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COLLEGE OF AGRICULTURE AND VETERINARY MEDICINE, DEPARTMENT OF AGRICULTURAL ECONOMICS AND AGRIBUSINESS MANAGEMENT

ANALYSIS OF SMALLHOLDER FARMERS' PARTICIPATION IN OFF-FARM ACTIVITIES: THE CASE OF TOLE DISTRICT, SOUTH WEST SHOA ZONE, OROMIA REGION, ETHIOPIA

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Analysis of Smallholder Farmers' Participation in Off-farm Activities: The Case of Tole District, South West Shoa Zone, Oromia Region, Ethiopia

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DEDICATION

I dedicate this thesis manuscript to my lovely families.

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The author was born in Bantu town, Tole district, south west shoa Zone of Oromia National Regional State in October 1997. He attended his elementary school education at Bantu primary school. The author completed secondary and preparatory education at Bantu senior secondary and preparatory school. After completion of his preparatory school education, he joined Mettu university bedele collage of agriculture and forestry, in October 2018 and graduated with Bachelor of Science degree in agribusiness and value chain management in June 2022. Soon after graduation, he worked one year as graduate assistant in agribusiness and value chain management department and served there until he joined Jimma University for his postgraduate study in October 2023, to pursue his MSc degree studies in agribusiness and value chain management.

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LIST OF ACRONYMS AND ABBREVIATIONS

CDF	Cumulative Distribution Factor
GDP	Gross Domestic Product
NFEA	Off-farm Economic Activities
NGO	Non- Governmental Organization
RNFE	Rural Off-farm Activities Employment
TLU	Tropical Livestock System
GIS	Geographical Information system
PM	Probit Model
SSA	Sub-Saharan Africa
TM	Tobit Model

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ABSTRACT

Poverty in rural areas of Ethiopia has its root, in low productivity, landlessness and erratic weather dominant areas. Small and fragmented farm size coupled with low level of technology, soil degradation and poor infrastructure, have reduced the capacity of small holder farmers to undertake long term investment on the farm. Therefore off-farm activities provide employment right in their own and also supplement agricultural incomes. This study investigated the factors that influence smallholder farmers' participation from off-farm activities among smallholder farmers in Tole District. Semi-Structured questionnaires were utilized to gather data for the study from 154 randomly selected farm households. Thus, a cross-sectional research design that utilized both descriptive and inferential statistics was used. The Heckman's two stage models were used to identify the variables that affect smallholder farmers' participation in off-farm activities and the total level annual income they derive from those activities respectively. Results show that about 52.6% of smallholder farmers engaged in off-farm activities. The first-stage probit model result revealed that the likelihood of engagement in off-farm activities in the research area is significantly influenced by sex, age, and distance to the main market, educational attainment, and extension contact. The Heckman's second stage model result showed that family size was found to be adversely related, but livestock ownership, experience, training, and cooperative membership were significant and favorably related to the income level of participant sample farm households. There was a significant difference in household income between those who engaged in off-farm activity and those who just relied on agriculture. Concerned stakeholders and government organizations are recommended to identify the numerous off-farm activity categories and provide support with the knowledge and expertise of these categories to help smallholder farmers operate more successfully. Furthermore, they might be required to develop appropriate strategies and policies to improve, which would increase the effectiveness of smallholder farmers.

Keywords: Ethiopia, Income, Off-farm Activities, Probit model, Smallholder Farmers, Tobit model

1. INTRODUCTION

1.1. Background of the Study

In least developed countries the reason for smallholder farmers to allocate their labor to off-farm activity arises from income risk which is arises from output irregularity, to maintain food security which results from low productivity, and income shock which aimed at to finance the household at the time of drought and insurance market failure and to generate finance for farm investments (Clarke and Dercon, 2015**)**

The majority of the world's poor are rural residents of emerging nations who rely on agriculture and related industries for their livelihood. In developing countries, farm households diversify their revenue streams by distributing their productive resources among various income-generating activities, including farm and off-farm jobs. Diversification may be a planned household policy or an impulsive reaction to a crisis. Furthermore, it might be attributed to declining and erratic farm incomes, growing poverty, and openings for employment away from farms. Governments, policymakers, and researchers have become interested in farm households' income diversification practices because of their prevalence and significance for socioeconomic growth, particularly in these nations (Wagale *et al.,* 2020). Evidence from the developing world indicates that rural economic diversification may help close the income gap between rural and urban areas and reduce rural poverty locally (Barbier, 2020). According to Rathi (2022), the rural off-farm industry generates between 32 and 40 percent of rural revenues worldwide and employs about 25% of full-time rural off-farm workers. According to Abay et al. (2021), off-farm activities provided 30–50% of rural income in sub-Saharan Africa. Off-farm economic activities are crucial for increasing the rural poor's standard of living in Africa as a way of income diversification (Tadele, 2021).

Furthermore, it can provide a chance for work for those who lack access to arable land and do not wish to continue relying on agriculture. In spite of its vitality, off-farm activity participation is low in Africa; 37% of rural households' income is actually derived from these activities, even if only 20% of the labor force is actually involved in them (Astatike and Gazuma, 2019). It entails doing paid work that is done somewhere other than the participant's own farm, and it has been acknowledged as playing an increasingly significant role in

sustainable development and poverty reduction, especially in rural areas, with the potential to increase farm investment, increase productivity, and reduce income uncertainty. Various studies have shown that most rural households in Africa are involved in agricultural activities as their main source of livelihood; however, they also engage in other income-generating activities to augment the main source of income (Alemu *et al.,* 2022). According to Okwuokenye (2021) off-farm activities are supplementary or complimentary activities that farmers engage in either off- season or on-season to support themselves such as in casual labor, transportation business traditional dancing, wine taping, petty trading .

In sub-Saharan African countries, agriculture is the major economic activity accounting for the highest share of the GDP and creates an oversized proportion of employment opportunities. Despite that agriculture is being major source of income and employment in most rural areas in developing countries, it has not been able to produce sufficient food to feed their population due to small ratio of farm land to population. As a result, rural households are increasingly earning their income from off-farm activities for his or her livelihood. Rajkhowa and Qaim (2022), found that off-farm activities contributed 35-50 percent of rural household income across sub-Saharan African countries. As part of sub-Saharan Africa, Ethiopian farmers tend to participate in off-farm activities to satisfy consumption needs by supplementing the sluggish agricultural income caused by erratic and seasonal rain fall; and due to crop failure and the resultant abundant labor force. Besides, farmers are vulnerable both for natural and man-made disasters and shocks that could be weather related, pests, death of livestock and others.

As a means of relief, rural farm households prefer to participate in off-farm activities and diversify their income thereby (Duong *et al.,* 2021). Hence, a certain farm household is tempted to participate in off-farm activities, largely due to push factors, like drought. They further inferred that, Ethiopian rural poor prefer to participate in off-farm activities with less entry costs like firewood collection and charcoal production, while the most lucrative off-farm activities are left aside. Contrary to this, some rural farm households tend to participate in off-farm activities basically to widen their income sources given their ample agricultural production and the resultant accumulated wealth, as a pull factor (Aynalem *et al.,* 2019).

According to (Melketo *et al.,* 2020) in northern central part of Ethiopia the farming system is featured by mixed farming which includes crop production and animal husbandry is the main source for the livelihood of smallholder farmers. Moreover the livelihood of the smallholder farmers is at the mercy of the nature since the agricultural practice is highly rain-fed. Despite insignificant conurbation to the household livelihood off-farm income activates are supplement for the livelihood of the household. The major off-farm activities are petty trading casual daily laborer, handcrafting of different forms and selling local liquor which demands less skill and entry capital.

In Ethiopia, off-farm activities are pro-cyclical with farming operations. The percentage of households‟ participation in off-farm employment is 34% at national level. This approach is a defensive survival strategy especially in rural areas where most of the households are already vulnerable undertaking livelihood diversification to attain food security. In Ethiopia, the key constraints for launching off-farm business activities are lack of access to credit (35%), marketing facilities to sell goods (30%) and poor roads (14%) (Tadele, 2021). Lack of assets and limited access to financial services constrain participation in high return off-farm activities. Study conducted in Moyale show that about 61.18% of the proportion of rural households who participate in off-farm activity, Oromia Regional state, Southern Ethiopia to 73.44% in Northern Ethiopia.

Between 80 and 90% of these off-farm business activities depend essentially on family labor and 70% of off-farm enterprises are exclusively self-employment (Michailidis and Lazaridou, 2020). Engaging in income earning activities significantly raises households' income in rural Ethiopia. Economic opportunities outside agriculture increase income, shape farm activities, strengthen households‟ purchasing power and lessen the risk associated with intra-year food production. Growth in off-farm sector and agriculture both create aggregate complex strategies that involve multiple income-generating opportunities for farm households. Thus, rural off-farm sector appears to be an indispensable complement to agriculture or additional source of income to stabilize food consumption and expenditure in agro-Eco regions. Incomes from the farming production are constrained by socio-economic, institutional, resource and environmental factors due to almost all farming system dominated within subsistence smallholder farmers (Kaur *et al.,* 2021).

Evidence from study by Kumar et al. (2020) suggested that off-farm activities can play a vital role in improving the well-being of the rural population. Moreover, since agricultural income is susceptible to different shocks, getting income outside of agriculture is significant for farm households. For this reason, the share of off-farm income was increasing in Ethiopia. Ethiopia faces severe land scarcity partially of highlands where population densities became very high and farm sizes became very small. Over half of household in Ethiopia cultivate less than one hectare of land while average household size is approximately five members likewise as in step with nearly 55 percent of all smallholder farmers operate less than one hectare (Abdurezak *et al.,* 2020). Thus, scarcity of land is a critical bottleneck in Ethiopia and particularly in the study area. At the same time there are also constraints (lack of capital, lack of skill, infrastructure problem and etc.) and various factors that tackle households from engaging in off-farm activities in study area. Therefore, identifying the factors affecting participation of rural households in NFA and level of income generated from it is the main issues of this paper.

Even though prior some related works are done on the determinant of rural household participation in off-farm at country level, still there aren't any empirical findings that are available on the determinant participation in off-farm and level of income from it in Tole district. This motivates the study to be conducted on factors affects participation of rural household in off-farm and level of income from it. Therefore, this study was aimed to analyze the determinants of rural household participation in off-farm and their level income generated from off-farm activities within the study area. The study would broaden rural households' understanding of off-farming activities and motivate the agricultural non-participant farmers to actively participate in off-farm activities to boost way of their living standards.

1.2. Statement of the Problem

In many rural areas of Africa and elsewhere, people engage in off-farm activities to supplement their scrimpy agricultural economy or as a primary means of livelihood. While the rural off-farm economy is usually neglected in policy debates, it has grown too large to ignore. The off-farm economy accounts for about 37 percent of rural incomes in Africa, while it goes even beyond 50 percent in Asia and Latin America (Fox and Gandhi, 2021).

Compositionally, the rural off-farm economy consists of a highly heterogeneous collection of trading, agro-processing, manufacturing, commercial, and mining activities. The type of activities, the scale of operation, their production mix, and the way of production vary across locations and among households, and thus, impacts on livelihoods vary in the same manner.

In Ethiopia, over 75 percent of the households have landholdings of one and bellow one hectare, and are cultivating only once. Rapid population growth has resulted in too small and fragmented land holdings, reducing labor marginal productivity and causing widespread unemployment over the nation and pushes the household to diversify their source of income because small landholding doesn't allow the farm household to stay in agriculture only. Due to the seasonal nature of agricultural production, rural labor cannot be employed throughout the year unless rural off-farm activities are widely developed. A study by Getahun et al. (2023) find that, rural households diversify their activities into off-farm and off-farm activities to reduce the diverse forms of risks and uncertainties associated with farming; create a way of smoothing their income over the years and seasons; and reduce their vulnerability to different kinds of shocks, seasonality, and trends. The income from off-farm activities contribute more for improving food security and well-being of the society and also the household who participated in the off-farm activities have more consumption expenditure and higher total income than non-participants (Ba *et al.,* 2021, Bui and Hoang, 2021, Mohapatra and Giri, 2019).

Having insufficient capital to launch a business prevents many rural households from engaging in non-farm activities. Several individuals remain in poverty because they engage in less non-farm activities. Hence, to inform and adjust policies in rural areas, policy makers need to determine the factors affecting access to and income from non-farm activities (Reardon et al., 2007).

The rural off-farm sector in Ethiopia is not an adequately researched component of the rural economy and knowledge about the determinants of participation and income generated in the broader development process is relatively little. Being part of the zone, the study area is characterized by rural HHS who engages in off-farm activities which are undertaken to generate additional income and improve their well-being. But, there is no empirical research that supports the existing off-farm and off-farm employment opportunities practiced by the

farmers in the area. From different literature only few researches have been dealt with rural off-farm activities and role of off-farm activities improving rural household total income.

According to (Demissie and Legesse, 2013) in East Hararghe Zone indicated that there is high level of participation in off-farm income activities, but it has insignificant contribution to the household total incomes as compared to farm income. Moreover they also recommended that it is important to support both agriculture and non-agriculture sector in order to achieve success in poverty reduction and food security. Provision of credit, training, infrastructure and promotion of employments opportunity are an important tools to tackle those factors that makes smallholder famers not to participate in off-farm activity.

Thus, even thorough (Demissie and Legesse, 2013) tries to identify determinant of income diversification among rural household in one of the most drought risk prone district in southwestern Ethiopia. This study also attempt to explore the factors that affect farmers to engage in off-farm income generating activities in the chronically food insecure kebles of the Tole in providing employments and income diversification opportunities. Moreover this study attempts to fill the gap through addressing the following question: what are determinants of smallholder farm households' to engage in off-farm activities in the study area? What factors determine the level of income of farm household from off-farm activities in the study area.

Many rural households are not undertaking off-farm activities due to lack of asset to start the business. Others are confined with less important activities that cannot allow them to grow out of poverty. Thus, identification of the factors determining access and income from off-farm activities is crucial for strategies to inform and adjust decision in the rural domain (Reardon *et al.,* 2007)

Most households in the district rely on rain fed agriculture for their livelihood, but population growth has led to fragmentation of available arable land, and average farm size has dropped below one hectare. The traditional development approach of providing technology and infrastructure to increase agricultural production has not succeeded in curbing the trend of increasing poverty, and alternative sources of productive employment must be sought in order to support the additional workforce created by population growth (Van Den Berg and Kumbi,

2006). Traditionally the rural economy was considered as purely agriculture. Hence policy makers at national levels equate improving the rural economy with promoting and supporting agriculture (Csaki and de Haan, 2003). Therefore this Research was done to contribute to understanding on the determinants of off-farm participation and describes the characteristics of off-farm activities to the area in particular and for the Oromia region in general. Previous studies on a range of non-farm activities were conducted in Ethiopia. However, their research did not cover the entire country, including the study area. The variables affecting rural households' income diversification in the district of southwest Ethiopia are investigated (Demissie and Legesse, 2013). Furthermore, there are no studies conducted in the Tole district on this topic or in the study area. Thus, this study aims to close a research gap by identifying the variables influencing the participation in and overall income from non-farm activities in the study area. To create jobs and opportunities for income diversification, this study also looks into the factors that influence farmers in the Tole district to engage in non-farm activities.

Kumar et al. (2020) showed that non-farm activities can play a major role in improving the well-being of the rural population. Apart from the fact that non-farm households earn more overall and spend more on consumption than households that do not engage in these activities, the income generated by these activities also contributes more to food security and societal well-being (Ba et al., 2021, Bui and Hoang, 2021, Mohapatra and Giri, 2019). Having sources of income outside of agriculture is also crucial for farm households, as agricultural income is susceptible to different types of shocks.

1.3. Objectives of the Study

1.3.1. General objective

The general objective of the study is to analyze the level and extent of participation'' of smallholder farmers' in off-farm activities in the study area.

1.3.2. Specific objectives

1. To analyses determinants of smallholder farmers' participation decisions in off-farm activities in the study area and
2. To identify factors affecting smallholder farmers' level of income from off-farm activities in the study area.

1.4. Research Questions

The main research questions of the study were:

1. What are the determinants of smallholder farm households' to participate in off-farm activities in the study area?
2. What factors determine the level of income of farm household from off-farm activities in the study area?

1.5. Significance of the Study

The study focuses on the determinants of smallholder farmers' participation's in off-farm activities and the income from off-farm activities. This study is a base line study that provided useful economic information for government, governmental, non- governmental organizations and others whoever wants to intervene in promotion of community-based development strategies and provide useful economic information that contributes to literature on households' decisions to engage in off-farm activities by smallholder farmers. The study has focused on identification of the significant factors that affect households' decision to participate on off-farm activities by using off-farm income as dependent variable that would help the south west Shoa zone in designing effective programs to boost households' income in the short term and the economy of Ethiopia in the long term through policy adjustment. It would also important to create awareness about the use of off-farm activities in livelihood diversification strategies of the smallholders to increase income and improve living conditions.

The study contributes to the understanding of the determinants of smallholder farmers' participation decision in off-farm activities and income the household derive from the off-farm activities. Results of this study will be important in providing information for governmental and non-governmental bodies who are working on off-farm activities for sustainable rural livelihood diversification. Moreover, it hopes to contribute to understand better the forces that drive change in rural off-farm economy, participation constraints and income generated from the off-farm activities.

1.6. Scope and Limitations of the Study

The study is limited to Tole district in identifying the determinants of participation decision of smallholder farmer's and the income from off-farm activities and to provide policy implications for policy maker in the study area. The participation in different types of off-farm activities and the income from each activity in a wider scope are not addressed by this study due to limited available resource. Since the conclusions are delineated to the study area, it may not represent the whole zone and other areas in general. So, future researchers may include other districts to generalize the findings and also to compare the results across the districts when it was practical. There will be employed random sample selection of the farm households to select representative samples from the population to address the determinants of participation decision and the income generated from participation in the study area.

1.7. Organization the Thesis

This research is divided into five chapters. The first chapter's introduction part covers the topic, issues that need to be investigated, the significance of the study, the gap that this research will fill, and the goal of the investigation. The second chapter reviews the literature and includes the findings, recommendations, and methods of earlier studies. The methodology and materials utilized in this investigation are covered in Chapter 3. The outcome and discussion are included in Chapter 4. Policy implications and a conclusion are included in the final chapter.

2. LITERATUREREVIEW

2.1 Definitions and Concepts of Off-farm Activities

The concept "off-farm income" is defined in many ways by different authors. Lanjouw and Lanjouw (2001) defined it as; the off-farm sector refers to all other activities outside the farm sector and agricultural wage employment. Off-farm activities are important to the livelihoods of rural households and should occupy a central position in policies addressing the development problems in Africa (Mulia *et al.,* 2021). The short-term effects of off-farm income on farm household food security are reasonably clear. Off-farm incomes provide the cash that allows a farm household to get food during a drought or after a harvest shortfall. Off-farm income is additionally a source of farm household savings, used for food purchases in difficult times. On the long-term effects on food security, however, there's relatively little empirical evidence and what exists is in conclusive(Carletto *et al.,* 2013).

Off-farm activities: Off-farm activities, defined as the participation of individuals in remunerative work away from a plot of land. It has been considered as an alternative income source for the agricultural sector and as an essential way to increase overall rural economic activity and employment in many developing countries (Man and Sadiya, 2012).

Off-farm income mainly refers to wage or exchange of labour in cash or in-kind away from one's own land within agriculture. It also includes some self-employment in natural resource extraction activities (Zu *et al.,* 2017).

Participation: Participation refers to taking or having a part in activities in various events often with others (Holmes *et al.,* 2019). If there is a need there is participation. It was not possible to investigate into all kinds of participation by the rural women. Accordingly possible kinds of participation's are participation in various agricultural/on-farm activities, and Participation in various non-agricultural/off-farm activities.

Household income: consists of all receipts in cash, in kind or in services that are received by the household or by individual members of the household at annual or more frequent intervals, but excludes windfall gains and other such irregular and typically one-time

receipts(Tenand *et al.,* 2020). “Off-farm” or “non-agricultural activities” includes all activities outside the agricultural sector, regardless of location.

Tilahun et al. (2019) defined off-farm activities as all rural businesses that pursue market oriented non-primary productive activities, including transformation, transport and marketing of primary products, mining, manufacturing, commerce, transportation and other services. So those who commute to a job in a nearby urban center are considered to be rural off-farm workers because the work is out of primary productive economic activities. According to Drall and Mandal (2020), off-farm activities in which farm household participates can be categorized into wage employment and self-employment activities. Three types of wage employment can be distinguished, namely paid development work, manual off-farm work and non-manual (skilled) off-farm work. Paid development work involves jobs in community micro dam construction, community soil and water conservation works such as construction of terraces and a forestation, and other community works done under the food for-work program. Manual off-farm work is an activity in which farm households work for private and public construction companies in urban and per-urban areas. Non-manual (skilled off-farm activities involve masonry, carpentry and cementing in public and private construction sites. Off-farm self-employment comprises mainly petty trade, transporting by animals on their back, stone mining, pottery and handicrafts, selling of wood and charcoal, local brewery and selling of fruits.).

Kassie (2017) distinguishes off-farm income from off-farm income in that the former refers typically to income of wage or exchange labor on other farms (i.e. within agriculture), whereas “off-farm” income sources are also identified as “non-agricultural” income sources which include off-farm wage employment, off-farm rural self-employment, and other income, such as remittance, pension and rental income, contrary to the farm income where it refers to income generated from own farming. Similar distinction is made by (Gada, 2021). For most rural people in developing and transitional economies therefore, off-farm economic activities (NFEAs) are part of a diversified livelihood portfolio.

2.2. Challenges of Off-farm Employment

Constraints to the development of small and micro enterprises can be categorized as: general infrastructure problem and firm-specific financial and economic problems. The infrastructure problem arises from the low quality and insufficient supplies of roads, electric power and telephone lines. In cottage handicrafts and small scale manufacturing enterprises, the major problem is lack of sufficient initial capital. The other problem is lack of adequate skills to start the enterprise for cottage manufacturing enterprises and lack of supply of raw materials and working premises. The experience in Tigray, as suggested by Woldehanna (2000), reveals that a few small scale and cottage manufacturing industries are not working at full capacity. The main reason reported were absence of market demand for the products, shortage of raw materials and lack of working capital. The survey conducted by the Ministry of Labor and Social Affairs showed that off-farm activities in Ethiopia are constrained by a number of problems. The most important problems are lack of credit, low market price, overlapping farm work, high price of raw materials, and lack of tools or equipment and low profit.
In addition, Sorensen (2003) has summarized the constraints of off-farm sector in the Amhara region as follows: cultural bias towards craft and commerce, insecurity and repression, poverty-and illiteracy, the aid dependency syndrome, the lack of market opportunities, inefficient infrastructure and environment

The study of (Beneberu *et al.,* 2016) that studied on the challenges and prospects of farm and off-farm livelihood strategies of smallholder farmers in Yayu Biosphere Reserve, Ethiopia explained that they have encountered several challenges in their engagement in off-farm livelihood options. Some of the main challenges include: scarcity of capital to start up a off-farm business, limited time to be involved in this sector, requirements of additional land for certain off-farm businesses, lack of skill and knowledge that fit to the demand of profitable off-farm businesses. In addition, some superstitious beliefs discouraged the involvement of families in some off-farm sectors such as pottery and blacksmith.

2.3. Off-farm Employment in Ethiopia

According to Woldehanna (2000), off-farm activities in which farm household participates can be categorized into wage employment and self-employment activities. Three types of

wage employment can be distinguished, namely paid development work, manual off-farm work, and non-manual (skilled) off-farm work. Paid development work involves jobs in community micro dam construction, community soil and water conservation works such as construction of terraces and afforestation, and other community works done under the food-for- work program. Manual off-farm work is an activity in which farm households work for private and public construction companies in urban and semi-urban areas. Non-manual (skilled) off-farm work involves masonry, carpentry and cementing in public and private construction sites. Off-farm self-employment comprises mainly petty trade, transporting by animals on their back, stone mining, pottery and handicrafts, selling of wood and charcoal, local brewery and selling of fruits.

In Ethiopia, the complex inter linkages among poverty, population pressure, institutional failure and environmental degradation cause shrinkage of land holdings that led to farm fragmentation, landlessness and expansion of farming to steeper and marginal lands (Kassie *et al.,* 2017a). In Ethiopia, participation into off-farm activities is increasing among rural households. According to Nagler and Naudé (2017) off-farm enterprise makes considerable contributions to rural income and approximately 25% of all households in rural Ethiopia own one or more off-farm enterprises, however, about 2% of households exclusively rely on off-farm enterprises. Off-farm activity in Ethiopia includes wage work and self-employment. Wage work, in turn, includes farm wage work, professional wage work, skilled labour (e.g. mechanics), unskilled wage work, and community work. The employers could be small and/or commercial farmers, NGOs, government organizations, urban dwellers, religious institution, and contractors. Self-employment includes milling, weaving, handicraft, trade in grain and livestock, collecting and selling firewood and selling local food and drinks. Enterprises dealing with milling, livestock and grain trade are relatively profitable. The off-farm activities in Ethiopia are almost labour intensive.

The study conducted by Bezu and Barrett (2012) on employment dynamics in the rural off-farm sector in Ethiopia also identified that initial asset holdings and access to saving and credit are important factors for transition into high-return rural off-farm employment and that households‟ participation in high return rural off-farm activities is robust to their experience of health shocks. However, shocks that affect their wealth or liquidity may trigger descents

into low-return off-farm employment. On the other hand, shocks that reduce agricultural income motivate transitions into high-return rural off-farm employment. Bezu and Holden (2014) Also studied on rural youth and employment in Ethiopia. They found out that youth (ages 25 to 34 years) have a greater probability of working in off-farm enterprises compared to mature individuals (age 35-64). However, wage labor opportunities remain scant in rural Ethiopia.

The majority of individuals working in off-farm employment are engaged in small-scale trade activities. The push factors are at play with regards to non- farm diversification, whereby those that live in less favorable agricultural potential areas with fewer assets, such as livestock, and less access to agricultural credit are more likely to seek off-farm work. While this research provides evidence that selected youth are engaged in off farm labor opportunities, however, a low proportion of the rural population, including youth, has diversified into other activities outside of agriculture. Low demand for higher-skilled labor remains a major obstacle to achieving structural transformation in Ethiopia in the near to medium term. In addition, the study of Ayenew et al. (2016) that conducted on rural off-farm sector, agricultural self-employment and wage employment in agricultural households in Ethiopia explained that the off-farm sector improves the income of the agricultural households, and serve as risk mitigation tool in rural Ethiopia. Combining the off-farm sector with hiring labor for agricultural activities at times of labor shortage increases the variance and contributes to positive skewness of income. The rural off-farm sector could serve as a key development pathway for improving livelihood in the predominantly smallholder production system in Ethiopia.

2.4. Review of Empirical Studies

Individuals and households in rural areas are differently positioned in terms of their ability and motivations to participate in different types of off-farm activities. Decisions of rural households concerning involvement in RNF activities depend on two main factors, i.e. incentives offered and household capacity (Demie and Zeray, 2015). Various studies have been carried out with the aim to provide more information on access constraints faced by poor

people seeking to work in the RNF economy. Some of the constraints identified may be equally applicable to participation in wage labor in the farm sector.

Demographic characteristics create the need and condition for off-farm activities. The need arises because an increased man-land ratio leads to increased demand for off-farm activities in order to generate cash income. The presence of adult persons in the household who are capable of participating in off-farm activity is also an essential requirement. Off-farm activity leather crafts of artisans requires some skill and training, hence, households with some skill and training are expected to be engaged in off-farm activities than others. Households at different locations from market center have different opportunities in terms of input supply that may be used in off-farm activity and demand for their products. Proximity to urban center is expected to stimulate off-farm activities (Oladimeji *et al.,* 2015).

2.5. Determinants of Participation in Off-farm Activities

Empirical studies in related to the factors affecting the household participation in off-farm activities are, however, limited in Ethiopia; though recently researchers are showing interest and hence carrying out a few studies Mainly there are two opposing factors to the entry of off-farm. These are distress push diversification and demand-pull diversification. Distress-push diversification, according to Robaa and Tolossa (2016), typically occurs in an environment of risk, market imperfections, and of hidden agricultural unemployment, and is typically triggered by economic adversity, which sets the household on a downward income trajectory. It implies engaging in economic activities that are less productive than agricultural production could be on a full- employment basis, and is motivated by the need to avoid further income decrease. Demand-pull diversification, on the other hand, is characterized as a response to evolving market or technological opportunities, training, credit facilities, and coaching, which offer the opportunity of increasing labor productivity and household incomes.

Damena and Habte (2017) Investigated the link between household livelihood and off-farm employment and income from off-farm using the survey data collected from 170 systematically selected households from four villages of Moyale district, Oromia National Regional state, Southern Ethiopia. By using Probit and Heckman selection model (two stage)

to examine, the household decision with respect to participation in off-farm employment using probit model, the researcher found that age, family size, credit, livestock holding, education ,marital status , distance to market and main road are the most influencing variables in determining households to participate in off-farm activities. Further, the effect of off-farm income on rural household livelihood is examined.

Demissie and Legesse (2013) employed Multinomial logit model was used to pinpoint factors influencing smallholder farmers households‟ participation in non/off-farm activities in Fedis district, Eastern Hararghe zone, Ethiopia. The result of multinomial logit model showed that there is disparity in the effect of explanatory variables on participation decision of households in non/off-farm wage and self-employment activities. Sex, age and education of household head, number of economically active family members, and number of children attending school significantly affected participation into wage employment activities. Gecho (2017) also applied Binary logit model to investigate factors influencing the rural farm households‟ participation in income diversification in Wolaita zone, Southern Ethiopia. The model result indicated that the education of household head, farm income and participation in local leadership influenced positively and significantly farmers participation in income diversification activities, while the ownership of livestock in TLU, sex, total farm size, oxen ownership and market distance negatively and significantly affected the diversification of income into off-farm, off-farm and combining off-farm and off-farm activities.

2.6. Determinants of the Level of Income from participating in Off-farm Activities

Estimation of the Tobit model revealed that having access to credit, better land size, livestock and number of adults in the household significantly and positively influenced the share of income from rural off-farm activities employment (RNFE). It was also found that age and sex (male) of household head had positive effect on the share of income from RNFE. Training's on off-farm activities of household head significantly and positively affected participant total income level from sole off-farm activities. This implies that household heads with training's on off-farm activities were found to have better information and knowledge to participate and earn better income from off-farm activities than those no trained sample households. Therefore, efforts should be made in improving skill and knowledge of farmers through

provision of training. Berg and Adefris and Woldeyohannes (2021b) have used a multivariate probit model to estimate the relation between poverty and participation in off-farm sector in Oromia region, Ethiopia. Off-farm activities were dis-aggregated in to three: hand crafts, food and drink and trade. Their result indicates, own cultivated land, which represents for rural households productive asset has a negative and significant effect on participation across the three off-farm activities. Haile (2012) on his study made in Kyrgyz republic has tried to identify the determinants of individual participation in pure off-farm and a mixture of farm and off-farm activities based on a multinomial logit regression analysis (where pure agricultural activities is the choice comparison). Results show that push factors like availability of small land size and poor land quality make individuals choose off-farm activities over agricultural activities.

Multiple motives prompt households and individuals to diversify assets, incomes, and activities. Participation in off-farm activities may be derived by limited risk bearing capacity in the presence of incomplete or weak financial systems that create strong incentives to select a portfolio of activities in order to stabilize income flows and consumption, by constraints in labour and land markets, and by climatic uncertainty (Kassie *et al.,* 2017b). It will be found that for a vast majority of the rural population, engaging in off-farm activities was distress driven (Pandi, 2015). In developing countries, farm households allocate their labour to off-farm income diversification activities for the following reasons: to reduce income risk by diversifying ex ante; to maintain food security (income and consumption) in the face of low farm productivity and income shocks such as drought, by diversifying ex post, in the face of insurance market failure; and to earn cash income to finance farm investments, in the face of credit market failure (Kassie, 2017).

2.7. Conceptual Framework

The decision of rural households to participate in off-farm activities is determined by individual or household specific factors, as well as other social, economic and environmental factors (Odoh and Nwibo, 2017). The purpose of participation's in off-farm activities of smallholder farmers is to reduce poverty and curtail the amounts of households found in insecure food situations. Given increasing the amounts of populations in the country and

decreasing of land holding coupled with weather conditions hardships the agricultural productions are unable to feed and sustain the developments of and standards of living of the smallholder farmers. Due to this, it is important to identify the determinants of off-farm activities participation of smallholder farmers. Entry barriers these are constraints that inhibits some interested household members' from participating in off-farm activities, particularly the poor ones. Such barriers include lack of access to social capital, financial capital and market information. Access to social capital is measured by the proportion of household members that are registered with various forms of associations. Access to formal credit is measured by the share of household members that had access to formal credit. Proximity to market and distance from main road is measured in terms of an hours of household to the nearest product and input market and main road (in voyage hours).Off-farm income is thus particularly important where farming income is in sufficient, for example due to poor agro-ecological conditions, low prices, crop and animal diseases or limited land availability. Such are generally households with little or no land, livestock or other material resources, and limited education (Neudert *et al.,* 2015). Based on these empirical reviews the conceptual frame work that tries to link the major factors determining household's decision to participate in off-farm income generating activities presented as follows. The factors can be grouped in to household features (age, sex and educational level of household head and dependency ratio), Socioeconomic features (availability of economically active labor, livestock ownership, total land size and total annual income) as well as institutional factors (Credit used by household head, Distance from urban market center, mass media and Savings).Based on this, the systematic representations activities, although the conceptual frameworks for this study are structured as follows.

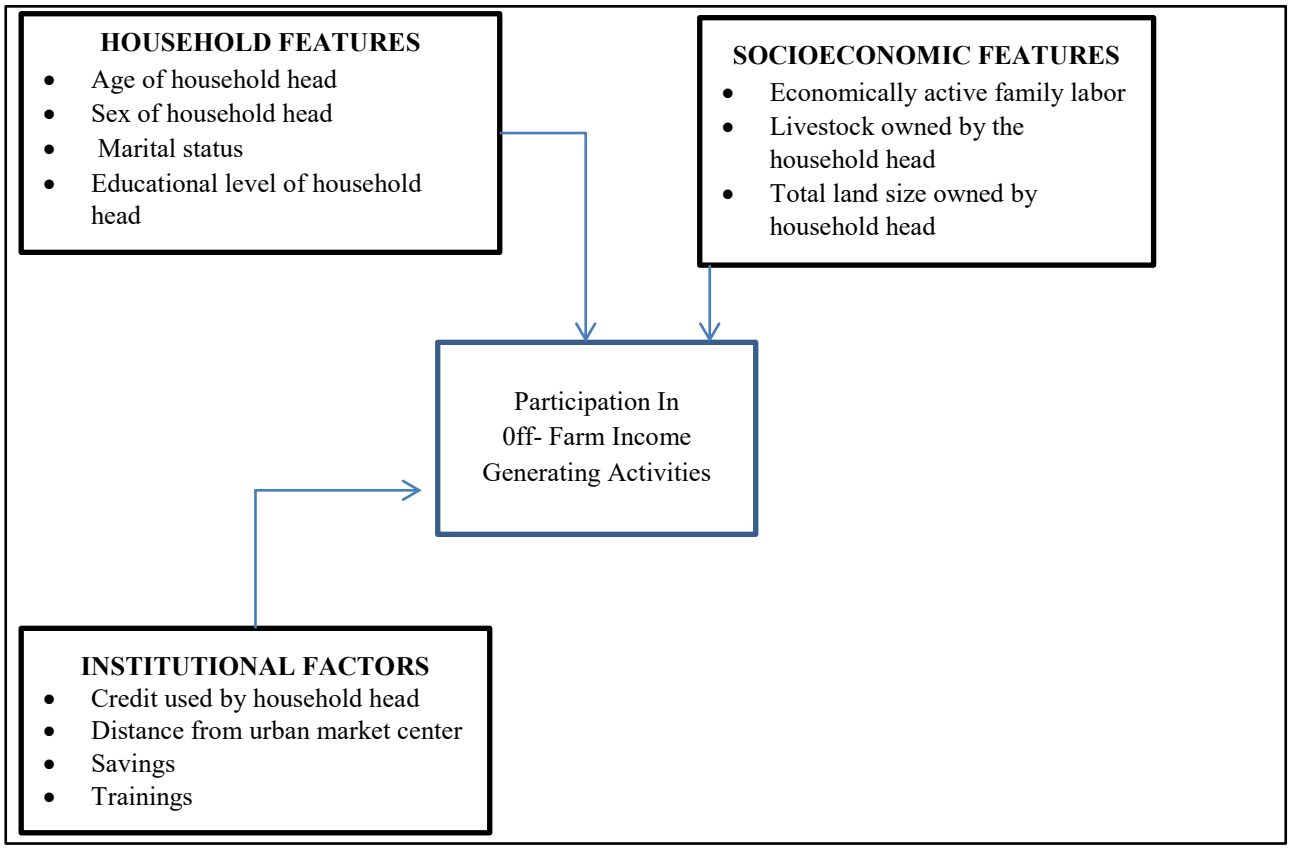

Figure 1| the conceptual framework

Source: own sketch

3. METHODOLOGY

3.1 Description of the Study Area

The Tole district is east of the administrative town of Woliso and southwest of Addis Ababa's capital city. Bantu, which is 85 kilometers southwest of Addis Ababa and 80 kilometers east of the zonal administrative town of Woliso, has served as the district administrative town since 1936. There are 24 kebeles in the district: 22 are rural and 2 are urban. Tole district's entire size is only 41,019 hectares (WQMBAT, 2023), or 6% of the zonal area, and it is situated between 80 28" and 80 47" N and 380 17" 12" and 380 29" E. Its neighbors include Kokir to the southwest, Bacho to the west, Elu to the northwest, the Awash River to the northeast, which divides it from Sebeta Hawas, and Kersana Kondaltiti to the east and south.

According to data from (WQMAT ,2017), this district has an estimated total population of 62,252, of which 30,960 are men and 31,292 are women; 2,272 or 3.65% of its residents, which is less than the zone average of 12.3%, live in cities. . There are just two agro climatic zones in Tole district: Dega (temperate climate) and Woina Dega (sub-tropical climate), which make up 20% and 80% of the area, respectively. Its yearly rainfall ranges from 1600 mm to 200 mm, and its average temperature ranges from 180 °C to 200 °C.(Tole district agricultural office, 2023).

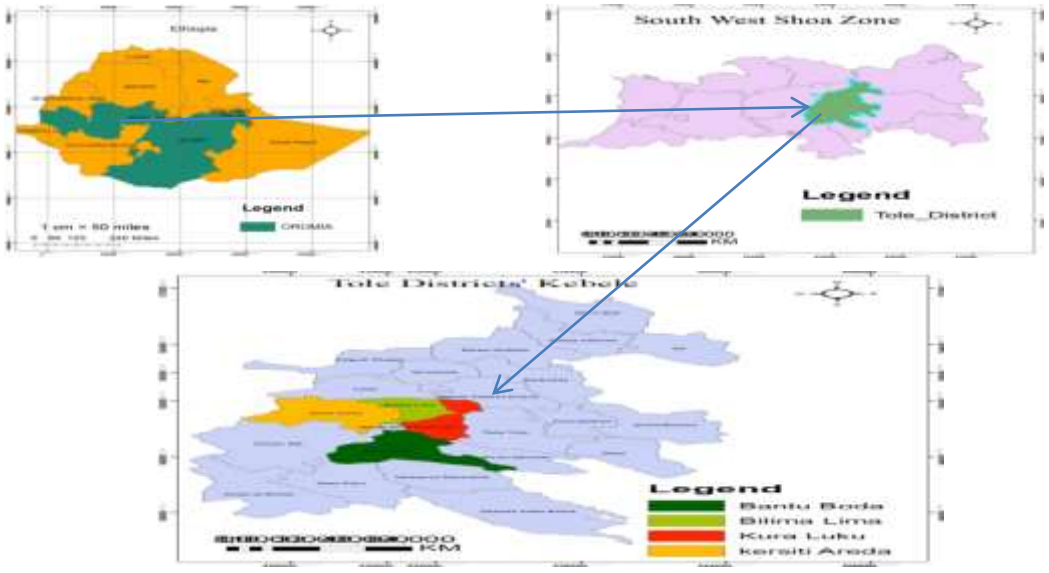

Figure 2| Map of the study area,

Source: *Drawn using GIS (2023).*

3.2. Research Design

A cross-sectional survey research design was employed to study the determinants of off-farm participation decision of smallholder farmers, the level of income of off-farm participation of smallholder farmers' in Tole District. In order to achieve the proposed objective, both qualitative and quantitative data from primary and secondary sources were collected at the same time. In order to select sample kebele and respondents, consultation was carried out with agriculture experts from the district office.

3.3 Type and Sources of Data

Both quantitative and qualitative data were collected from primary and secondary data sources to meet objectives. Primary data were collected from households using a semi-structured questionnaire. In addition, discussions were held with elders and key informants to access detailed information. Formal and informal methods of data collection are employed. Formal data collections were used by employing a semi-structured questionnaire, which was administered by enumerators to collect data on various social, institutional, and economic variables from the sample respondents. The informal method consists of group discussions by the authors with farmers, development agents, relevant agricultural professionals, and administration officers at all levels. Secondary sources included published and unpublished materials about farm and off-farm activities. It was collected from relevant sources, such as reports, socio-economic survey documents of the area, maps, and books.

3.4. Sampling Procedure and Sample size determination

This study was carried out in the south-west Shoa Zone, Tole district. Two stage sampling procedures were used to select sample households. At the first stage, out of 24 smallholder farmer kebeles in Tole district, four were selected by using a simple random sampling procedure since the populations are homogeneous in terms of off-farm activities across the sample kebeles. In the second stage, using the population list of sampled Kebele farming Households were selected randomly using a probability proportional from each sample Kebeles. 154 sample households were selected from the four kebeles of household data with the help of the representatives sample size. Finally, representative sample size was determined

based on Yamane's (1967) formula at 92% confidence level and level of precision is 8% (0.08).$\boldsymbol{n = \frac{N}{(1+N(e^2))}}$

$$\boldsymbol{n = \frac{8967}{(1+8967(0.08^2))} = 154} \quad (1)$$

Therefore, 154 sample households were selected for face to face interview. Therefore, n = is the sample size of households that was taken in the Kebeles, N = is the total numbers of farming Households of the kebeles and e = 0.08 is the level of precision. The total number of farming households of the 4 kebeles is 8967. Moreover, Yamane's formula was used because of its homogenous type of population in the study. We used an 8% precision level in order to reduce the sample size. We used this amount, saving time and handling data effectively, within the allocated budget. In a homogeneous community, bias would not arise from decreasing the precision level of sampling. Probability proportional to size was used to determine sample sizes from each Kebeles and distribution as follows.

Table 1| Distribution of sample households across sample kebeles

Name of sampled kebeles	Total Number of farming Households	Proportion Sampled households (%)	Number of sampled households
Bili Malima	2238	24.958%	38
Kursiti And Areda Leqa	2242	25.003%	39
Bantu Boda	2244	25.025%	38
Kura Lukku	2243	25.014%	39
Total	8967	100%	154

Source: Tole District of agricultural office data, 2023.

3.5. Methods of data collection

Questionnaire was developed and pretested before data collection. Likewise, Separate Questionnaires was designed for, off-farm activities in order to obtain relevant information related to objectives of the study. Data related to demographic characteristics, socioeconomic factor and institutional factor were gathered through semi- structured interview schedule.

Focus group discussion and field observation were also undertaken during primary data collection in the study area. Additionally, secondary data analysis were employed in order to collect secondary data from published and unpublished materials, articles, related literature and government and non-government organizational report to support primary data.

3.6. Methods of Data Analysis

Two types of data analysis, namely descriptive statistics and econometric model was used for analyzing the data. Descriptive statistics analysis methods such as frequency, mean, percentages and standard deviations was used to describe characteristics of sample households. While the inferential statistics such as t-test and chi-square test were employed to compare participants and non-participants on off-farm activities. Econometric models analysis was involve the use of the Heckman two stages. The statistical analysis for the survey was carried out by using statistical package for social science (SPSS) version 20, Stata version 14 and Microsoft Excel Spread sheet software.

3.6.1. Descriptive statistics

Descriptive statistics give a clear picture of the characteristics of farm and off-farm sample units. By applying descriptive statistics, one can describe, compare, and contrast different categories of sample unit (farm and non-form households) with respect to the desired characteristics. In this study, descriptive statistics, such as mean, standard deviation, percentages, frequency of occurrence, and percentage, were used, along with econometric model, to analyze the data. For a comparison chi-square for dummy variables and t-test for continuous variables were used.

3.6.2 Econometrics model

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 activities. 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)

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.

Probit model was being employed to identify the determinants of smallholder farmer's participation in off-farm activities.. The probability of participation in off-farm activities given the explanatory variables is captured by running a probit regression model. In this model, the response variable is binary, taking only two values, 1 if the household participate in off-farm activity, 0 if not.

The participation in off-farm activities is determined by different explanatory variables. This is expressed by

$$hi = Xi\beta i + ui$$

Where; Household participation hi is dependent variable, Xi is explanatory variable, ui is denotes error term.

As before, let hi =1 if the household participate in off-farm activities and hi =0 if it does not. Reasonable to assume that there is a critical or threshold level of the index, call it h*, such that if hi exceeds hi *, the household participate, otherwise it did not. The threshold h* , like hi , is not observable, but if we assume that it is normally distributed with the same mean and variance, it is possible not only to estimate the parameters of the index but also to get some information about the unobservable index itself. This calculation is as follows; given the assumption of normality, the probability that h * is less than or equal to h can be computed from the standardized normal CDF.

$$Pi = P(hi = 1 \mid Xi = P(h^*i \leq hi) = P(Zi \leq \beta 1Xi) = F(\beta 1Xi) \qquad 2$$

Xi denotes explanatory variables in equation one, Where P (hi =1|Xi) means the probability that an event occurs given the value(s) of the Xi, or explanatory variable(s) and where Zi is the standard normal variable, i.e., Z ~ N (0, σ2). F is the standard normal CDF, which is written as follows (Green 2005).

$$P^{*}i = F(hi) \qquad = \frac{1}{2\pi}\int_{-\infty}^{Xi} e\frac{-2^{2}}{2}d2 \qquad 3$$

P_i* cannot be observed; it can only be observed if the farmer works off-farm or not. Then p_i = 1 if p* > 0, p_i = 0 otherwise. For the probit estimation models, marginal effects are reported, instead of the raw coefficient, to make interpretation of the coefficients easier.

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.

The second stage of the Heckman procedure applied for analyzing individual and household factors influencing the probability of change in income in off-farm activity using the Tobit model is shown in the below equation.

3.7 Hypothesis and Definition of Working Variables

Different variables are expected to affect households' participation decision and level of income generated from off-farm activities participation's in the study area. The variables hypothesized to affect participation in off-farm activities and incomes generated from off-farm activities are the following.

Dependent Variables The study has two dependent variables.

Participation Decision: It is a dummy variable that takes a value 1 if the farmer has the probability to participate in off-farm activities and 0 otherwise.

Total annual off-farm income: It is a continuous variable which represents the total amount of off-farm income earned by participant in Ethiopian birr and which is conditional on the probability of participation in off-farm activities.

Independent variables: Based on literature review and past experience, the following factors are expected to influence participation in off-farm income generating activities.

Age of household head: The role of a framer's age in explaining farmer's participation in off-farm activity is somewhat controversial in the literature. Whatever the condition, it is important to include age as a factor that would help explain farmer's participation in off-farm activity. It is measured in number of years from birth. It is assumed that as farmer age increases the probability of participation in off-farm activity is expected to decrease because as the farmer's age increases, it is expected that the farmer becomes conservative (Danso-Abbeam *et al.,* 2020).

Sex of household head: It refers to the sex of the household (male=1, female=0). Gender difference is found to be one of the factors influencing farmer's participation in off-farm activity. Due to many socio-cultural values and norms, males have freedom of mobility and participation in different extension programs and consequently have greater access to information which helps them for the participation in off-farm activity. According to Zheng et al. (2023) Sex of the household head has significantly and positively affected off-farm self-employment income at 5% level of significance revealing that male household heads earned more income than the female headed ones.

Educational level of household head: It is a dummy variable that takes the value of 1 for primary, 2 for secondary, 3 for higher and 0 for illiterate. According to Challa et al. (2019) Education level of household head was a significant and positive determinant of non/off-farm self-employment income at 5% significance level. It is presumed that household heads with formal education are better in their perceptive values, knowledge and decision making ability to participate into rewarding self-employment activities and earn better income than the

illiterate households. From this I was hypothesized that whether it has negative or positive influence on off-farm activities participation decision and its effect on total income level in the study area.

Family size: is the total no of individuals living in the same household. It includes both the dependent and independent members. Dependent members are of children under age 15 and old age of above 64. The existence of large dependency ration in the family could reduce the availability of capital of the household by increasing consumption. Saba et al. (2022) also identified that family size is positively and significantly affects likelihood of participation in off-farm wage employment. Thus, it is hypothesized that the family were positive relation with participation in NFIGS.

Livestock owned by the household: It is defined as the number of livestock a household has in Tropical Livestock Unit (TLU). In rural context, livestock holding is an important indicator of household's wealth position. Based on this assumption this variable was hypothesized to have positive relation with farmer's participation in off-farm activity (Saba *et al.,* 2022).
Dufera et al. (2023) found out that livestock holdings have positively and significantly influenced smallholder farmers‟ participation in multiple self-wage employment activities. Households with more livestock holding do have the capacity to participate in lucrative non/off-farm employment activities, putting them in a better position than those households with no or small size livestock holding. It is therefore, expected to have a positive relationship with the off-farm participation. This is because households who participate in off-farm activities are expected to have more wealth which helps them to diversify income sources.

Total land size owned by the household: It is the size of the land in hectare which includes cultivated, garden and grazing land. Farmers who have more land to cultivate or to use for generating extra income by land renting and sharecropping expected to engage in off-farm activities as they have more resources. According to Leza (2019), Tobit analysis revealed that, for participant households, non/off-farm self-employment income is significantly and positively influenced by the size of cultivated land. Anang et al. (2020) also revealed that cultivated land size is significantly and positively influenced the rural household off-farm

participation. Therefore, the total land owned is hypothesized to be related to off-farm activities involvement positively.

Credit used by household: It is dummy variable that can be measured by the access of credit from different sources in Birr the household used for one year. Anang et al. (2020) Also revealed that credit positively and significantly relates with off-farm self-employment participation. Ebaidalla (2022) Also identified that access to credit affect the level of income diversification of household's positively and significantly. Households who use credit are more likely to take part in off-farm self- employment activities than those who did not use. This variable is hypothesized to have positive relation with off-farm participation as it is expected to ease the financial constraints to participate in off-farm activities.

Distance from urban market center: It is the distance between household home to main urban market center in minute. Urban center encourages off-farm activities by serving as center for input sales and presenting demand for products. Kassegn and Abdinasir (2023) also revealed that distance to market influences non/off-farm self-employment income significantly and negatively. The negative sign, at conventional level of significance, shows that as the distance from homestead to market center increases, the likelihood of the household to earn non/off-farm self-employment income declines. Therefore, it is hypothesize that it is positively related with non- farm activities involvement.

Cooperative membership is a dummy-dependent variable in the model, taking a value of 1 if a farmer is a member of the cooperatives and 0 otherwise

Farm experience (FARMEX): It is a continuous variable that is measured by the number of years the household has been involved in off-farm activities.

Training on off-farm activities: It is the dummy variable and it takes 1 if the household head got training related to off-farm income generating activities and 0 other wise. Training is one of the means by which farmers acquire new knowledge and skills. Hence, participation in training is expected to positively influence farmers‟ participation in off-farm income generating activities (Kerorsa, 2022). Duga (2022) identified that both short term and long term training's affect household participation in off-farm activities. He also found that training's

positively and significantly related to on-farm plus off-farm and a combination of on-farm, off-farm, and off-farm livelihood diversification strategies. Access to training may improve rural households‟ information on off-farm opportunities. Hence, the study hypothesized that training on off-farm activities increase the probability of participation as it develops the knowledge and skills of farmers to identify feasible off-farm IGAs and do business effectively.

Extension service: It is continuous variable measured in number of contacts per annul. It creates access to information about modern agricultural production techniques that increases production and income of the household. The frequency of contact between the extensions agent and the farmers is hypothesized to be the potential force, which accelerates the effective dissemination of adequate agricultural information to the farmers, thereby enhancing farmers' decision to participation in off-farm activity. Empirical results revealed that extension contact has an influence on farm households‟ participation in off-farm activity (Tesfaye and Nayak, 2022).

Table 2 Summary of Variables and Hypothesis

Variables	Type	Measurement	Hypothesis	Sources
Dependent variables				
Participation decision	Binary	1=if participant,0=if not	+	
Total annual income	Continuous	Birr	+	
Independent variables				
Age	Continuous	Number of years	+/-	(Danso-Abbeam *et al.,* 2020)
Education level	Continuous	Years of schooling	+	Challa et al. (2019)
Family size	Continuous	Man equivalent	-/+	Saba et al. (2022)
Distance from market	Continuous	Kilometer	-	Kassegn and Abdina sir (2023
Credit use	Dummy	1=if user, 0=if not	+	Duga (2022)
Frequency of extension c ontact	Continuous	Number of contacts	+	(Tesfaye and Nayak, 2022).
Land size allocated	Continuous	Hectare	+	Leza (2019)
Total livestock owned	Continuous	TLU	+	
Cooperative membership	Dummy	Have access=1,0=otherw ise	+	(Saba *et al.,* 2022)
Farm experience	(Continuous)	Number of years	+	

4. RESULTS AND DISCUSSION

This chapter uses econometric models and descriptive statistics to give the general results and discussion of the thesis in various sections. First, descriptive findings of the overall socioeconomic, institutional, and demographic characteristics of the sampled farmers were provided. Along with the descriptive statistics, inferential statistics like the t-test and chi-square test were also computed. Finally, factors influencing smallholder farmers' likelihood of choosing to participate in off-farm activities and income from off-farm activities were discovered using econometric analysis.

4.1. Types and Annual Income from Off-farm Income Generating Activities

The types of NFIGAs that smallholder farm households in drought prone rural areas of Tole district participated in include petty trade, small hotels, livestock trade and others. Among those engaged in NFIGAs, 23.46% participated in petty trade, 3.7% participated in small hotels, 61.73% in livestock trade and 11.11% in other NFIGAs. The types of NFIGAs identified among the households participating in NFIGAs and their distributions are presented in Table 3. Results also show that petty trade, others and livestock trade are the major NFIGAs that rural households in the study area participated in. However, petty trade followed by livestock trade is the NFIGAs which fetch better income for these households. One way ANOVA result shows that there is a significant income differences between the different types of NFIGAs at 1% probability level

Table 3: Types of NFIGAs that household in the study area participated in off-farm income

Type of NFIGA	Frequency	%	Annual household income	
			Mean	SD
Livestock trade	50	61.73	10932.3	2639.56
Petty trade	19	23.46	13734.47	8759.41
Small hotel	3	3.70	7505	8.66
Others	9	11.11	6752.77	351.64

4.2. Descriptive Statistics

4.2.1. Demographic characteristics of sample households

Among the 154 sample respondents, 81 participated in off-farm income activities, while the remaining 73 did not. With the help of the t-test for continuous variables and the chi2-test for dummy variables, group comparisons of those who participated in off-farm activities and those who did not were computed. The results are shown in the following tables:

The decision to participate in off-farm activities was significantly influenced by the gender of the family head. As shown in Table 4 below, 52 (33.77%) of the sample respondents were households with a female head of household, while 102 (66.23%) were headed by a male. Comparing choices regarding off-farm activity participation, 4.94 percent of the 81 participant families had a female as the head of the household, and the remaining 95.06 percent were headed by male. Also, at a 1% level of significance, the chi-square test result revealed a significant difference between the two groups.

In terms of cooperative membership, 30(19.48%) of the sample households participated in cooperatives, compared to 124 (80.52%) of the sample households who did not. With a significant mean difference at the 5% significance level. About 74 (48.05%) of the respondents used credit, compared to 80 (51.95%) who did not use credit. With a significant mean difference at the 1% significance level, participants also receive more credit than non-participants.

Table 4: Descriptive statistics of dummy variables by participation in off-farm activities

Dummy variable		Participant		Non-participant		Total sample		X 2 – value
		N	%	N	%	N	%	
Sex of household head	Female	4	4.94	48	65.75	52	33.77	
	Male	77	95.06	25	34.25	102	66.23	63.496***
Credit use	No	26	32.1	54	73.97	80	51.95	
	Yes	55	67.9	19	26.03	74	48.05	26.97***
Cooperative membership	No	59	72.84	65	89.04	124	80.52	
	Yes	22	27.16	8	10.96	30	19.48	6.425**
Training access	No	23	28.4	64	87.67	87	56.49	
	Yes	58	71.6	9	12.33	67	43.51	54.89***
Education	Illiterate	29	35.8	59	80.82	88	57.14	
	Primary	9	11.11	14	19.18	23	14.94	
	Secondary	5	6.17	0	0	5	3.25	54.045***
	Higher and above	38	46.92	0	0	38	24.67	

Note: ***, **, * implies statistically significant at 1%, 5%, and 10% significance level respectively. N= frequency, %= percent SD= Standard Deviation

Source: Own computation (2023)

The percentage of sample household members who had received training in off-farm activities was 43.51%, compared to 56.49% of those who had not. Among all off-farm activity participants, the sample response revealed that 71.6% of sample household members had off-farm activity training, compared to 28.4% who had not. Similarly, 12.33 and 87.67% of trained and untrained respectively were from households of non-participants. At the 1% level of significance of the chi square test, participant households received greater training in off-farm activities than the non-participant sample households.

In terms of literacy level, the distribution of the entire sample of respondents revealed that 57.14 percent were illiterate, or at the very least were unable to read and write; 14.94 percent

had formal education in the primary; 3.25 percent had formal education in the secondary; and 24.67 percent had formal education in higher and above. According to the comparison of participation in off-farm activities, 35.8% of participants and 80.82% of non-participants were found to be illiterate; 11.11% of participant household heads and 19.18% of non-participants attended formal education from the primary; 6.17% of participants and 0% of non-participants attended formal education from the secondary; and 46.92% of participants in off-farm activities attended formal education from higher education and above. The chi-square test similarly demonstrates that, at the 1% level of significance, there is a significant difference in education level between participants and non-participants in this study.

Table 5 : Descriptive statistics of continuous variables by participation in off-farm activities

Continuous variable	Participant		Nonparticipant		Total Sample		t test
	Mean	SD	Mean	SD	Mean	SD	
Age	41.333	10.289	31.726	6.835	36.779	10.025	-6.747***
Farm size	1.898	0.920	0.656	1.076	1.309	1.173	-7.719***
Family size	3.326	2.013	1.746	2.107	2.577	2.199	-4.754***
Extension contact	12.234	3.613	4.246	3.875	8.448	5.468	-13.234***
Livestock ownership	6.55	4.019	2.312	2.012	4.542	3.855	-8.136***
Distance from market	18.138	19.66	56.972	37.669	36.547	35.333	8.131***
Experience	4.962	2.633	2.890	2.840	3.980	2.915	-4.697
Household Income	10998.27	5080.32	4099.49	1117.16	7728.07	5101.59	-11.35***

Note: ***, **, * implies statistically significant at 1%, 5%, and 10% significance level respectively. SD= Standard Deviation

Source: Own computation (2023)

There was a significant mean difference between off-farm activities participants and non-participants, according to a two-group mean-comparison test of the continuous variables utilized in the study. The average family size for both participants (3.33) and non-participants (1.75) is close to three persons per household, which is less than the national average of 4.6 people per household. Furthermore, the average family size differs significantly between participants and non-participants.

The sample's total numbers of respondents have an average age of 36.78 years. The sample's participating household heads have an average age of 41.33, whereas non-participating household heads have an average age of 31.73. At the 1% probability level, there is a significant mean difference between the two groups.

The mean yearly income of those who participated in the off-farm activity and those who did not varied significantly. The average yearly income for non-participating households is 4099.49 Ethiopian Birr, compared to 10998.27 Ethiopian Birr for participating households. The results of the t-test analysis showed that, at the 1% level of significance, the differences in mean yearly total income between participants and non-participants were statistically significant compared to those between the two groups.

4.3. Econometric Data Analysis

4.3.1. Factors Affecting Smallholder Farmers' Participation in Off-farm Activities

In the first stage, households decide whether they would be participating to off-farm activities or not. The decision to participate in off-farm activities was estimated by probit maximum likelihood estimator. Results of first-stage probit model estimation of the determinants of off-farm participation decision of the sampled households are given in Table 5. The model chi-square tests applying appropriate degrees of freedom indicate that the overall goodness of fit of the probit model is statistically significant at a probability of less than 1%. Out of the eleven explanatory variables, five of them were found to determine the probability of participating in off-farm activities significantly. These are: sex of household head, age, and distance from market, education and access to extension services. Explanatory variables that appeared to be statistically significant are presented and discussed here under.

Age of household head

The household head's age was shown to be significant and positively correlated with the likelihood of participating in the off-farm activities at the 5% significance level, according to the results of the probit model. The marginal effect analysis showed that, ceteris paribus, one additional year of household head age results in an average increase of 1.9% in the probability of engaging in off-farm activities. According to other studies that utilized age as a proxy for

experience, it is evident that older households in the study area had the most experience in off-farm activities. The implication is that older households can find trade partners at a lower cost than younger households because they have more experience and are thought to be wiser in resource allocation and risk management. This outcome is in line with the results of Anabo (2021) that the decision to participate in off-farm activities by households was positively correlated with the age of the household head. Saba et al. (2022) discovered a similar favorable link between the decision of households to engage in the off-farm activities and the age of the household head.

Educational status of household head

Since it is considered that increases in the household head's educational level enhance the likelihood of participation in off-farm activities, it was estimated that the household's decision to engage in off-farm activities was influenced by their statues of study in education. The empirical finding supports the hypothesis that, at the 5% level of significance, there is a positive and significant link between the educational statues of the household head and the choice to engage in off-farm activities. It demonstrates that, while other factors remain constant, if the educational statues of the household head increases, the likelihood that they were participate in to off-farm activities might raise by an average of 25%. The result is consistent with that of Li et al. (2022); Danso-Abbeam et al. (2020).

Frequency of extension contact

As predicted, the frequency of extension contacts influenced households' decisions to engage in off-farm activities favorably. The marginal effect from the probit model revealed that the frequency of household’s interaction with extension agents was shown to be statistically significant at a 5% level of significance. The findings imply that increasing interaction with extension agents by one day would, on average, enhance the probability of participating in off-farm activities by 5.5%. This finding suggests that technical advice offered to farmers by agricultural specialists, development agents, and other relevant organizations has a significant impact on households' participation in off-farm activities. Ojo and Baiyegunhi (2020) findings, which suggested a relationship between the frequency of extension contact and involvement choices for engage in off-farm activities, are supported by the findings of this study.

Distance from the nearest market

The proximity of the households to the nearest market was thought to have an impact on their involvement in off-farm activities. As previously expected, the first stage result demonstrates a negative and statistically significant association between households' decision to participate and their distance from the closest market at a 10% significant level. The marginal effects demonstrate that, if other factors remain constant, the probability of participation decreases by 1.5% on average as the distance from a household's home to the closest market increases by one minute. This suggests that the likelihood of engaging in off-farm activities decreases with distance from the nearest market. This outcome is consistent with earlier research by Neglo et al. (2021), Adefris and Woldeyohannes (2021a), Tesgera et al. (2023), and Abdurezak et al. (2020), which found that distance from the nearest market had a negative association with the likelihood of engaging in off-farm activities.

Sex of household head

It was found that the male gender of the household head had a positive impact on participation of off-farm activities, with a 1% level of significance. The marginal effects revealed that, when compared to households with female heads, having a male head increases the likelihood of engaging in off-farm activities by 43.3%. This result was caused about by the fact that women are typically responsible for household tasks including cooking, cleaning, and child care. This finding is in line with what Beyene (2008); Abebe and Debebe (2020) and (Teshome *et al.,* 2019) reported.

Table 6: The determinants of farmers' participation in off-farm activities

Variable	Coefficient	Std. Err.	p-value	Marginal effect
Sex	1.152***	0.4	0.004	0.433
Age	0.051**	0.022	0.02	0.019
Farm size	-0.1	0.222	0.653	-0.038
Credit Access	0.208	0.375	0.58	0.079
Education	0.655**	0.265	0.014	0.250
Livestock ownership	-0.15	0.103	0.146	-0.057
Training access	0.397	0.51	0.437	0.149
Cooperative membership	-0.105	0.543	0.846	-0.040
Extension contact	0.145**	0.07	0.039	0.055
Distance from market	-0.015*	0.008	0.065	-0.006
Family size	0.066	0.096	0.487	0.025
Constant	-3.239***	0.917	0.001	
mills lambda	200.08		487.85	0.682
Rho	0.23			
Sigma	856.98			

*** p<.01, ** p<.05, * p<.1*

Source: Own survey (2023)

4.3.2. Factors that determine the level of income from off-farm activities

Heckman's second stage of estimation identifies the significant factors that determine the level of income from off-farm activities by using the selection model which included the inverse Mill's ratio calculated from a maximum likelihood probit estimation of off-farm activities participation decision. The coefficient of Inverse Mills ratio (Lambda) in the Heckman two-stage estimation is insignificant (Table 5). The overall joint goodness of fit for the Heckman selection model parameter estimates is assessed based on the log likelihood ratio test. The model chi-square tests applying appropriate degrees of freedom indicate that the overall goodness of fit for the Heckman selection model. This shows that jointly the independent variables included in the selection model regression explain the level of participation.

The participants' overall income levels from just off-farm activities were significantly and favorably impacted by training on household heads' the level of income from off-farm activities. This suggests that, compared to household heads in the untrained sample families,

individuals with training in off-farm activities were shown to have greater information and knowledge to engage in and earn better revenue from off-farm activities (Kehinde and Ogundeji, 2023). Therefore, efforts should be made to increase the knowledge and abilities of farmers by offering them training. Compared to non-trained farm households, the income level of the trained farm household increased by 1238.29 Ethiopian birr annually. The result is consistent with that of (Wonde *et al.,* 2022, Seblewengel *et al.,* 2017, Tilahun *et al.,* 2019).

When the cooperative membership of farm households that engaged in off-farm activities increased by one unit, household annual total income increased by 1296.16 Ethiopian Birr compared to non-members, which is significant at the 1% level of significance. Neglo et al. (2021) and Gebru et al. (2018) also reported similar results for Ethiopia farmers.

Employment prospects, earnings potential, and sustainable livelihoods are all influenced by livestock ownership. At a statistical significance level of 10%, the livestock ownership of households has a positive relationship. This demonstrates that rural residents with high number of livestock ownership are more likely to engage in off-farm livelihood activities, which raises their income by 60.46 Ethiopian Birr. This finding was consistent with the result obtained by (Goyal and Kumar, 2021, Tohara, 2021, Rai *et al.,* 2019). Fundamentally, income increases with increased with number of livestock ownership. Employees with higher amount of livestock ownership make more money than those with lower amount. According to this study's findings, having a high amount of livestock ownership makes it easier to get off-farm jobs with greater pay. People's earning capacity and ability to accumulate resources that can improve their standard of living are determined by livestock ownership.

A household's annual total income decrease by -201.97 Ethiopian Birr compared to those who had more family size, which is significant at the 1% level of significance when the family size of farm households participating in off-farm activities grew by one man equivalent. The result is consistent with that of Raza et al. (2023); Jitmun et al. (2020) and Ceballos et al. (2020).

A household's annual total income increased by 78.33 Ethiopian Birr compared to those who had no experience, which is significant at the 5% level of significance when the experience of farm households participating in off-farm activities grew by one year. The result is consistent with that of Raza et al. (2023); Jitmun et al. (2020) and Ceballos et al. (2020).

Table 7 : Determinants of the level of income from participation in off-farm activities

None farm Income	Coefficient	Std. Err.	p-value
Sex	449.49	638.24	0.481
Farm size	-93.22	151.23	0.538
Credit Access	-203.23	248.80	0.414
Education	138.67	87.36	0.112
Livestock ownership	60.46*	33.37	0.070
Training access	1238.29***	296.52	0.000
Cooperative membership	1296.16***	261.40	0.000
Extension contact	73.55	52.61	0.162
Family size	-201.97***	54.90	0.000
Experience	78.33**	39.88	0.050
Constant	2561.14**	1088.46	0.019

Log likelihood = -36.003 Number of obs. = 154

Pseudo R2= 0.6621 LR chi2 (11) = 141.07 Prob > chi2 = 0.0000

**** p<.01, ** p<.05, * p<.1*

Source: Own survey (2023)

5. SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. Summary

The objective of this research was to examine the participation of smallholder farmers in off-farm activities in Ethiopia's Tole District, South West Shoa Zone. In this study, Multi-stage sampling procedure was used to select 154 sample households from four randomly selected kebeles. Both primary and secondary data were used. Secondary data were gathered from various sources, while primary data were acquired using structured questionnaires. Statistical analysis of the data was done using Heckman's two stage models and descriptive statistics. To ascertain smallholder farmers' choices regarding engagement in off-farm activities, the first-stage probit model was utilized. In order to determine the variables influencing smallholder farmers' levels of income from off-farm activities, the Heckman's second stage model was utilized.

Among the 154 sample respondents, 81 participated in off-farm income activities, while the remaining 73 did not. The descriptive statistics indicated that about, 52 (33.77%) of the sample respondents were households with a female head of household, while 102 (66.23%) were headed by a male. Comparing choices regarding off-farm activity participation, 4.94 percent of the 81 participant families had a female as the head of the household, and the remaining 95.06 percent were headed by male. The descriptive statistics indicated that the sample households' mean annual income was discovered to be Ethiopian Birr 7728.07 and the average yearly income for non-participating households is 4099.49 Ethiopian Birr, compared to 10998.27 Ethiopian Birr for participating households.

5.2. Conclusion

The results of the first-stage probit model demonstrated that the age, education level, sex, frequency of contact with extension all had a positive and significant influence on their participation in off-farm activities. But distance to the market center was negatively and significantly affecting the participation of off-farm activities. The Heckman's second stage model's findings also indicate that livestock ownership, experience, cooperative membership, training in off-farm activities, and family size are important variables in predicting the level of income from off-farm activities of smallholder farmers.

5.3. Recommendations

The following recommendations were forwarded based on the finding on the study:

- Educational status of household head significantly and positively influenced participation and level of income from off-farm activities. This implies education may expand probability to employ in off-farm activity and enhances high income earning capacity of farmers from off-farm activities. Therefore, rural households should be equipped with basic formal education as it improves skill and knowledge of farmers to diversify their household income

- Thus, education could be an effective instrument in increasing participation in off-farm activities. So, district education office has to find ways by which the uneducated members can better benefit from the service and providing training related to NFIGAs

- The marginal effect from the probit model revealed that the frequency of household's interaction with extension agents was shown to be positively and statistically significant This finding suggests that technical advice offered to farmers by agricultural specialists, FTC ,development agents, and other relevant organizations has a significant impact on households' participation in off-farm activities.

- Distance to nearest market affects probability of participation in off-farm activities and level of income from it negatively. Therefore, Local market should expand in the study area in order to reduce the entry barriers and facilitate easier access to off-farm activities.

- The results of Heckman's two stage model's findings also indicated that a unit incremental of credit received by respondents increases the probability of smallholder farmers participation decision and thereby increasing the level of annual income in NFIGAs. This is because credit removes the financial constraint and enables them to finance the initial capital of the off-farm sector.

- Therefore, micro credit organizations suggest expanding their scope of coverage among smallholder farmers especially to those involved in low income activity and the rural policy would do well to provide better access to credit for the rural smallholder farmers

by motivating micro-finance institutions and banks with little or no interest charged to improve the credit requirements on their off-farm income generating activities.

- Entrepreneurial training on off-farm activities is one of the factors that significantly and positively affect the probability of rural household participation in off-farm activities. As a result, provision of such training for rural household is vital be it by government or NGO and even by cooperatives organization.

- Finally, there should be policy and program intervention to facilitate and stimulate participation of rural household in off-farm activities due to off-farm activities has play a great potential role for increasing rural employment and improving well-being since the agricultural sector alone cannot have a position to create additional-employment opportunities and provide adequate income to sustain the livelihood of the rural household. .

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1. APPENDIXES

Appendix 2.**1**: Conversion factors for man equivalent and adult equivalent

Age group (year)	Man equivalent		Adult equivalent	
	Male	Female	Male	Female
<10	0	0	0.6	0.6
10-13	0.2	0.2	0.9	0.8
14-16	0.5	0.4	1	0.75
17-50	1	0.8	1	0.75
>50	0.7	0.5	1	0.7

Source: storck *et al.,* 1991

Appendix **7.2**: Conversion factors used to estimate tropical livestock unit equivalents.

Animal category	TLU
Calf	0.25
Weaned Calf	0.34
Donkey (Young)	0.35
Donkey (adult)	0.70
Camel	1.25
Heifer	0.75
Sheep and Goat (adult)	0.13
Caw and Ox	1.00
Sheep and Goat young	0.06
Horse	1.10
Chicken	0.013

Source: Storck *et al.,* 1991

7.3. Survey questionnaires

Part 1: General information on farm household

1.1. Name of the household head_____

1.2. Kebele of the household head_____

1.3. Village of the household head

1.4. Age of the household head in years_____

1.5. Sex of the house hold:

1. Male 2. Female

1.6. Marital status of the household:

1. Married 2. Single 3. Divorced 4. Widowed

1.7. The highest level of formal education completed by the household head: _____ Grade. For illiterate fill zero.

1.8. Please tell us the details of your family members by age category

Age category (year)	Male	Female	Number of family members working on the farm full time	Number of family Members working On off- farm activities	Total
<15					
15- 64					
>64					
Total					

Part 2: Income Generating Activities

A. On Farm Activities

1. What is the main occupation of the household?

1. Crop production 2. Livestock production 3. Mixed farming 4. Others, specify____

2. If you have your own land what is the total farm size in hectare (1/10) quindi _____

1. The grazing area _____

2. Area allotted to grains _____

3. Area allotted to vegetables_____

4. Area allotted to fruits _____

5. Area allotted to cash crops _____

6. Homestead area_____

7. Leased-in _____

8. Leased-out _____

3. Do you have livestock? 1. Yes 0. No
4. If Yes to Q3, fill in the following table

Types of livestock	number	Average price in ETB	Total value
Cows			
Oxen			
Heifers			
Bulls			
Calves			
Sheep (Adult/Young)			
Goat (Adult/Young)			
Donkey(Adult/Young)			
Horse			
Mule			
Chicken			

5. Crop production and sales

No	Type of crop		Quantity Produced	Quantity sold	Price per Kg	Total
1	Grains	Sorghum				
2		Maize				
3		Teff				
4		Other				
5	Vegetables	Potato				
6		sweet potato				
7		Tomato				
8		Onion				
9		Green paper				
10		Other				
11	Fruits	Papaya				
12		Mango				
13		Orange/mandarin				
14		Other				
15	Cash crop	Coffee				
16		ground nut				
17		Chat				
18		Other				
	Total					

6. Income from sales of livestock and its products last year?

No	Livestock	Quantity sold	Single price	Total
1	Cow			
2	Ox			
3	Camel			
4	Sheep			
5	Goats			
6	Donkey			
7	Horse			
8	Mule			
9	Poultry			
10	Egg			
11	Milk per liter			
12	Honey per Kg			
	Total			

1. Estimated total annual on-farm income of the household _____Birr

B. Off/Off-farm Activities

1. Have you ever been involved in off-farm activities to generate more income? 1. Yes 0. No
2. If yes for Q1, how long since you have started in practicing off-farm activities? _____year
3. If yes for Q1, what type of off-farm activities you have been involved in?

1. Petty trading	2. Livestock trading	3.Pottery	4. Small hotels	5. Weaving
6. Tannery	7.Carpentry	8.Black Smith	9.Carpet making	10.Others, specify

If yes for Q1, how did you start off-farm activity? Advice from

1. Neighboring farmers	2. Agricultural extension agents	3.NGOs	4. Relatives and friends	5. Others

3. How much money did you have when you started this activity? _____Birr
4. Estimate the annual income of off-farm income of the household _____Birr.
5. Do you think that you have enough business knowledge about off-farm activity you engaged? 1. Yes 0. No
6. What are the benefits that you get from engaging in off-farm activities?

1. basic needs for household	2. Ability to improve the house materials	3. Making the children to join the school,
4. Increasing ability to save more	5. Other, specify_____	

7. What are the main problems you faced related to off-farm activities in your locality? Rank based on their severity

No	Problems	Rank 1	Rank 2	Rank 3
1	Low purchasing power of the local			
2	Low market access & information			
3	Lack of knowledge & skill			
4	Lack of capital & credit			
5	Lack of transport			
6	Lack & sustainability of input supply			
7	Lack of appropriate training & advice			
8	Lack of close supervision			

III. INSTITUTIONAL SUPPORT

1. How many times you have obtained agricultural extension advice last year?_____
2. If you have got agricultural extension services, have you ever been advised about off-farm activities? 1. Yes 0. No
3. Did you receive any training about off-farm activities? 1. Yes 0. No
4. If yes for Q3.3 from which organization did you get the training about off-farm activities?

   1. Cooperative 2. NGOs 3. Other specify_____

5. Do you need training's and advice's about off-farm activities to improve your business skill? 1. Yes 0. No
6. Did you take any credit last year? 1. Yes 0. No
7. If Yes for Q3.6 identify the sources and amount of credit taken

No	Credit source	Amount taken	Amount repaid
1	Agricultural office		
2	Microfinance		
3	HCS		
4	Union		
	Total		

8. If Yes for Q3.6 for what purpose did you use the credit?

1. on farm activities 2.Off-farm activities 3. For buying basic needs 4. Other, specify____

9. If you used the credit for off-farm activities do you have repayment problems? 1. Yes 0. No
10. If you did not use the credit for off farm activities why do you think? 1. Lack of knowledge about off farm activities, 2. Off-farm activities are not feasible in our area, 3. Lack of inputs for off-farm activities, 4. The money is not enough for off-farm activities, 5. Other, specify_____
11. Where is your market center commonly used to sell your products and buy necessary items?_____
12. How far you could travel to get the nearest market center to sell your products and buy the necessary items? _____km.
13. From where did you get market information? 1. Neighbors 2. Friends and relatives 3.Agricultural agent 4.Medias, 5. Others, specify_____
14. Did you save from your income? 1. Yes 0. No
15. If yes for Q3.14 how much money did you save per month?_____ birr
16. If you save where did you save? 1. Iqub 2. Bank 3.Cooperative 4.Home 5. Other, specify_____

FOCUSED GROUP DISCUSSIONS LEADING QUESTIONS

Focused group discussion points for off-farm activities research

1. List different types of off-farm income generating activities that found in your localities

2. List the benefits that the farmers get from involving in off-farm income generating activities

3. What are main constraints to participate in off-farm activities in your localities?

- Low purchasing power of the locals
- Low market access and information
- Lack of knowledge and skill
- Lack of capital & credit
- Lack of transport
- Lack & poor sustainability of input supply
- Lack of appropriate training and advice
- Lack of close supervision

4. What do think that the solutions for the problems related to the practices of off-farm activities in your locality?

5. What are good opportunities found for the implementation of off-farm activities in your locality?

6. What are the important activities that GOs and NGOs have done to encourage the farmers to involve off-farm income generating activities?

7. What do you think that the concerned stakeholders (GOs, NGOs, communities…) should do to encourage the farmers to involve off-farm income generating activities?

Appendix 7.4: Heckman two stage model

Heckman selection model -- two-step estimates (regression model with sample selection)

Number of obs	154
Censored obs	73
Uncensored obs	81
Wald chi2(10)	110.01
Prob > chi2	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Non_farm_inc						
Sex	449.4987	638.2431	0.70	0.481	-801.4348	1700.432
Farm_size	-93.22386	151.2342	-0.62	0.538	-389.6374	203.1896
Credit_Access	-203.2336	248.8062	-0.82	0.414	-690.8848	284.4177
Educ	138.6778	87.36221	1.59	0.112	-32.549	309.9046
Lvstckh	60.46863	33.37792	1.81	0.070	-4.950884	125.8881
Traing	1238.294	296.528	4.18	0.000	657.1096	1819.478
Cooprtv	1296.161	261.4083	4.96	0.000	783.81	1808.512
Extnc	73.55316	52.61155	1.40	0.162	-29.56358	176.6699
FAM_SIZE	-201.9718	54.90038	-3.68	0.000	-309.5746	-94.36904
EXPER	78.33199	39.88626	1.96	0.050	.1563647	156.5076
_cons	2561.149	1088.467	2.35	0.019	427.7928	4694.505
Partcip						
Sex	1.152133	.4004996	2.88	0.004	.3671684	1.937098
Age	.0508307	.0218543	2.33	0.020	.0079971	.0936643
Farm_size	-.0995972	.2215172	-0.45	0.653	-.5337629	.3345685
Credit_Access	.2077802	.3749779	0.55	0.580	-.5271629	.9427234
Educ	.6551178	.265415	2.47	0.014	.1349139	1.175322
Lvstckh	-.1497619	.1030503	-1.45	0.146	-.3517368	.052213
Traing	.3966399	.5104467	0.78	0.437	-.6038173	1.397097
Cooprtv	-.1051073	.5425393	-0.19	0.846	-1.168465	.9582502
Extnc	.1451347	.0704888	2.06	0.039	.0069791	.2832902
Dismrkt	-.0151969	.0082266	-1.85	0.065	-.0313208	.000927
FAM_SIZE	.0664478	.0955822	0.70	0.487	-.12089	.2537856
_cons	-3.239001	.9169854	-3.53	0.000	-5.036259	-1.441742
mills						
lambda	200.0841	487.858	0.41	0.682	-756.1	1156.268
rho	0.23347					
sigma	856.98509					