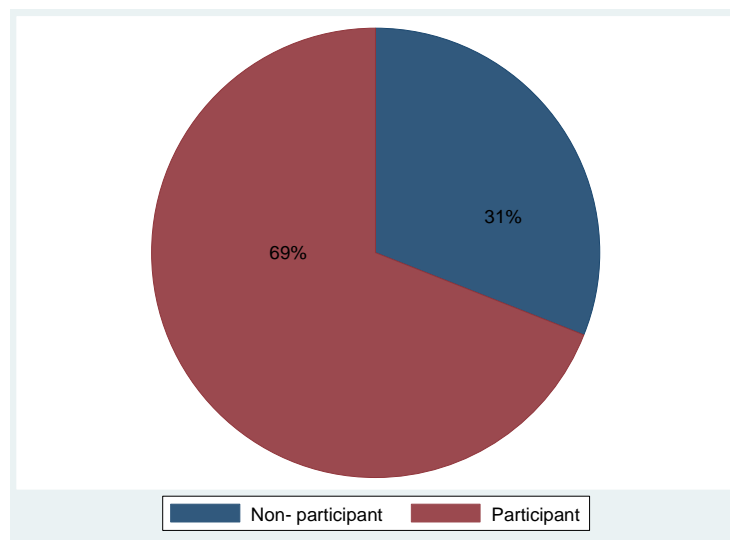
Variables	Description and measurement	Nature	Expected Sign
HHLPA&	1, if the household participates in Off-farm activities, 0 otherwise	Dummy,	Not applicable
Offincome	Amount of Off-farm income	Continuous	
Sex	1, if the household head is male, 0 otherwise	Dummy	+
Age	Age of household head in the year	Continuous	-
Literacy	1, if the head can read and write, 0 if otherwise	Dummy	+
Edu1	1, if the household has a primary school completed member, 0 if otherwise	Dummy	+
Edu2	1, if the household has a secondary school completed member, 0 otherwise	Dummy	+
Farm size	Number of family size	Continuous	+
Adult	Number of people whose age from 16 to 65 and not attending school	Continuous	+
Land size	Size of arable land in hectares	Continuous	-
Lanfrlty	1, if households land is rich in fertility, 0 otherwise	Dummy	-
Livestock	Number of total livestock owned by respondents in TLU	Continuous	+
Drfta	1, if the household has draft animals for transportation, 0 if otherwise	Dummy	+
Finance	1, if the farming household has access to finance, 0 otherwise	Dummy	+
Distance	Time spent by households to reach a major market	Continuous	-
Training	1, if the household head has access to training, 0 otherwise	Dummy	+
Agrishock	1, if there is an Agricultural shock, otherwise 0.	Dummy	+

CHAPTER FOUR

RESULT AND DISCUSSION

4.1 Measuring the Off-farm participation Status of the Households

As already reviewed in the literature review part of this paper, there is a different definition of Off-farm employment which is defined by different scholars. However, the overall basic principles and definitions of Off-farm, that is, “a broader concept than non-farm and mostly related with activities apart of own farm against payment in cash or in-kind”. Following this definition, from the total 323 sample households, only 100 households were found to not participate in Off-farm employment while the remaining 223 participate in Off-farm employment. In other cases, 69 percent of the households were participating in a different kind of Off-farm employment and the remaining or 31 percent were not participating in Off-farm employment.



Source: From own Survey data, 2021

Figure 4. 1 Off-farm participation status of the districts’ households.

4.2 Comparison of participant and non-participant households using continuous explanatory variables

The study employed an independent t-test for continuous variables to make a comparison/make sure the presence or absence of difference between the Off-farm participant and non-participant households. The mean values of continuous variables in the two categories were compared using an independent t-test. Table 4.1 shows, the mean differences between the participants and non-participants in the study area, which were significant, differ in age of household head, family size, laborers of family, land size, total livestock unit, and distance to the major market center.

Table 4. 1 Descriptive statistics of sample households for continuous variables

Continuous variables	Respondent (N=323)		Non-participant (N=100)		Participant (N=223)		Mean d/ce & t-value	
	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev	Meand/ce	t-value
Age	46.55	9.3522	52.51	9.410	43.87	8.011	8.636	8.474***
Famsize	6.57	2.263	4.96	1.979	7.30	1.996	-2.336	-9.749***
Adult	3.71	1.653	2.58	1.451	4.22	1.480	-1.640	-9.262***
Lansize	1.551	1.01927	2.1350	1.27000	1.2892	.75178	.84576	7.456***
Livestock	6.86	3.6456	4.2307	2.79948	8.0400	3.11639	-3.80933	-10.473***
Distance	1.842	.92093	2.2435	.80034	1.6625	.91624	.58103	5.473***

Source: Computed from own survey, 2021. *** Significant at 1% probability level.

The results from table 4.1 showed that the average age of the respondents is 46.55 years. It also found the mean age of participant households (43.87 years) which is less than the non-participant households (52.51 years). An independent sample t-test was conducted to compare the difference in mean age between participant and non-participant sample respondents which was statistically significant at 1% probability level ($t = 8.474$). The significance means the difference of the computed household head's age between the two groups revealed the presence of a statistically significant difference in average age between participants and non-participants. On average, participant households were younger than the non-participants.

The mean family size of the Jimma Arjo sample households was found to be 6.57. The average family size for participant and non-participant households was 7.3 and 4.96 respectively. The analysis ($t = -9.749$) also shows that the mean difference between participant and non-participant households in Off-farm employment concerning family size is found to be statistically significant at less than a 1% probability level. This revealed that participant households had larger family sizes than non-participants.

Moreover, in the Jimma Arjo district, the overall average family labor of the respondents was 3.71. The mean family labor of the participant and non-participant farmers amounts, 4.22 and 2.58 respectively. An independent sample t-test was employed to compare the mean difference between the participant and non-participant households on Off-farm employment and the result shows statistically significant at a 1% probability level ($t = -9.262$). The significance means the difference of the computed family labor between the two groups implies that the participant has more family labor (member of family aged between 15 and 65 years and not attending school) than the non-participant households.

The land is a base for any economic activity, especially in the rural and agricultural sectors. In the study area, the average land size owned by non-participant and participant households was 2.1350 and 1.2892 hectares respectively. The overall average land size of the respondents was 1.5511 hector. The result of the t-value depicted that the mean difference between the two sample groups about the size of cultivated landholding was statistically significant at a 1% significance level. This indicates that the average land size of non-participant households was higher than that of participants.

In the Jimma Arjo district, farmers undertake mixed farming where livestock rearing is one of the important components. To indicate the livestock holding, conversion factors to estimate the Tropical Livestock Unit was calculated (see appendix 1.1). The average livestock population held by the sample household was 6.8607 in TLU. The mean number of livestock owned by non-participant and participant households were 4.2307 and 8.0400 TLU, respectively. The mean

difference between the participant and non-participant groups regarding the size of livestock was statistically significant at a 1% level of significance.

The mean time it takes to reach the main market for the sample households is 1.8424 hours. The mean time it takes to the nearest market for participant households was less than the meantime it took for non-participant households. To reach the nearest major market (town market) from an individual's residence on average, it takes 1.6625 hours for participants and 2.2435 hours for non-participants respectively. This revealed that non-participant households are located in remote areas or far from a town than the participant households.

In general table 4.1 shows, the mean differences between the participant and non-participant households significantly differed in the age of household head, total family size, number of workers(adults) in family, size of owned land, total livestock, and distance to the nearest main market. On average, participant households have a smaller size of the land but a larger number of total livestock as well as a larger laborer and family size than the non-participant households. Compared to non-participants, participant households are youngsters and living nearer to the marketplace. All the variables described are statistically significant at ($p < 0.01$) between participant and non-participant households.

4.3 Comparison of participant and non-participant households using discrete explanatory variables

The study employed a chi-square test for discrete variables to make a comparison/make sure the presence or absence of difference between the Off-farm participant and non-participant households. As indicated in table 4.2, out of the total sample under consideration, concerning the gender of household heads, male-headed households accounted for 90.4% and the remaining 9.6% of households were headed by females. The result also shows that from the participant households 94.62% were male-headed households and 5.38% were female-headed households. On the other hand, 81% of non-participant households were male-headed households, whereas 19% of non-participant households were female-headed. The chi-square test (14.759) portrays the existence of a statistically significant difference between the two groups of households

concerning the sex of household head at a 1% probability level. This implies that males more highly participated in Off-farm activities than females in the Jimma Arjo district.

Table 4. 2 Descriptive statistics of sample households for discrete variables

Variables	Response	Non-participant		Participant		Chi-square value
		Frequency	Percent	Frequency	percent	
Sex	Female	19	19	12	5.38	14.759***
	Male	81	81	211	94.62	
Literacy	Can't read& write	82	82	148	66.37	8.229**
	Can read& write	18	18	75	33.63	
Primary educ.	Not completed	77	77	144	64.57	4.934**
	Completed	23	23	79	35.43	
Secondary edu.	Not completed	98	98	212	95.07	1.537
	Completed	2	2	11	4.93	
Draft animals	Have not	61	61	47	20.08	49.443***
	Have	39	39	176	78.92	
Finance	Not access to credit	85	85	50	22.42	111.139***
	Access to credit	15	15	173	77.58	
Land quality	Not fertile	33	33	63	28.25	0.745
	Fertile	67	67	160	71.75	
Training	Not access	59	59	175	78.48	13.118***
	Access to training	41	41	48	21.58	
Agricultural shock	Not facing	76	76	69	30.94	56.659***
	Facing	24	24	154	69.06	

***, ** significant at 1%, and 5% significant level respectively. Source: Computed from own survey data, (2021)

Education level of household: Table 4.3 describes that out of the total sample households 71.2% were unable to read and write and 28.8 were able to read and write. From non-participants, only 18% of the sample households were able to read and write, while from participants 33.63% were able to read and write. The chi-square ($\chi^2= 8.229$) shows that there is a statistically significant difference between participant and non-participant group at 1% probability level in terms of ability to read and write. Regarding primary education, from total sample households, 31.6% of respondents were having at least one member who has completed primary education while 68.4% were haven't any member who complete primary education, and 23% of non-participants and 35.43% of the participants have at least one member who has completed primary school

education level, and the $\chi^2 = 4.934$ shows that there is a statistically significant difference between the participant and non-participant group at less than 5% probability level in terms of having a member who has completed primary level of education. This indicates that the proportion of educated respondents were greater in Off-farm participant households than that of non-participants. Besides, from the total sample household, only 4% of households were having at least one member who has completed secondary level of education, and 4.93% of the participants and 2% of the non-participants have a member who acquired secondary level of education. This shows that few households were having a member who completes a secondary level of education and living in the rural area of the Jimma Arjo district.

Draft animals are pack animals such as donkeys, horses, and mules which are used for transporting loads and human beings. So, they are used in trading activities which are an important source of income for farmers in the study area. From the sample households, 39% of the non-participants and 78.92% of the participants have draft animals while 61% of the non-participants and 21.08% of the participants haven't draft animals for transportation purposes. The chi-square result ($\chi^2=49.443$) shows that there is a statistically significant difference between participant and non-participant farmers at a 1 percent probability level in terms of having draft animals. This indicates that farmers-owned draft animals have a high probability of participation in Off-farm employment.

Lack of finance is one of the barriers to participating in Off-farm activities. Access to finance refers to the provision of credit for farm households. Access to finance can relax farmers' financial constraints to do things in a way they consider paying. The distribution of total sample respondents in terms of access to finance showed that 85% of non-participant farmers hadn't access to financial services while only 24.42% of participant farmers didn't have financial accessibility. In other words, only 15% of households had access to finance from the non-participant, but 77.58 participant households had access to finance. This implies that the participant households have more access to finance than non-participants. The result of $\chi^2=111.139$ shows that there is a statistically significant difference between the two groups in terms of access to finance. It shows that the participation decision in Off-farm employment can

be determined by access to finance since household with access to finance has a high probability to be a participant in Off-farm employment.

In addition to land size, quality of land is an important attribute of productivity and is one of the factors influencing farm households to participate in Off-farm employment. The sample respondents were asked about the soil fertility of their land. From the total participants, 28.25 % of them reported that their land is poor in soil fertility, and the remaining 71.75% reported the opposite. Similarly, the majority of non-participants (67%) reported that their land is fertile and the remaining 33% of them reported as their land is poor in soil fertility. This revealed that farmers who owned fertile land have less probability of participation in Off-farm employment.

The descriptive result showed that access to training is also statistically significant at a 1% significant level with the $\chi^2= 13.118$. The test revealed that there was a significant difference between participant and non-participant households in terms of access to training. Meaning that households who have access to training are more likely to participate in Off-farm activities than the households who have not accessed training.

Agricultural shock is one of the economic variables hypothesized to influence rural households' participation in Off-farm employment. It is composed of variables showing a reduction in agricultural output due to unavailability of oxen, fertilizer, and shocks like crops suffered from livestock eating, pests and damage due to weed infestation). From the participant households, 69.06% of them faced this problem, and only 30.94% of participants were didn't face the problem of agricultural shock. From the non-participant respondents, 76% of them didn't suffer from this shock, but 34% of them have been facing the problem of agricultural shock. The chi-square analysis portrays the existence of statistically significant differences between the two groups at a 1 percent probability level ($\chi^2= 56.659$). This shows that farmers who face the problem of agricultural shock are more likely to participate in Off-farm employment.

4.4 Sample household participation in on-farm and Off-farm employment

Table 4.3 shows the proportion of rural households; participating in on-farm only, Off-farm, and on-farm livelihood strategies in three selected villages. Of the total respondents, 69% participate in Off-farm activities and the remaining 31% were non-participant households. The majority of non-participants in Off-farm employment were from Meta village (41.4%) followed by Wayu Kumba (27.1%) and Hara Keku (21.2%) in comparison of villages. Inversely, among the Off-farm participant households in each of the selected villages, Hara Keku was the highest (78.8%) followed Wayu Kumba (72.9%) and Meta (58.6%). From this result, in Hara Keku village there would be more push and pull factors that make households participate in Off-farm employment than in others farm villages.

Table 4. 3 Sample household participation in on-farm and Off-farm employment in selected village of Jimma Arjo district.

Activity	Villages						Total	Percent
	Wayu Kumba		Meta		Hara keku			
	Frequency	Percent	Frequency	Percent	Frequency	Percent		
On-farm	26	27.1	53	41.4	21	21.2	100	31
On&off farm	70	72.9	75	58.6	78	78.8	223	69
Total	96	100	128	100	99	100	323	100

Source: computed from own survey data, (2021)

4.5 Types of Off-farm Activities in the Jimma Arjo district

In the study area, farm households were engaged in different types of activities that are practiced for the fulfillment of the livelihoods of farm households. Off-farm activities are among the major activities that supplement farm income. The table below summarizes types of Off-farm activities mostly practiced in the study area. As shown in the table, households have been participating in two categories of Off-farm activities, namely self-employment and wage employment.

Table 4. 4 Activities of Off-farm employment in the Jimma Arjo district

Self and wage employment activities	Frequency	Percent	Cumulative percent
Sale of local food and drinks	17	7.62	7.62
Local trading	49	21.97	29.59
Selling firewood or charcoal	11	4.92	34.519
Handicraft and weaving	13	5.82	40.339
Carpentry and forest products	5	2.24	42.579
Animal drawn carts	6	2.69	45.269
Animal Fattening	21	9.41	54.687
Milling and tailoring	6	2.69	57.377
hair dressing	7	3.139	60.516
Shopkeeper	5	2.24	62.756
More than one activities	10	4.48	67.26
Subtotal self-employment activities	150	67.26	67.26
Causal agricultural	4	1.79	1.79
Religious worker	6	2.69	4.48
Government organization	15	6.73	11.21
Daily wage work	16	7.17	18.38
Food- for-work	3	1.345	19.725
Work for trader (private sector)	12	5.38	25.11
Subtotal wage employment activities	56	25.11	25.11
Both in self and wage employment	17	7.62	7.62
Grand Total	223	100	100

Source: computed from own survey data, (2021)

As the above table indicates, from the participant households about 67.26% of the sample households reported that they participated in different self-employment activities while 25.11% of participant households were participating in Off-farm wage employment. However, 7.63% of households have a member participating in both self and wage employment. Since participation in the Off-farm activity is dependent on family labor, which is also used for on-farm activities, the complementary nature of Off-farm employment to farm employment is likely to depend on agricultural conditions. In the face of acute weather variability, Off-farm activities could become attractive adaptation options to agricultural activities. This indicates why the majority of respondents participate in self-employment Off-farm activities since wage/salary employment cannot be available when farm households want to work in slack seasons. As shown in Table 4.4, the most common types of Off-farm self-employment, in terms of participation in local trade (21.97%) followed by animal fattening (9.418%), Sale of local food and drinks (7.62%), Handicraft and weaving (5.82%), Selling firewood, or charcoal for sale (4.92%), More than one activities(4.48), hairdressing (3.139%) and the others constitute the remaining.

Similarly, the major types of wage-employment include daily wage work (7.17%), government organization (6.73%), individual trader (5.38%), religious worker (2.69), casual agricultural (1.79%), and food-for-work (1.345%). From this result, most commonly practiced Off-farm in the Jimma Arjo district are; local trade, animal fattening, and sale of local food, drinks from self-employment, participating in different activities of both self and wage- employment (farmers with large family size send their member to both self and wage-employment activities at the same time), and daily wage work, government organization and work for the individual trader.

4.5.1 The Patterns of household’s participation in Off-farm activities

Table 4. 5 patterns of households’ participation in Off-farm employment

Patterns of Off-farm employment in the district	Frequency	Percent
Temporarily/causally	36	16.1
Seasonally/as a par time activity	89	39.91
Permanently	98	43.9
Total	223	100

Source; computed from own survey data, 2021)

The pattern of participation in Off-farm activity shows, how often households are participating in any type of Off-farm employment. Table 4.5, portrays the distribution of the Off-farm participant households concerning their patterns of participation in Off-farm employment. From 223 participant farm households, 16.1% were temporarily participating in Off-farm employment due to the unavailability of Off-farm jobs around their residence while the majority of households (43.9%) were participating in Off-farm activities constantly or permanently. This is due to limited farmland to give job opportunities for family labor as it was reported by most permanently participant farm households. However 39.91% of households were participating in Off-farm employment depending on the season or as par time activities, the reason for choosing this pattern of participation is seasonality of agriculture because they were busy on the farm during peak season. This indicates that the majority of seasonally participant households participate in Off-farm employment during the off-season, which means that before and after their farming activity.

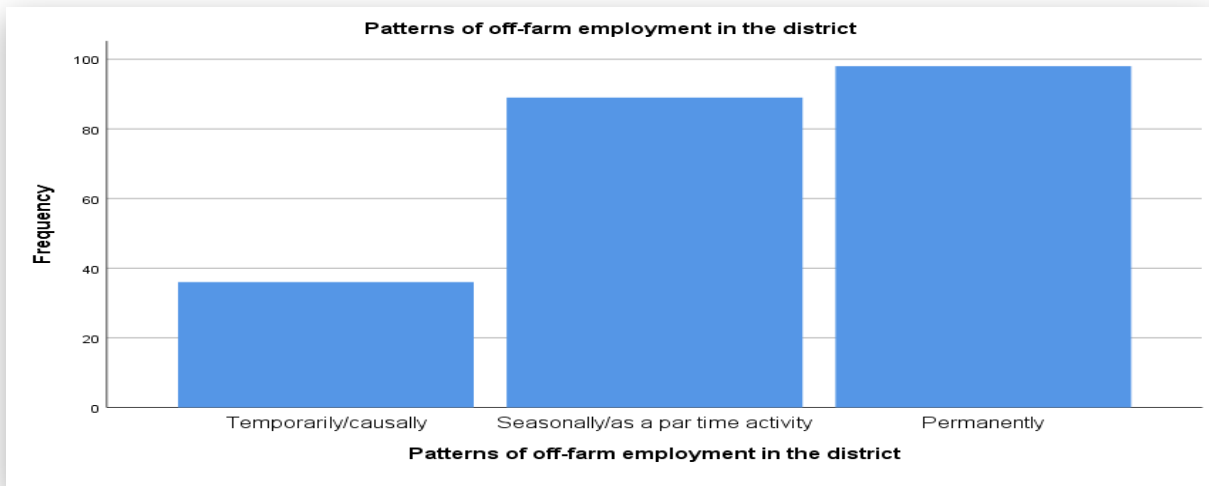


Figure 4. 2 Patterns of Off-farm employment activities in the Jimma Arjo district

4.6 The contribution of Off-farm employment in the Jimma Arjo district.

Respondents were asked about the main benefits of Off-farm employment and they were listed as they got the following advantages like additional employment, learn new skills, increase purchasing power/relaxation of financial constraint, better health, better health, educating children, and better housing. The interview has also revealed that Off-farm activity is an important part of livelihood diversification. Off-farm employs individuals who would otherwise be unemployed, and it can provide additional employment for those whose main employment is not full-time and/or does not provide an income sufficient to bring the household out of poverty.

Interviews also gave knowledge they have about Off-farm activities; as these activities can provide employment, main or supplementary for many youths as well as for small farm households in rural areas of the district. It can provide one important route out of agricultural work and generally provide a higher standard of living than enjoyed by those dependent on agricultural employment alone. However, it is important not to see them in isolation from agricultural employment. In rural areas, agricultural and Off-farm employment are linked through production and consumption. Both are part of livelihood strategies at both the individual and the household levels in rural areas. Moreover, evidence from the interview stated that the Off-farm economy can make a major contribution to the incomes and welfare of rural

households, thereby pulling rural households out of poverty. The sector contributes considerably not only to rural development and reducing rural poverty, but also it can help transform an agrarian rural economy into one that is more diversified in rural areas, and increasingly integrated with the urban economy.

4.7 Major Pushing and Pulling factors for participating in Off-farm activities

Farm households were asked why they participated in Off-farm activities. One of the key reasons for participating in Off-farm activities was limited agricultural income. This supports the view that farm and Off-farm incomes are complements for households with limited access to other resources like assets and credit. Depending on their response concerning participation in Off-farm activities, there are two major factors: these are push and pull factors.

Table 4. 6 Reasons for participating in Off-farm activities

Push and Pull factors	Frequency	Percent
Low farm labor productivity& limited farm income	41	18.38
Insufficient access to land and low land productivity	33	14.79
Lack of self-financing capability	19	8.5
Large family size with many dependent members	38	17
To support livelihood	27	12
Large family size with many adult members	29	13
Seasonal nature of agricultural labor	11	4.9
Sub-total of push factors	188	84.3
Proximity to urban area	9	4
Off-farm work is more rewarding than farm work	4	1.8
The wage differential between the two sectors	6	2.575
The riskiness of each type of employment	10	4.484
Availability of Off-farm work opportunities	6	2.575
Sub-total of pull factors	35	15.7
Total	223	100

Source: computed from own survey data, (2021)

The majority of rural households (84.3%) of participants are pushed to Off-farm activities to meet their needs and offset income shortfalls, 18.38% of them were forced to participate in Off-farm employment due to low farm labor productivity and limited farm income followed by large family size with many dependent members (17%), insufficient access to land and low land

productivity (14.79%), large family size with many adult members (13%), to support livelihood (12%), lack of self-financing capability (8.5%) and seasonal nature of agricultural labor (4.9%). The remaining households, mean 15.7% make a positive choice to take advantage of opportunities in the rural Off-farm economy. Proximity to the urban area, considering the risk of each type of employment followed by availability of Off-farm work opportunities, the wage differential between the two sectors, and consideration Off-farm work is more rewarding than farmworkers are among the factors pulling households to participate in off-employment.

This portrayed that most of the sample households were participating in Off-farm activities mainly to supplement their agricultural income since production and productivity of the agricultural sector is low and farm household income is not sufficient even to feed their families. Excess labor in the family and the seasonality of agriculture are also factors responsible for farmers to participate in Off-farm activities.

The interview was also undertaken to collect information concerning factors enforcing farm households to participate in Off-farm employment and it shows various risks like animal disease, shortage of grazing land for animals, low fertility of the soil, high population growth as a major reason for farm households to participate in Off-farm employment. This implies that most rural households choose Off-farm activities as a result of push factors which mainly target reducing the risks associated with agriculture to smooth consumption during a period of low agricultural production or to reduce vulnerability to shocks.

4.8 Challenges to participate in Off-farm employment

Non-participant farm households were asked why they do not participate in Off-farm activities. One of the key reasons for not participating is poor infrastructure such as road, telecommunication, electricity, and transport problem. Although there are many challenges, depending on their response the following Table 4.7 indicates the major challenges that hinder them to participate in Off-farm activities

Table 4. 7 Challenges of participation in Off-farm employment

Challenges	Frequency	Percent	Cumulative Percent
Lack of access to credit	16	16.2	16.2
Poor infrastructures	26	26.3	42.4
Lack of capital/assets	10	10.1	52.5
Lack of access to markets	21	21.2	73.7
Lack of job opportunity	18	18.2	91.9
Lack of coordination& time	8	8.1	100.0
Total	100	100.0	

Source: computed from own survey data, (2021)

Farmers in the Jimma Arjo district have been facing numerous constraints. The above table shows the key reasons of non-participant respondents why they did not participate in Off-farm activities. As it is shown in table 4.8, non-participant households were forced not to undertake Off-farm activities typically due to infrastructural problems (26.3%) followed by lack of access to markets (21.2%). Besides, lack of job opportunity (18.2%), lack of access to credit (16.2), lack of capital/assets (10.1%), and lack of coordination & time (8.1%), were appeared to be obstacles to rural households' for participating in Off-farm employment in the Jimma Arjo district.

4.9 An Econometric Estimation Results

In this sub-section, Heckman's two-stage selection analyses are executed to identify the individual and family-level characteristics, household assets, infrastructural, institutional, and shock factors that determine the decision of smallholder farmers to participate or not to participate in the Off-farm employment, in the first stage by applying probit regression. In the second stage, the conditional estimation/OLS method was used to investigate factors that influence the level of their Off-farm earning. However, before running the regression analysis, the diagnostic tests, such as the existence of multicollinearity and the problem of heteroscedasticity of variables included in the model are needed to be checked both for the continuous and discrete explanatory variables. The higher the value of VIF, the more

“troublesome” or col-linear the variable X_i is. As a rule of thumb, if the VIF of a variable surpasses 10, there is multicollinearity (Gujarati, 1995). In this study, all the computed values of VIF for explanatory was below two. Hence, there is no evidence of a multicollinearity problem in the model. The data were tested for heteroscedasticity using the Breusch-Pagan test. The Breusch-Pagan test evaluates the null hypothesis of constant variance in the data (Wooldridge, 2015). The Chi-square value results of Stata output were presented in an appendix 1.6. Accordingly, the null hypothesis of a constant variance was not rejected implying the absence of heteroscedasticity in survey data.

All the screened variables, therefore, were decided to be included in the model analysis. The dependent variable is the determinants of farmers’ participation in Off-farm employment and Heckman's two-stage models were employed to estimate the effects of the hypothesized independent variables on farmers’ Off-farm participation and amount of earning. In doing so a total of fifteen independent variables were included in the model. These are; sex of household head, age of household head, education level of household head, family size, laborers in family, land size, farm fertility, total livestock unit, having transportation animals, access to finance, agricultural shock, time spent to reach main markets, and access to training. The included variables were selected, based on literature, observation, and the relevance of the variables. Furthermore, they were selected by testing significant differences of the mean using t-test and χ^2 -test.

4.9.1 Factors determining smallholder farmer’s Off-farm participation

Table 4.9 shows the probit regression and marginal effect of probit outcomes of factors that influence the likelihood of smallholder farm participation in Off-farm employment. The model constructed with 15 independent variables and out of these 12 variables are significantly determining Off-farm employment participation. These variables include the age of household head, sex of household head, family size, household labor (adult), land size in hectares, fertility of household’s land, Literacy (able to read and write), education level of a household member or having a member who completes primary education, livestock (in TLU), access to finance, Agricultural shock and time spent to reach the main market were significant determinants of Off-

farm employment choice up to 10% level of significance. However, the rest variables were insignificant.

Table 4. 8 Determinants of participation in Off-farm activities: Parametric and Marginal effect of Heckman's 1st stage estimation

Dependent variable: Off-farm emp.t 1 =Participant and 0 = Non- participant	Log likelihood = -66.42446, Number of obs = 323, LR chi2 (15) = 266.88, Prob > chi2 = 0.0000 Pseudo R ² = 0.6677				
	Parametric Estimation			Marginal effect Estimation	
Explanatory variables	Coefficient	Z	P> z	Marginal effect	Std. Err
Age (Age of the HH head in year)	-.0355121	-2.36	0.018	-.0077175**	.0035
Sex (Sex of household head)	1.149959	3.12	0.002	.3623885***	.13562
Literacy (Able to read& write)	.6750089	2.10	0.036	.1252502**	.05342
Edu1 (Primary education)	.5237048	1.58	0.114	.102351*	.06015
Edu2 (Secondary education)	.4756825	0.70	0.483	.0798613	.0856
Famsize (Total family size)	.1633356	2.45	0.014	.0354964**	.015
Adult (Number of family labor)	.1669446	1.78	0.047	.0362807**	.02079
Lansize (Owned farm size in ha)	-.5735554	-3.90	0.000	-.1246461***	.03798
Lanftrly (Quality of land)	-.7268514	-2.53	0.011	-.1343908**	.05439
Livestock (In TLUs)	.1228273	2.43	0.015	.026693**	.01038
Drfta (Animal used for transport)	.3357365	1.03	0.305	.0774886	.08274
Finance (Access to finance)	.8357717	3.16	0.002	.1957108***	.06936
Agrishocks (Shocks in agriculture)	.7250159	2.67	0.008	.1644397**	.06693
Training (Access to training)	-.2139113	-0.79	0.427	-.0489679	.06419
Distance (Time to reach town)	-.2395084	-3.52	0.000	-.1284318***	.03527
Constant	.2395084	0.22	0.220	-----	-----

Source: Stata result, (2021); ***, ** and* represent significant at less than 1%, 5%, and 10% probability level, respectively

4.9.2 Interpretation of Heckman's 1st stage estimation results

All significant variables were found to be statistically significant with expected signs. Accordingly, age of household head (Age), owned farm size (Lansize), soil fertility of household's land (Lanftrly), time spent to reach the main market (Distance) was negatively and significantly related with farmer's participation. Sex of household head (Sex), Literacy, Primary level of education (Edu1), Family size (Famsize), household labor (Adult), access to finance (finance), and Agricultural shock (Agrishocks) were positively and significantly related to Off-farm employment participation as they were expected previously. To the contrary of the

hypothesis, owning transportation animals (Drfta), training, and secondary level of education (Edu2) were not significantly related to farm household's Off-farm participation.

Age of household head (Age): With regards to individual characteristics, age has a significant effect on the participation decision of Off-farm employment. The probability of participation in Off-farm employment significantly decreases with the age of the household head at a 5% probability level. The marginal effect for age implies that as the age of the household head increases from its mean value 46.55 to 47.55 years, the probability of participation in Off-farm employment would decrease by 0.77%, while other variables are constant at their mean. The negative association indicates the preference of the younger households for Off-farm employment. Households' heads with one more year of age are more likely to refrain from joining the Off-farm jobs compared to their younger neighbors. This result is consistent with other findings such as (Demeke & Zeller, 2012; Fentie & Rao, 2016; Kassa, 2019)

Sex of household head (Sex): Sex of household head had a positive effect on households' participation in Off-farm employment and it was statistically significant at a 1% significance level. The value of the marginal effect indicates that male-headed households are more likely to participate in Off-farm employment than the female-headed counterparts by 36%, holding other variables constant. This is due to gender-based favoritism widely exists in rural areas, where girls have a larger burden of housework and are often discouraged to work outside of the home. This result is also in agreement with other findings. For instance (Bezabih et al., 2010; Fentie & Rao, 2016; Weldegebriel, 2017; Kassa, 2019)

Education level of household head and member (Literacy and Edu1): Educational status of the household head is one of the important determinants of Off-farm participation in study villages. The result presented the education level of the household head had a positive effect on the probability of participation in Off-farm employment. But the significant level was different with different levels of education. Here, from the education category, illiterate was taken as the base category. Able to read and write (Literacy) and primary education are found to be significant at 5% and 10% levels respectively. The result for the marginal effect shows, farm household head,

who able to read and write (through informal education and religion organization) and primary education has 12.5% and 10% more probability of participation in Off-farm employment respectively than the illiterate counterparts, keeping other regressors at their mean.

The outcome portrays that, households with informal and primary education have a significantly higher probability of participation in Off-farm employment than illiterate households. This proves that educated households have a greater probability of participating in local Off-farm activities than uneducated households. However, secondary education (Edu2) is insignificant to affect farmer's choice of Off-farm employment. This portrays, non-existence of the relationship between Off-farm employment and above primary education in the Jimma Arjo district, this would be because most rural Off-farm activities in Ethiopia are very labor-intensive and do not require a higher education level to participate in it. However, it is to be noted that a household that attended or have a member who attended at least primary education has a superior opportunity in participating in Off-farm employment especially in wage works. This result is in agreement with other empirical findings such as (Beyene, 2008; Woinishet, 2010)

Family size (Famsize): As economic theory predicts; family size is found to have a positive and significant relation with local Off-farm activities at less than 5% probability level in the study area. Accordingly, the marginal effect shows that by holding other independent variables at their mean, an increase of family size from the mean value of 6.57 to 7.57 would increase the probability of participating in Off-farm employment by 3.549%. The possible explanation from this result is large family size has relatively higher consumption needs, supporting the notion that participation in Off-farm activities could be a strategy that enables household heads to increase the financial capacity to sustain family basic needs. This is consistent with other findings, for instance (Yesuf, 2015; Fentie & Rao, 2016; Bekele et al., 2019; Kassa, 2019)

Family labor (Adult): The presence of more adult family members is found to be significant at less than 5% probability level. It increases the probability of participation in Off-farm employment. On average; as the number of adults in the family increase from 3.71 to 4.71, the probability of participating in Off-farm employment increases by 3.6%. Having a greater labor force, gives the household, the flexibility to distribute work between the farms and Off-farm

employment, and therefore have a higher capacity of participation in Off-farm employment. Indeed, households with an extra labor force would have extra hands available to generate income from sources in addition to their farm, including collecting and sale of firewood, wage employment on others' farms, small trade, handcrafts, and others. This result is in agreement with other empirical findings for example, (Yesuf, 2015; Bekele, 2016; Weldegebriel, 2017).

Size of farmland (Lansize): Land is an essential resource for agriculture, and therefore, households having larger landholdings can generate better income from agriculture than those with smaller landholdings. The result of the binary probit regression model shows that; the size of farmland was statistically and negatively significant at a 1% probability level with Off-farm employment participation of rural farm households. The marginal effect shows that the respondents who have one-hectare greater land size than their neighbor counterparts have a lower probability of participation in Off-farm employment by 12.46% keeping other independent variables at their mean. This indicates that farm households who have small and fragmented land tend to participate in Off-farm activities. This means as the land size gets smaller, farm households should be forced to participate in Off-farm activities to generate additional income. In other words, households with greater land size are less likely to participate in Off-farm employment as they get busy with farm activities. This indicates that the Off-farm sector is not as attractive or eye-catching as agriculture for those who have superior potential in agriculture. This result is consistent with other findings, but (Zewdie and Sivakumar, 2017) found that the size of farmland has a direct relation with off-employment participation in the Shebedino district of Sidama Zone.

Land fertility (Lanferty): Similarly, in addition to the household's farm size; the quality of that land is one of the variables expected to affect farm household participation in Off-farm employment. As it was hypothesized this variable is negatively and significantly influencing the choice of Off-farm employment at less than 5% significance level. Marginal effect indicates that keeping the influence of other variables constant, households owned richly fertile land are less likely to participate in Off-farm activities by 13.4% than household holding poorly fertile land. This indicates that households with better agricultural resources do not have the incentive to go

for Off-farm activities. Other findings are also in agreement with this result, for instance (Abebe & Hess, 2014; Yesuf, 2015; Bekele, 2016; Kassa, 2019)

Livestock (TLU): Livestock holding is positively influenced the household's choice of participating in local Off-farm activities at less than 5% probability level. The marginal effect shows that an addition of one TLU (which is equivalent to one cow and three sheep/goats) to the existing stock of a typical household would increase the probability of participation by 2.67% keeping all other variables at their mean value. This indicates the farmer with higher livestock holding would have a higher probability to diversify livelihoods into local Off-farm employment, since having more livestock will increase the possibility to get initial capital to start Off-farm self-employment. Many farmers in the Jimma Arjo district, especially in the low land area buy livestock during the off-season to fatten and get profit until the harvest season. This result is not in agreement with some other results, for example (Bekele, 2016; Eshetu & Mekonnen, 2016) found that as the size of livestock holding increases, the probability of participation in Off-farm activities would decline. Bekele (2016) found that livestock has a substitution effect on Off-farm employment. However, Yesuf (2015) found a positive association between Off-farm employment and livestock holding.

Access to finance (Finance): As hypothesized this variable was positively and significantly influencing the probability of participating in Off-farm employment at a 1% probability level. Keeping the influence of other variables constant, the probability of credit user households' participation in Off-farm employment would increase by 19.57%. This implies that households who have access to finance are more likely to participate in Off-farm employment. On the other hand, households who haven't access to finance are less likely to participate in Off-farm employment. The possible reason would be financing enables the rural households to start Off-farm self-employment. This result is consistent with other findings such as (Woinishet, 2010; Yesuf, 2015; Bekele, 2016; Asfaw et al., 2017; Zewdie & Sivakumar, 2017).

Agricultural shock (Agrishocks): Shocks in agriculture also found to influence the Off-farm participation of farmers positively and significantly at a 1% probability level. It portrays that households who suffered from Agricultural shock are more likely to participate in Off-farm

activities than those households that do not suffer from this problem. This means that those households have low agricultural production due to the unavailability of oxen, unable to buy fertilizer, and their crops are damaged by pests, livestock eating and feed infestation are more probable participating in Off-farm activities than the households who didn't suffer from these problems. Additionally, the marginal effect shows that the probability of participation in Off-farm employment by households who face Agricultural shock would increase by 16% than their counterparts, holding other variables constant. Many researchers hadn't include this variable in their inferential analysis, but some (Bezabih et al., 2010; Woinishet, 2010; Demeke & Zeller, 2012) were focused on the covariate shocks especially on the weather as such as wind, the occurrence of flooding, storm and low temperature(frost) as the determinant factor of Off-farm employment. However, the impact of these shocks is different from place to place depending on the climatic condition of the specific area.

Distance: As hypothesized, distance to the nearest market was found to be negatively and significantly influenced the probability of participation in Off-farm employment at less than 1% significance level. The marginal effect shows that, by holding other independent variables constant, an increment of time spent to reach the major market from the mean value of 1.8424 to 2.8424 hours would reduce the probability of participating in Off-farm employment by 12.8%. This justifies that markets serve as an important source of Off-farm employment opportunities and information that promotes their participation decision. Those farmers living near the market center can easily access information and have a higher opportunity to participate in various Off-farm activities to increase their income and improve their livelihood than the households far from the market center. This result is consistent with other findings, for instance (Woinishet, 2010; Eshetu & Mekonnen, 2016; Zewdie & Sivakumar, 2017; Adugna, 2017)

4.9.3 Determinants of the amount of Off-farm earning

In this section, the researcher analyzes the determinants of income from Off-farm wage work and self-employment sources. The advantage of this separation study is to make it understandable why some households are better able to arise income from specific Off-farm activities than others. It responses also the question do variables that influence Off-farm employment

participation can also influence the analogous level of revenue from them?. Since many households do not arise income from Off-farm wage and Off-farm self-employment activities, Off-farm employment income is not observed for the non-participant. Hence if we apply OLS using data from the participant samples only we may get biased and inconsistent results. For this reason, Heckman's two-step selection model was applied to estimate the income equations, because the Heckman model helps to consider observations that have missed data. Heckman's model has also been used by other authors in similar contexts, for instance (Woinishet, 2010; Adugna, 2017). These scholars used panel data from Ethiopian Rural Household Survey (ERSH) for analysis purposes. However, Heckman's second stage estimation does not account for the panel nature of the data; it only estimates the selection equation with additional information variable from the participation equation using OLS (Adugna, 2017). Again as this scholar, another way to take advantage of the information hidden in the data for the non-participants and also to use the panel nature of the data is to employ the panel-Tobit estimation technique. Thus, Heckman's two-step estimate is very appropriate for cross-sectional data to estimate the amount earning from Off-farm activities, hence it allows us to use information from non-participating households to improve the estimates of the parameters in the Off-farm income regression model.

Accordingly, the estimate for mills lambda for the Off-farm income is, $\lambda=0.146$, given at the bottom of table 4.9 is statistically significant at less than 10% significant level (with, $p= 0.063$). This indicates the existence of selection bias and rho or $\mu = 0.65$, is the correlation of the residuals in the two equations. When $\mu = 0$, OLS regression provides unbiased estimates, when $\mu \neq 0$ the OLS estimates are biased. Hence, applying the ordinary least square (OLS) method without correcting for selection bias can give us biased and inconsistent coefficients.

Table 4. 9 Determinants of Off-farm income or intensity of Off-farm activities: Heckman 2nd stage OLS estimation results

The dependent variable is LnOffincome (Natural logarithm of off-fam income)	Number of obs	= 323		
	Censored obs	= 100		
	Uncensored obs	= 223		
	Wald chi2 (15)	= 364.46		
	Prob > chi2	= 0.0000		
Explanatory variables	Coefficient	Std. Err	P> z 	Z
Age (Age of household head in the year)	-.0034641*	.00208	0.095	-1.67
Sex (Sex of household head)	.072035	.0728	0.322	0.99
Literacy (Dummy for able to read and write)	.0768016**	.03924	0.050	1.96
Edu1 (Dummy for primary education)	.1151027***	.04014	0.004	2.87
Edu2 (Dummy for secondary education)	-.0035077	.07908	0.965	-0.04
Famsize (Total family size in number)	.0510222***	.00923	0.000	5.53
Adult (Number of family labor)	.0422247***	.01213	0.001	3.48
Lansize (Owned farm size in hectare)	.0074121	.02578	0.774	0.29
Lanfrlty (Dummy for land fertility)	-.0363575	.04542	0.423	-0.80
Livestock (In Total Livestock Unit)	.0089617	.00569	0.115	1.57
Drfta (Dummy for draft animals)	.0177612	.04205	0.673	0.42
Finance (Dummy for access to finance)	-.0064246	.04579	0.888	-0.14
Agrishocks (Dummy for Agricultural shock)	.0611083*	.0367	0.096	1.67
Training (Dummy for access to training)	.0921245**	.04515	0.041	2.04
Distance (Time spent to reach market)	-.3463791***	.0212	0.000	-16.36
Mills lambda	.1464856*	0.2242	0.063	1.86

$\rho = 0.6533$, $\sigma = .22421098$, $Mills\ lambda = 0.1464856 = \rho * \sigma$.

(Source: Stata result, 2021)

Heckman's ρ , the inverse hyperbolic tangent of ρ , is the correlation of the residuals in the t wo equations. σ is the standard error of the residuals of the second stage of the equation. $Mills\ lambda$ is $\rho * \sigma$. Censoring occurs when all values in a certain range of a dependent variable are transformed into a single value. ***, ** and* represent significant at 1%, 5%, and 10% probability level, respectively.

4.9.4 Interpretation of Heckman 2nd Stage OLS estimation results

As indicated in the previous section, several independent explanatory variables; individual and family characteristics, household assets, institutional and infrastructural characteristics were postulated to influence farmers' Off-farm employment income. Out of sixteen explanatory variables including IMR/inverse mills ratio hypothesized to affect income from Off-farm activities, nine variables were found to be statistically significant in affecting Off-farm earning. These factors include the age of household head, Total Family size (Famsize), household labor (adult), Literacy of the household head (able to read and write), education level of a household member or having a member who completes primary education (Edu1), Agricultural shock, Training, time spent to reach the main market, and Inverse mill's ratio were significant determinants of Off-farm income up to 10% level of significance. However, the rest variables were insignificant.

Age of household head (Age): With regards to individual characteristics, age has a significant effect on participation decision and income from the Off-farm activities. The income obtained from Off-farm employment significantly decreases with the age of the household head at a 10% probability level. The marginal effect for age implies that a one-year increase in age or as the age of the household head increases from its mean value of 46.55 to 47.55 years, the income that the household obtain from Off-farm employment will decrease by 0.346%, while other variables are constant at their mean.

Family size (Famsize): Family size is found to have a positive and significant relation with earnings from Off-farm activities at less than 1% probability level in the study area. The result indicates that an increase in the household size is a determining factor for earning more from Off-farm activities. As expected, the presence of more family power motivates households to participate in various activities by having more hands and helps to get better earning. This allows us to agree on the presence of positive relation between allocated labor and the amount of earning keeping other things constant.

Family labor (Adult): As interpreted under the participation, the presence of more adults in family members is found to be positive and statistically significant at a 1% probability level in generating Off-farm income. On average; as the number of adults in the family increase from its mean of 3.71 to 4.71, the income from Off-farm employment increases by 4.22%. This indicates having a greater labor force, gives the household the flexibility to distribute work between the farms and Off-farm employment, and therefore has a higher capacity of generating income from Off-farm employment. Indeed, households with an extra labor force would have extra hands available to generate income from sources in addition to their farm, including the collection and sale of firewood, wage employment on others' farms, small trade, handcrafts, and others.

Education level of the household head and member (Literacy&Edu1): Education is one of the key variables in the economic literature influencing participation in Off-farm work and total earnings from Off-farm work. Better educated households have a much higher likelihood of adopting strategies and generating an income from Off-farm employment (wage- and self-employment). Literacy (able to read& write) of the household head has a positive and significant effect in generating income from Off-farm activities at a 5% level of significance in the Jimma Arjo district. Besides, the education level of the household members has a positive and statistically significant relationship with the earning from Off-farm activities at a 1% level of significance.

Agricultural shock (Agrishock): Agricultural shock was found to influence the Off-farm earning positively and significantly at a 10% probability level. This implies that household who suffered from Agricultural shock generates more income from Off-farm activities than those households do not suffer from this problem. This means that households who have low agricultural production due to unavailability of oxen, unable to buy fertilizer, and their crops are damaged by pests, livestock eating and feed infestation are forced to participate in and earn income from Off-farm activities to feed their family than the households who didn't suffer from this problem. Besides, the marginal effect shows that the household who suffered from agricultural shock obtain an income from Off-farm activities by 6.1% than the household who didn't suffer from this problem by keeping other variables constant.

Training: Training is the variable that was insignificant under the participation, but it affects the amount of Off-farm earning positively and significantly at a 5% level of significance. There are some activities, like trading and professional works, that require some kind of soft and physical skill, which attracts those households who have training with some of the skill requirements. Technical support to develop the capacity of the farm households who were/are participating in the Off-farm sector in the study area is found to be an important factor affecting the amount of earning from Off-farm activities. The marginal effect from the Heckman two-step model implies that keeping other independent variables constant, the farmers who have access to training earn the return from Off-farm activities by 9.2% than their counterpart households.

Distance: As in the participation case, distance has a negative and significant influence on the amount of earning from Off-farm activities at less than 1% significance level. When the distance to the nearest market increases, the return from Off-farm activities is reduced. This is in line with the expectation that a household that accesses a market with a lesser cost is getting more return because of their comparative advantage. From Heckman's two-step regression result, the marginal effect shows that by holding other independent variables constant, an increment of time spent to reach the major market by one hour, or from the mean value 1.8424 to 2.8424 hours would reduce the amount of income from Off-farm employment by 34.6%. This justifies that residing near to market serves as an important source of Off-farm income. Those farmers living near the market center can easily access information, have a higher opportunity to participate in various Off-farm activities, increase their income and improve their livelihood than the households far from the market center.

Mills lambda: This is a selection bias control factor, reflects the effect of all the unmeasured characteristics which are related to the participation decision, the coefficient of this factor in the Off-farm income analysis catches the part of the effect of these characteristics which is related to income. This indicates whether there is selection bias and what the direction of this bias is. From the above Heckman 2nd stage regression result, the coefficient lambda is positive (0.147) and significant at less than 10% significance level (0.063) indicates that participants compared to non-participants have unmeasured characteristics which are positively related to Off-farm income.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Summary

Diversifying the sources of income for subsistence farmers beyond agriculture plays a significant role in reducing the rural-urban income gap, poverty reduction, slowing down rural-urban migration, building local industry, improvement of food security status, provision of off-season income, and absorbing surplus labor for youths and women. The purpose of this study was to examine the determinants of participation in and the amount of Off-farm earning activities in the Jimma Arjo district of East Wollega Zone. Data used for the study was collected from 323 households drawn from the Jimma Arjo district. A multistage sampling method was used to select the households. In the first stage, the district was selected randomly. In the second stage based on the information of the district office of Agriculture, 22 peasant associations/kebeles of the district were stratified into 3 agroecology zone: lowland, medium land, and highland. In the third stage, one peasant association was randomly selected from each of the three agroecology zones. In the last stage, based on a simple random sampling method the respondents were selected from each identified peasant association for the study. Finally, data were analyzed both by descriptive statistics and an econometric model.

5.2 Conclusion

Agriculture alone has failed to support the livelihood of the farm households in the Jimma Arjo district. As result, participation in Off-farm activities was found to play important role in supporting and stabilizing the livelihood of the farm households. Accordingly, 69% of the households among the total farm households sampled for the study were found to participate in and generate income from Off-farm activities. The majority of participants, (84.3%) were pushed to participate in Off-farm employment due to low farm labor productivity& limited farm income, large family size with many dependent members, insufficient access to land, and low land

productivity, etc., to meet their basic needs. Local trading, animal fattening, sale of local food and drinks are among the major Off-farm economic activities that help rural households of the Jimma Arjo district by relaxation of their financial constraints, food security, better health, educating children, and better housing.

According to the descriptive results, there was a significant difference between Off-farm participants and non-participant households in terms of their demographic, institutional, and socioeconomic characteristics. Accordingly, the proportions of aged farmers in the non-participant groups were more than the participants. More of an individual who participated in Off-farm employment were literate in comparison to non-participant household heads. Moreover, the proportion of male-headed households, households with small size and poorly fertile of the land, credit accessed and large family size households, more livestock holding households and households living close to the market were more in participant households than non-participant households.

Heckman's two-step model was also used to estimate the effects of hypothesized independent variables on the dependent variables (participation decision and amount of earning). Out of fifteen explanatory variables hypothesized to determine farmers' participation and amount earning, twelve variables were found to be statistically significant in determining participation up to 10% probability level. However, only nine variables including the inverse mills ratio were found to be statistically significant in determining the amount of Off-farm earning. Accordingly, the results of the Heckmans' two-stage model showed that age of household head, land size, fertility of the land, and distance from the major market were negatively and significantly influence farm households to participate in Off-farm activities. Sex of household head, education level of household head (able to read & write and primary education of family member), family size, adult, total livestock, access to finance, and agricultural shock had a positive influence on Off-farm participation. Similar to in the participation case, Age, and distance were negative and statistically significant in determining the amount earning from Off-farm activities. Education level of household head (able to read & write and primary education of family member), family size, adult, training, agricultural shock, and inverse mills ratio had a positive and statistically significant effect on the amount of Off-farm income.

5.3 Recommendations

The type of Off-farm activities in which farmers participate should be understood well before designing any policy since the activities that farmers participate in are different from place to place depending on the socio-economic factors of their environment. From this study, the types of activities undertaken in the surveying district are low-productive, low-skill types mostly undertaken by resource-poor households. Therefore, before encouraging farm households to participate more in Off-farm activities, the government must make sure to expand Off-farm opportunities with growth potential by expanding the provision of the necessary inputs like ensuring the sustainability of education for farm household, the development of specific financing schemes through easily accessible way, training/ capacity-building for farmers, and investing in infrastructure to promote local market by facilitating road, electricity, telecommunication, water, and others. These help the smallholder farmers to create additional job opportunities especially new self-employment and make them profitable. Besides, policies for smallholder farming systems that support the improvement of soil quality and restoration of degraded and marginal land instead of expanding cropland through deforestation are recommended.

5.4 Suggestion for Future Research

Finally, it is important to point out some of the limitations of this study as a guide for future research works. First, this study was mainly limited to smallholder farmer participation in Off-farm employment in the Jimma Arjo district. Second, specifications such as dummy for a season, a dummy for villages, specific labor time allocation of households were not used. Other specific indicators for infrastructure and other communication networks (i.e.irrigation, road type, and access to phone) are not used in the analysis. Future research should take into account these factors since the use of these specifics may provide more detailed results for specific districts, zones, regions, and national policy design.

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Appendix One

Conversion Factors, Diagnostic Tests, And Regression Results

Appendix 1.1 Conversion factors to estimate the Tropical Livestock Unit equivalents

Calf=0.25, Heifer=0.75, Sheep&Goat=0.13, Cow&Ox=1, Donkey=0.7, Horse=0.75, Mule=1.1, Chicken=0.013

Appendix 1.2 Model specification test

```
. linktest
```

```
Iteration 0: log likelihood = -199.86538
Iteration 1: log likelihood = -67.209483
Iteration 2: log likelihood = -65.893186
Iteration 3: log likelihood = -65.889882
Iteration 4: log likelihood = -65.889881
```

```
Probit regression                Number of obs   =       323
                                LR chi2(2)       =       267.95
                                Prob > chi2        =       0.0000
Log likelihood = -65.889881      Pseudo R2      =       0.6703
```

HHPA	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
_hat	1.052783	.1226438	8.58	0.000	.8124052	1.29316
_hatsq	-.0720725	.0668096	-1.08	0.281	-.2030169	.058872
_cons	.0911869	.1519375	0.60	0.548	-.2066051	.3889788

```
Logistic regression            Number of obs   =       323
                                LR chi2(2)       =       268.79
                                Prob > chi2        =       0.0000
Log likelihood = -65.472661      Pseudo R2      =       0.6724
```

HHPA	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
_hat	1.041501	.1364324	7.63	0.000	.7740981	1.308903
_hatsq	-.0320164	.0395709	-0.81	0.418	-.1095739	.0455411
_cons	.107605	.2699606	0.40	0.690	-.4215082	.6367181

Appendix 1.3 Multicollinearity test for continuous explanatory variables

. vif

Variable	VIF	1/VIF
Famsize	1.36	0.737704
Adult	1.34	0.747475
TLU	1.06	0.943560
Lansize	1.04	0.964232
Distance	1.03	0.969103
Age	1.02	0.978109
Mean VIF	1.14	

Appendix 1.4 Contingency coefficient for discrete variables

	Sex	Literacy	Edu1	Edu2	Lanfrt-y	Drfta	Finance	Agrish*s	Training
Sex	1.0000								
Literacy	-0.0249	1.0000							
Edu1	0.0631	-0.4173	1.0000						
Edu2	0.0667	-0.1302	-0.1052	1.0000					
Lanfrtlty	0.0641	-0.0054	-0.0100	0.0298	1.0000				
Drfta	0.0810	0.0594	0.0580	-0.0552	0.0991	1.0000			
Finance	0.1075	0.1507	0.0896	-0.0820	0.2180	0.3042	1.0000		
Agrishocks	0.0018	-0.0034	0.0374	-0.0052	0.1621	0.2707	0.3205	1.0000	
Training	-0.1990	0.0363	-0.0314	0.0147	-0.0538	0.0405	-0.2220	-0.0146	1.0000

Appendix 1.5 Multicollinearity test for both continuous and discrete explanatory variables

```
. vif
```

Variable	VIF	1/VIF
Lanfrtly	1.75	0.570710
Edu1	1.66	0.602522
Training	1.62	0.616442
Distance	1.60	0.625660
Literacy	1.51	0.661648
Lansize	1.50	0.665886
Adult	1.42	0.705299
Famsize	1.41	0.708041
Finance	1.37	0.731621
TLU	1.33	0.753717
Edu2	1.30	0.770281
Drfta	1.27	0.784335
Age	1.22	0.816716
Agrishocks	1.15	0.867851
Sex	1.11	0.897311
Mean VIF	1.42	

Appendix 1.6 Breush Pagan heteroskedasticity test

```
. hettest
```

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of LnOffincome

chi2(1) = 0.00

Prob > chi2 = 0.9874

```
. hettest
```

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of HHPA

chi2(1) = 12.83

Prob > chi2 = 0.0003

Appendix 1.7 Binary Probit estimation results

```
Iteration 0: log pseudolikelihood = -199.86538
Iteration 1: log pseudolikelihood = -71.204905
Iteration 2: log pseudolikelihood = -66.522208
Iteration 3: log pseudolikelihood = -66.42473
Iteration 4: log pseudolikelihood = -66.42446
Iteration 5: log pseudolikelihood = -66.42446
```

```
Probit regression                Number of obs   =       323
                                Wald chi2(15)      =       107.38
                                Prob > chi2         =       0.0000
Log pseudolikelihood = -66.42446 Pseudo R2         =       0.6677
```

HHPA	Robust					
	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Age	-.0355121	.0133482	-2.66	0.008	-.061674	-.0093502
Sex	1.149959	.4140423	2.78	0.005	.3384505	1.961467
Literacy	.6750089	.2889362	2.34	0.019	.1087043	1.241313
Edu1	.5237048	.3017202	1.74	0.083	-.067656	1.115066
Edu2	.4756825	.4416561	1.08	0.281	-.3899476	1.341313
Famsize	.1633356	.0480381	3.40	0.001	.0691826	.2574885
Adult	.1669446	.0765142	2.18	0.029	.0169795	.3169098
Lansize	-.5735554	.1427313	-4.02	0.000	-.8533035	-.2938072
Lanfrtly	-.7268514	.2299339	-3.16	0.002	-1.177514	-.2761892
TLU	.1228273	.0444185	2.77	0.006	.0357686	.209886
Drfta	.3357365	.3040347	1.10	0.269	-.2601606	.9316336
Finance	.8357717	.269013	3.11	0.002	.3085159	1.363028
Agrishocks	.7250159	.2446526	2.96	0.003	.2455057	1.204526
Training	-.2139113	.2568736	-0.83	0.405	-.7173742	.2895516
Distance	-.5909753	.1514335	-3.90	0.000	-.8877795	-.2941711
_cons	.2395084	.9604427	0.25	0.803	-1.642925	2.121941

```

Iteration 0: log likelihood = -199.86538
Iteration 1: log likelihood = -71.204905
Iteration 2: log likelihood = -66.522208
Iteration 3: log likelihood = -66.42473
Iteration 4: log likelihood = -66.42446
Iteration 5: log likelihood = -66.42446

```

```

Probit regression                               Number of obs   =       323
                                                LR chi2(15)    =       266.88
                                                Prob > chi2    =       0.0000
Log likelihood = -66.42446                    Pseudo R2     =       0.6677

```

HHPA	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Age	-.0355121	.0150677	-2.36	0.018	-.0650442	-.0059799
Sex	1.149959	.3691474	3.12	0.002	.426443	1.873474
Literacy	.6750089	.3211546	2.10	0.036	.0455574	1.30446
Edu1	.5237048	.3311922	1.58	0.114	-.1254201	1.17283
Edu2	.4756825	.6786418	0.70	0.483	-.854431	1.805796
Famsize	.1633356	.0665664	2.45	0.014	.0328679	.2938033
Adult	.1669446	.0937398	1.78	0.075	-.0167821	.3506713
Lansize	-.5735554	.1471823	-3.90	0.000	-.8620275	-.2850833
Lanfrtly	-.7268514	.287053	-2.53	0.011	-1.289465	-.1642379
TLU	.1228273	.0505203	2.43	0.015	.0238094	.2218453
Drfta	.3357365	.3269777	1.03	0.305	-.3051279	.9766009
Finance	.8357717	.264657	3.16	0.002	.3170536	1.35449
Agrishocks	.7250159	.271513	2.67	0.008	.1928602	1.257172
Training	-.2139113	.2693751	-0.79	0.427	-.7418768	.3140542
Distance	-.5909753	.1679065	-3.52	0.000	-.9200661	-.2618846
_cons	.2395084	1.08708	0.22	0.826	-1.891129	2.370146

```
. mfx
```

```

Marginal effects after probit
y = Pr(HHPA) (predict)
= .86481563

```

variable	dy/dx	Std. Err.	z	P> z	[95% C.I.]		X
Age	-.0077175	.0035	-2.21	0.027	-.014573	-.000862	46.548
Sex*	.3623885	.13562	2.67	0.008	.096571	.628205	.904025
Literacy*	.1252502	.05342	2.34	0.019	.020551	.229949	.287926
Edu1*	.102351	.06015	1.70	0.089	-.01555	.220252	.315789
Edu2*	.0798613	.0856	0.93	0.351	-.087916	.247639	.040248
Famsize	.0354964	.015	2.37	0.018	.006106	.064887	6.57276
Adult	.0362807	.02079	1.75	0.081	-.004463	.077025	3.71207
Lansize	-.1246461	.03798	-3.28	0.001	-.199088	-.050204	1.55108
Lanfrt~y*	-.1343908	.05439	-2.47	0.013	-.240984	-.027798	.702786
TLU	.026693	.01038	2.57	0.010	.006351	.047035	6.86068
Drfta*	.0774886	.08274	0.94	0.349	-.084688	.239665	.665635
Finance*	.1957108	.06936	2.82	0.005	.059766	.331656	.582043
Agrish~s*	.1644397	.06693	2.46	0.014	.033261	.295618	.551084
Training*	-.0489679	.06419	-0.76	0.446	-.174786	.07685	.275542
Distance	-.1284318	.03527	-3.64	0.000	-.197563	-.0593	1.84235

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Appendix 1.8 Heckmans' two-stage estimation results

```

Heckman selection model -- two-step estimates   Number of obs   =       323
(regression model with sample selection)       Censored obs    =       100
                                                Uncensored obs  =       223

                                                Wald chi2(15)   =       364.46
                                                Prob > chi2     =       0.0000

```

LnOffincome	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
LnOffincome						
Age	-.0034641	.0020756	-1.67	0.095	-.0075323	.000604
Sex	.072035	.0727958	0.99	0.322	-.0706421	.2147121
Literacy	.0768016	.0392364	1.96	0.050	-.0001005	.1537036
Edu1	.1151027	.0401397	2.87	0.004	.0364304	.1937751
Edu2	-.0035077	.0790762	-0.04	0.965	-.1584941	.1514787
Famsize	.0510222	.0092297	5.53	0.000	.0329324	.069112
Adult	.0422247	.0121311	3.48	0.001	.0184482	.0660013
Lansize	.0074121	.0257833	0.29	0.774	-.0431222	.0579463
Lanfrtlty	-.0363575	.0454225	-0.80	0.423	-.125384	.052669
TLU	.0089617	.0056921	1.57	0.115	-.0021947	.0201181
Drfta	.0177612	.0420459	0.42	0.673	-.0646474	.1001697
Finance	-.0064264	.045792	-0.14	0.888	-.0961772	.0833243
Agrishocks	.0611083	.0366991	1.67	0.096	-.0108205	.1330372
Training	.0921245	.0451529	2.04	0.041	.0036265	.1806225
Distance	-.3463791	.0212029	-16.34	0.000	-.387936	-.3048221
_cons	10.20395	.1574271	64.82	0.000	9.895399	10.5125
select						
Age	-.0355121	.0150677	-2.36	0.018	-.0650442	-.0059799
Sex	1.149959	.3691474	3.12	0.002	.426443	1.873474
Literacy	.6750089	.3211546	2.10	0.036	.0455574	1.30446
Edu1	.5237048	.3311922	1.58	0.114	-.1254201	1.17283
Edu2	.4756825	.6786418	0.70	0.483	-.8544309	1.805796
Famsize	.1633356	.0665664	2.45	0.014	.0328679	.2938033
Adult	.1669446	.0937398	1.78	0.075	-.0167821	.3506713
Lansize	-.5735554	.1471823	-3.90	0.000	-.8620275	-.2850833
Lanfrtlty	-.7268514	.287053	-2.53	0.011	-1.289465	-.1642379
TLU	.1228273	.0505203	2.43	0.015	.0238094	.2218453
Drfta	.3357365	.3269777	1.03	0.305	-.3051279	.9766009
Finance	.8357717	.264657	3.16	0.002	.3170536	1.35449
Agrishocks	.7250159	.271513	2.67	0.008	.1928602	1.257172
Training	-.2139113	.2693751	-0.79	0.427	-.7418768	.3140542
Distance	-.5909753	.1679065	-3.52	0.000	-.9200661	-.2618846
_cons	.2395084	1.08708	0.22	0.826	-1.891129	2.370146
mills						
lambda	.1464856	.0787781	1.86	0.063	-.0079166	.3008878
rho	0.65334					
sigma	.22421098					

. mfx

Marginal effects after heckman

y = Linear prediction (predict)
= 10.134659

variable	dy/dx	Std. Err.	z	P> z	[95% C.I.]	X
Age	-.0034641	.00208	-1.67	0.095	-.007532	.000604		46.548
Sex*	.072035	.0728	0.99	0.322	-.070642	.214712		.904025
Literacy*	.0768016	.03924	1.96	0.050	-.0001	.153704		.287926
Edu1*	.1151027	.04014	2.87	0.004	.03643	.193775		.315789
Edu2*	-.0035077	.07908	-0.04	0.965	-.158494	.151479		.040248
Famsize	.0510222	.00923	5.53	0.000	.032932	.069112		6.57276
Adult	.0422247	.01213	3.48	0.001	.018448	.066001		3.71207
Lansize	.0074121	.02578	0.29	0.774	-.043122	.057946		1.55108
Lanfrt~y*	-.0363575	.04542	-0.80	0.423	-.125384	.052669		.702786
TLU	.0089617	.00569	1.57	0.115	-.002195	.020118		6.86068
Drfta*	.0177612	.04205	0.42	0.673	-.064647	.10017		.665635
Finance*	-.0064264	.04579	-0.14	0.888	-.096177	.083324		.582043
Agrish~s*	.0611083	.0367	1.67	0.096	-.01082	.133037		.551084
Training*	.0921245	.04515	2.04	0.041	.003626	.180622		.275542
Distance	-.3463791	.0212	-16.34	0.000	-.387936	-.304822		1.84235

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Appendix Two
Questionnaire
JIMMA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
DEPARTMENT OF ECONOMICS

Questionnaire Schedule for MSc Research Entitled Determinants of Participation in Off-farm Employment among Small Holder Farms of Jimma Arjo District, East Wollega Zone, Oromia, Ethiopia

Instructions for enumerators/data collectors

- Make a brief introduction to each household before starting the interview, get introduced to the farmers, (locally greet them) get his/ her name, tell them the purpose and objective of your study.
- Please, ask each question so clearly and patiently until the respondent understands.
- Please, fill up the interview schedule according to the farmer's reply (do not put your own opinion)
- Please, do not try to use technical terms while discussing with farmers, and do not forget to use/record the local unit.
- During the process put the answers of each respondent both on the space provided and encircle the choice
- At the end prove that, all questions are asked & the interview schedule format is properly completed

Serial No -----

Date -----

Name of data collector-----

Signature -----

Section A. Preliminary household head information

1. Identification

1.1 name of village or Ganda with its agro-ecology: H/keku (1) W/kumba (2) Meta (3)

1.2 household category: Off- farm participant (1) Non-participant (0)

1.3 Type of Off-farm category of participant: Wage employment (2) Self-employment (1)

2. Demographic characteristics of respondents

2.1 Gender of household head Male (1) Female (0)

2.2 Age of household head in year. [] _____

2.3 Current marital status of household head; Single (0) Married (1) Widow/widower (2)
 Divorced (4)

2.4 Education level of household head; Illiterate (0) Able to read and write (1)

2.4.1 In this family is there any member who finished primary education A) yes

B) No. If your answer is yes how many members had finished primary education? _____

2.4.2 In this family is there any member who finished secondary education A) yes

B) No. If your answer is yes how many members had finished secondary education? _____

3. Family Characteristics of the respondents

3.1 Total family members of the household: _____

3.2 Number of people whose age from 15 to 64 and not attending school in the household: ____

3.3 Number of members whose age below 15 or above 65 or still attending school in the household: ____

3.4. Is there a member of the household who was unable to work in the previous season due to health problems Yes (1) No (0)?

3.5. What do you suggest about the level of your economy in relationship with your neighborhood?

Poor (1), Moderate (2), rich (3)

4. Households' asset variables

4.1. How big is your farmland? ____ Hecter

4.2. How do you perceive the average fertility level of your farmland?

Poor Fertility (0), Good/moderate Fertility (1)

4.3. Do you have your livestock? 1. Yes----- 2. No -----

If yes, indicate the type and number of livestock owned currently.

Type of Livestock		Number
Cattle	Oxen	
	Cows	
	Heifer	
	Calves	
	Bull	
Subtotal		
Sheep and goat	Sheep	
	Goat	
Equines	Horses	
	Mules	
	Donkeys	
Poultry	Chicken	

4.5. Do you practice irrigation? No (0) Yes (1)

4.6. Do you save if you have any surplus? Yes (0) No (1)

4.7. If yes to question 4.6, how do you save? Cash at home=1, bank deposits=2, Equib=3, through livestock raising=4,

5. Infrastructures, social and institutional condition

5.1 Have you received training on livelihood strategy? No (0) yes (1)

5.2 What are the problems in access to the market? Transportation problem (1) Too far from market place (2)

5.3 Do you listen to media (have radio/phone)? Yes (1) No (0)

5.4. Do you have clean water access to your family? No (0) YES (1)

5.5 Is there electricity access in your locality? No (0) YES (1)

5.6 Do you have transport access to the nearest town? Yes (1) No (0)

5.7 What is the time spent to arrive at the nearest town/city market? _____(hr).

5.8 Do you receive remittance? (No=0 Yes=1)

5.7 If yes to question number 5.8, who send you a remittance? My son/daughter=1, parents=2, other relatives=3, organization=4, If other please specify _____.

5.9 Do you belong to any cooperative society? No (0) Yes (1)

5.10 If yes in which community-based organizations you are a member of? Iquib (1), idir (2), daboo (3) five peers led (4) Keble council (5) committee or local grouping (6)

5.11 Would you have relatives to rely on /ask for support in time of need?

No=0, Yes=1

5.12. Is there any credit institution in your locality? Yes (1). No (0)

5.13. Have you ever taken credit/loan for investment on any non-farm economic activities?

No (0) yes (1)

5.14. If yes, what is your source of credit? A. Savings and credit institutions

B. Commercial/developmental banks C. Informal creditor's D. other _____

5.15. If your source of credit is a formal sector, how much money did you borrow in the last two years? _____ETB

5.16. If you didn't borrow from a formal credit institution, why?

1 High-interest rate 2. Collateral requirement

3. Availability of other alternatives 4. I don't want 5. Other _____

Section B Off-farm activity for each household member

1. Do you Practice Off-farm activities? 1=Yes, 0=No., if your answer for above is yes; tell me the most important activities your family members have done in the last 12 months in terms of earning money or goods for themselves or the household? Tick those appropriate for you.

Activities

Handicraft and weaving

Causal agricultural

Local trading

Religious worker

Selling firewood and charcoal

Government organization

Carpentry and forest products

Daily wage work

Food- for-work

Animal Fattening

Animal drawn carts

Work for trader (private sector)

Milling and tailoring

Selling face mask

Sale of local food and drinks

Hairdressing

Shopkeeper

Others please specify;

I. _____

1.1. If you engaged in Off-farm activities what was your most important motive for starting?

1. Limited farm income , 2. To support livelihood

3. Inadequate land to cultivate , 4. Large family size

5. Seasonal nature of agricultural labor 6. Off-farm work is more rewarding than farm work

7. The wage differential between the two sectors 8 the riskiness of each type of employment

9. Availability of Off-farm work opportunities 10. Other, specify _____

1.2. If you participated in off farm employment, how do you undertake these activities?

1. Temporarily/casually , why? _____

2. Seasonally or as par time activities ; reason out _____

3. Permanently ; why _____

1.3. List the main benefits you have got from Off-farm work.

1.4 If you don't engage in Off-farm activities, what are the barriers to participate?

(1) Inadequate asset/capital (2) lack of credit facilities

(3) Lack of awareness and training (4) Poor infrastructural

(5) Lack of market

(6) Lack of job opportunity

- (7) Others (specify) I. _____
 II. _____
 III.-----

1.5 In what ways do you think the above problems identified can be solved?

- I. _____
 II. _____

Section C: Off-farm earnings in birr

Please provide details of earnings from working on the following activities with the duration of months or days does the household member participated in this activity on the provided blank space. Exclude earnings from farm products produced by the household.

A. Work for wages

1. Agricultural wage work-----
2. Casual /non-agricultural wage work-----
3. Salaried/regular wage work-----
4. Food/cash-for-work-----

B. Business/self-employment income

1. Earnings from trading including animals and grain selling-----
2. Earnings from processed food/alcohol-----
3. Earnings from handicrafts (pottery, weaving, mat making etc)-----
4. Earnings from carpentry, etc-----
5. Earnings from services (tailor, barber, hairdressing, other traditional etc-----
6. Charcoal and fuelwood selling-----
7. Stone and sand collection-----
8. Wild fruit selling-----
9. Petty trade-----
10. Others specify-----

In which season does your household participate in Off-farm activities? _____

Why does your household participate in Off-farm activities? _____

For what purpose does your household spent the income earned from Off-farm sources?

Section D Shocks occurring in the farming activities

1. Do you face a reduction in agricultural output? a) Yes b) No. If your answer is yes what is the reason behind: A) unavailability of hired labor B) unavailability of oxen C) unavailability of fertilizer D) please list any other reasons-----

2. Do you often face the Idiosyncratic shocks a) yes b) no. If your answer is yes which kind of shocks do you face often? A) Crops suffered from livestock eating B) damage due to weed infestation C) ill-health of family member D) List other shocks-----

Interviews

1. What are the constraints for farm households to participate in Off-farm activities, in your peasant association/village?
2. What are the opportunities for diversifying the Off-farm activities in your village?
3. Do you think Off-farm activities are an essential component for the survival of farm households in the district?
4. What are the contributions of the existing Off-farm activities in the study area for the rural people in particular and economic development in general?

Translation To Afaan Oromoo

Maqaa Nama ragaa funaanuu _____ Mallattoo _____

Kan qulqulleesse _____ Mallattoo _____

Kutaa A: Gaaffii Abbaa Warraatiif Dhiyaate

1. Haala Maatii

1.1 Ganda qonnaan bulaa haala qilleensaa gandichaa waliin Haraa Keekkuu (baddaa) (1)

Waayyuu Qumbaa (badda daree) (2) Meettaa (gammoojjii) (3)

1.2 Haala hojii maatii qonnaan alaan walqabatee Ni hirmaatu (1) Hin hirmaatan (0)

1.3 Yoo Ni hirmaatu ta'e gosa hojii qonnaan alaa kam irratti hirmaatu?
 Hojii dhuunfaa (1). qacaramee (2)

2. Odeeffannoo ragaa haala hoogganaa Maatii gaaffiin Kun dhiyaateef

2.1 Saala hoogganaa/ttu maatii 1. Dhiira 0. Dubartii .

2.2 Umurii hoogganaa/ttu maatii _____ (waggaa)

2.3 Haala gaa'elaa hoogganaa/ttu maatii: 0. Kan hin fuune/heerumne

1. Kan gaa'ela qabu/du 2. Kan hiike/te 4. Kan irra du'e/jalaa duute

2.4. Sadarkaa barnootaa hoogganaa/ttu maatii fi miseensota maatii: 0. Kan hin baranne

1. Dubbisuu fi barreessuu Kan danda'u/dandeessu 2. Barnoota sadarkaa 1ffaa 3. Barnoota sadarkaa 2ffaa

3. Odeeffannoo ragaa haala Maatii gaaffiin Kun dhiyaateef

3.1 Baay'ina miseensota maatii _____

3.2 Miseensota maatii Umurii 15-64 jiraniif fi Kan barnootarra hin jirre _____

3.3 Miseensota maatii waggaa 15 gadiif fi 64 olii akkasumas barnootarra Kan jiran _____

3.4 Miseensota maatii keessaa sababa rakkoo fayyaa waqtii darbe Kan hojii dadhabe jiraa?

1 Eeyyee 0, Lakki

3.5 Sadarkaa dinagdee keetii olloota keen yeroo madaalamu kami?

0. Hiyyeessa 1. Giddu-galeessa 2. Soorressa

4. Odeeffannoo ragaa haala qabeenya lafaa fi horii maatii gaafatamtootaa

4.1 Lafa dhuunfaa keetii qabdaa? 1. Eeyyee 2. Lakki

4.2 Bal'inni lafa qabduu heektara meeqa ta'a? _____

4.3 Gabbina lafa qonnaa kee ilaalchise: 1. Lafa furdaa 2. Diilolee/haphii

4.4 Beeyilada qabdaa? 0. Lakki 1. Eeyyee

Yoo qabaatte, gosaa fi baay'ina beeyiladaa yeroo ammaa qabdu ibsi.

Gosa beeyiladaa		Baay'ina
Hori	Sangaa	
	Sa'a	
	Goromsa	
	Jabbii	
	Dibicha	
Cita-waligalaa		
Hoolaa fi re'ee	Hoolaa	
	Re'ee	
Hori geejibaa	Farda	
	Gaangee	
	Harree	
Handaanqoo	Lukkuu	

4.5 Jallisii hojjetee beektaa? 0. Lakki 1. Eeyyee.

4.6 Yoo qarshii gahaa qabaatte qusatee beektaa? 0. Lakki 1. Eeyyee

4.7 Yoo qusatee beekte, akkamitti? 1. Manatti qarshii callaa [] 2. Baankiitti []

3. Iqqubidhaan [] 4. Hori bituudhaan []

5. Odeeffannoo ragaa haala dhaabbata tajaajila hawasummaa fi Kan biroo

5.1 Leenjii ogummaa haala jireenya kee irratti fudhattee beektaa? 1. Eeyyee [] 2. Lakki []

5.2 Rakkooleen haala gabaatiin wal qabatan maaltu jira? 1. Rakkoo geejjibaa [] 2. Lafa gabaa irraa fagaachuu []

5.3 Carraa miidiyaa hordofuu qabdaa? 1. Eeyyee [] 2. Lakki []

5.4 Tajaajila bishaan quluqulluu Ni argattuu? 1. Eeyyee [] 2. Lakki []

5.5 Naannoo keessanitti tajaajila ibsaa/electricity/ Ni argattuu? 1. Eeyyee [] 2. Lakki []

5.6 Magaalaa isinitti dhiyoo deemuuf tajaajila geejjibaa Ni argattuu? 1. Eeyyee 2. Lakki

5.7 Deebiin gaaffii ‘5.6’ eeyyee yoo ta’e, gabaa mijataa isinitti dhiyaatu gahuuf saa’atii meeqa isinitti fudhata? _____

5.8 Yeroo si barbaachisetti fira gargaarsa gaafattu qabdaa? 0. Lakki 1. Eeyyee

5.9 Yoo qabaatte, eenyurraati? 1. Hintala Koo 2. Ilma Koo 3. Fira Kan biroo 4. Dhaabbata gargaarsaa 5. Kan biroo yoo jiraate ibsi -----

5.10 Miseensa gamtaa hawaasaa keessa jirtaa? 0. Lakki 1. Eeyyee

5.11 Deebiin kee eeyyee yoo ta’e, dhaabbata hawaasaa kamiif miseensa? 1. Iqqubii 2. Iddirii 3. Daboo 4. Tokko-shanee hiriyummaa 5. Kaawunsilii gandaa 6. Garee naannoo

5.12 Dhaabbanni liqa kennu naannoo keessan jiraa? 0. Lakki 1. Eeyyee

5.13 Hojii qonnaan alaa ittiin hojjechuuf liqa fudhattee beektaa? 0. Lakki 1. Eeyyee

5.14 Deebiin kee eeyyee yoo ta’e maddi liqa kee maali? 1. Waajjira liqii fi qusannoo 2. Baankii 3. Liqeessitoota al-idilee 4. Kan biroo yoo jiraate ibsi

5.15 Yoo dhaabbata liqii idilee irraa liqeffatte ta’e, waggoota darban lamman kana qarshii meeqa liqeffatte? _____

5.16 Yoo hin liqeffanne ta’e sababni maali? 1. Dhalli liqii cimuu 2. Qabsiisa dhabuu 3. Jiraachuu carraawwan biroo 4. Waan hin barbaadneef 5. kan biroo yoo jiraate ibsi _____

B. Hojiwwan qonnaan alaa fi galii irraa argamu

Hojii qonnaa cinatti ji’oottan 12n darban keessa hojii miseensotni maatii kee irratti hirmaachaa turtanii fi galii irraa argattan keessaa kanneen murteessoo ta’an himi.

Gosoota Hojiwwanii

1. **Hojii harkaa:** Sibiila tumuu, Wayyaa dhahuu, Wayyuu hodhuu/suphuu, Rifeensa sirreessuu, Firaashii hodhuu, Hojii mukaa

2. **Daldala;** Midhaan daldaluu, Beeyilada daldaluu, Dhugaatii fi nyaata nannoo gurguruu, Suuqii

3 Horii furdisuu 4 Hojii qonnaa Nama birooof kaffaltii guyyaatiin

5 Hojii qonnaan alaa kaffaltii guyyaatiin 6 Hojii qacarrii miindaa ji’aatii 7 Kan biroo, yoo jiraate ibsi _____,

Galii Giddu-galeessaan ji'oottan 12n darban kana keessa gosoota hojiiwwanii kana irraa argattan himi

1. **Hojii harkaa:** Sibiila tumuu irraa-----, Wayyaa dhahuu irraa----- Wayyuu hodhuu/suphuu irraa-----, Rifeensa sirreessuu irraa-----, Firaashii hodhuu irraa-----, Hojii mukaa irraa-----

2. **Daldala:** Midhaan daldaluu irraa-----, Beeyilada daldaluu-----, Dhugaatii fi nyaata nannoo gurguruu irraa-----, Suuqii irraa-----

3 Horii furdisuu irraa----- 4 Hojii qonnaa Nama biroof kaffaltii guyyaatiin argattu-----

5 Hojii qonnaan alaa kaffaltii guyyaatiin argattu----- 6 Hojii qacarrii miindaa ji'aatiin----- 7 Kan biroo, yoo jiraate ibsi_____.

1.2 Yoo hojii qonnaan alaatti hirmaatteetta yoo ta'e, akka itti hirmaattuuf maaltu si kakaasee ture yookiin si dirqisiise?

1, Xiqqeenya lafa qonnaa 2, Dhabinsa lafa qonna 3, Carraa gabaa 4, Gorsa hiriyoottaa
5, Ittiin jiraachuuf 6, Galiisaatiin qonna hojachuuf 7, Ogummaasaa Kan qonnaa caalaa waanan qabuuf 8, Galii gad-aanaa qonna irraa waanan argadhuuf 9, Baay'ina miseensota maatii
8, Kan biroo yoo jiraate tarreessi-----

C. Mudachuu gad-bu'insa Oomishaa

1. Hir'ina oomisha qonnaa qabdaa? 0. Lakki 1. Eeyyee

2. Yoo deebiin kee eeyyee ta'e sababa maaliif si hir'ate jettee yaadda?

A, Sangaa dhabuu B, Xaa'oo bituu dhadhabuu C, Midhaan ani oomishaa jiru beeyiladootaa fi bineeldotaan mancha'u D, Rakkoo Aramaa E, Rakkoo ilbiisota adda addaa F, Kan biroo yoo jiraate ibsi-----

D. Akkaataa Kamiin hojii qonnaan alaa irratti hirmaatta?

1. Yeroof/ akka tasaa. Yeroof yoo ta'e, maaliif? -----

2. Waqtiilee irratti hundaa'uuni. Sababa waqtii irratti hundaa'uudhaan hirmaattuuf ibsi-----

3. Dhaabbataadhaani/ yeroo hunda. Sababa yeroo hirmaattuuf ibsi-----

E. Faayidaa hojii kanatti hirmaachuun argatte tarreessi

F. Hojii qonnaan alaa irratti yoo hin hirmaattu ta'e, maaltu akka hin hirmaanne si taasise yookiin si danqe?

1 Hanqina kaappitaalaa 2 Hanqina liqii 3 Fedha dhabuu 4 Rakkoo gabaa

5. Rakkoo bu'uuraalee misoomaa 6. Dhabamuu hojii 7. Kan biroon yoo jiraate ibsi

1.5 Rakkooolee armaan oliitti ibsitan akkamitti furamuu danda'u jettanii yaaddu?
