

Research Article

Drivers of Smallholder Farmers' Involvement in Off-Farm Activities in Guto Gida District, Oromia Region, Ethiopia

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Abstract

Utilizing data from the Guto Gida Districts in the East Wollega zone, this research investigates what drives smallholder farmers to engage in off-farm activities. A sample of 355 respondents was drawn using a multi-stage sampling procedure combined with a simple random sampling strategy. This study utilized both primary and secondary data sources. A semi-structured questionnaire was used to gather primary data from household heads. Drivers of smallholder farmers' participation in off-farm employment were examined using descriptive analysis and the probit model to enhance smallholder farmers' knowledge and ensure the availability of agricultural inputs and credit. The probit model disclosed that the household's gender, access to livestock, market location, and training were positively and significantly associated with smallholder farmers' engagement in off-farm activities in Guto Gida district. Additionally, the distance to the nearest market influenced household heads' off-farm activities at a 5% significance level. The study recommended ongoing awareness creation about off-farm activities through training and extension services. This should involve promoting off-farm opportunities, ensuring the availability of credit and agricultural inputs, and enhancing the knowledge of elder farmers.

Keywords

Smallholder Farmers, Drivers, Involvement, Probit Model, Off-Farm Activities, Guto Gida, Ethiopia

1. Introduction

In developing countries, agriculture constitutes the largest segment of employment, including informal employment, and plays a dominant role in rural economic life [16]. It accounts for 68% of the income of rural households in the Social Security Administration, for half of such income in Asia, and 43% in Latin America [8]. In developing countries, agriculture is usually the sector with the lowest productivity, marked by low income and precarious jobs [5].

In developing countries, farm households create multiple income sources by distributing their productive resources across various income-generating activities, which include

both agricultural and non-agricultural work [12]. Diversification can either be a household strategy pursued with intention or an impulsive reaction to crisis. Moreover, it can be linked to the decline and unpredictability of agricultural incomes, the escalation of poverty, and the rise of off-farm employment prospects [4]. Due to its prevalence and role in socio-economic development, particularly in developing countries, income diversification among farm households has attracted the interest of governments, policymakers, and researchers [18, 63, 44].

Africa's rural population is concentrated in accessible re-

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gions that possess high agricultural potential, regardless of whether land is abundant or constrained, and where opportunities for land expansion are limited [3]. In the long run, this will heighten the pressure on a growing number of smallholders to maintain commercial viability and engage in sustainable intensification, particularly in light of the declining median farm size in both land-abundant and land-scarce countries [14]. Additionally, agricultural intensification—through improved seed use, fertilizers, agrochemicals, water control measures, and mechanization—has not yet met expectations given population pressures and market access conditions, except for a more continuous cultivation of land [9, 26].

In Africa, the off-farm economy constitutes roughly 37 percent of rural incomes, whereas in Asia it exceeds 50 percent. Trading, agro-processing, manufacturing, commercial, and mining activities make up a highly diverse collection of components that comprise the rural off-farm economy. The activities undertaken, the scale of operations, the production mix, and the production methods differ from one location to another and among households. Consequently, the effects on livelihoods vary accordingly [10]. It entails engaging in paid employment beyond the participant's farm and has been acknowledged as playing a vital role in sustainable development and poverty alleviation, especially in rural regions, resulting in greater investment in farming, enhanced productivity, and diminished income uncertainty [4-6].

Empirical studies state that off-farm activities, despite their importance, see low participation rates in Africa; indicate that 37% of rural households' income is derived from off-farm activities, in which surprisingly less than 20% of the labor force participates. Similarly, research conducted in Nigeria found that involvement in off-farm activities, especially wage employment for both skilled and unskilled workers, led to reductions in rural poverty of 11.02% and 10.68%, respectively; participants reduced poverty more effectively than non-participants. Off-farm income-generating activities account for approximately 35 percent of the incomes of households in sub-Saharan African countries. According to some studies, over 50% of households in rural Ethiopia engage in non-farm activities [9, 52, 54, 60, 88].

Some studies examine the diversification of off-farm activities in Ethiopia. In Ethiopia, agriculture remains the main source of household income and consumption [13, 15]. While crop cultivation represents the majority of agricultural income sources, animal husbandry accounts for a significant portion as well. Off-farm activities are progressively acknowledged as essential contributors to household income. According to research carried out in the high-potential agricultural zones of Ethiopia, 18% of household income was derived from off-farm activities, with wage income constituting 55% of these off-farm revenues. This share is anticipated to continue, as it is the lowest in comparison to the averages for Asia and Latin America. This transition involves increasing the importance of off-farm economic activities in the rural economy

[40, 41].

Agriculture in Ethiopia is marked by traditional farming methods that primarily depend on animal traction and rain-fed practices. As a result of shocks caused by weather or human activity, the country's agricultural output and productivity vary, leading to rural households having inadequate income [28-30]. Furthermore, agricultural output has deteriorated due to drought and erratic rainfall, obsolete production techniques, and land degradation. These elements play a major role in problems like unemployment and underemployment, poverty, and food insecurity [10, 13, 14].

Farm households that participate in rural off-farm activities are vital for job creation, income generation, and the enhancement of farm income activities. These non-agricultural activities included self-employment and wage work in various fields such as milling, weaving, handicrafts, trading grain and livestock, general commerce, sharecropping on peripheral land, collecting and selling firewood and charcoal, baking, salt trading, pottery making, and selling local food and drinks [7, 86, 87].

Studies argue that poverty and low income are significant issues in the Assosa Zone of the Benishangul Gumuz Regional State, given that the economy is primarily reliant on agriculture. The majority of households were reported to participate in off-farm activities to meet their basic needs [11, 19]. Additionally, among the total households, 41.2% were engaged in unskilled wage employment, 22.7% were In addition, the research conducted highlighted that around 35.3%, 32.8%, 26.05%, 24.4%, and 14.3% of households in the examined area were involved in petty trade, collection and sale of firewood and charcoal, mining, handicrafts, and other activities, respectively [6, 66].

Guto Gida district is one of the high-potential areas of off-farm work, which can change the life of households if they participate in these activities. However, off-farm participation by the rural farmers in the study area is low, and its contribution to the income of farmers in the area is not as much as the existing potential due to economic, social, human, and infrastructure factors. Consequently, various incentives and constraints influence farm households' decisions regarding their involvement in off-farm activities. These factors that could influence participation in off-farm activities are based on individual, household, social, and community aspects. Consequently, it is essential to comprehend what drives involvement in off-farm work and how this affects rural farm households. This study aimed to evaluate the factors influencing off-farm participation and its impact on rural farm households in the Guto Gida district.

The classical development economic theories of Lewis and Ranis [17, 70] presumed that, if agriculture is at the early stage with excessive labor, it is possible to shift the excess agricultural labor from the agricultural sector to other sectors without any reduction in total agricultural output. Therefore, in Ethiopia densely populated and land-scarce resource, the withdrawal of excess labor from agriculture and participation

in off-farm activities should enable them to earn additional income without affecting the farm income.

Several studies conducted have sought to assess determinants of smallholder farmers' participation in off-farm activity and its impact on household income, found numerous factors that determine smallholder farmers' participation decision in off-farm activity, along with mixed results on the effect of smallholder farmers' off-farm participation on household income in developing countries [20, 49, 60, 62, 67, 73].

For instance, the study by [13, 31, 40] to investigate determinants of off-farm activities and their contribution to household income found that the gender, age, marital status, and occupation of the household head significantly increased household participation in off-farm activities in Nigeria. However, this study has methodological limitations in the areas of sample size determination and also shows no empirical investigation that rectifies the relationship between off-farm activity participation and household income, which reduces the relevance of the study result to be considered as a scientific type of inquiry about the effect of off-farm activity participation on household income [2, 12, 43].

In Ethiopia, there is scant literature on the determinants of smallholder farmers' participation in off-farm activity and its effect on household income. Empirical studies assessed that the effect of off-farm activities on rural household income found that the age, the Gender of household head, credit access, the amount of farm income and having information about off-farm employment shows a significant increases the participation decision of households in off-farm activities while the married or unmarried, livestock owned and market distance significantly reduce households' decision to engage in off-farm activities and consequently the participation in off-farm activities significant increases households' total income in Wolaita zone of Ethiopia [1, 23].

In general, the above studies that have found mixed results on the effect of off-farm participation on household income were not free of limitations in their study, as most of the above scholars, such as [67, 85], did not consider the problem of sample selection bias because the choice to engage in off-farm work is voluntary, and farm households might self-select into off-farm wage activities. This can lead to a biased sample and challenges in establishing causation. As a result of self-selection, off-farm work participants may have systematically different household attributes compared to non-participants. This study aims to address the identified gaps in the literature regarding the factors influencing smallholder farmers' involvement in off-farm activities and the impact of such involvement on their income. It does so by examining demographic characteristics, socio-economic factors, and institutional determinants within the context of the Guto Gida district in the East Wollega zone.

This study is important because it enhances individuals' comprehension of the factors affecting farm households' involvement in off-farm activities, the benefits derived from these activities, and the significance of off-farm income

across various income groups. Additionally, local administrators in Guto Gida and NGOs may find the results useful for developing strategies to enhance the livelihoods of impoverished rural populations. The research was carried out in the Guto Gida district of Oromia Regional State. This means that the study is confined to these areas alone because of limitations related to resources and time. This study is primarily focused on off-farm activities as one of the livelihood strategies of rural households in the district, among all other options. This study analyzes rural farm households.

2. Literature Review

2.1. Theoretical Literature Review

The household's decision to participate is grounded in the theory of the agricultural household model, which posits that the household serves as both producer and consumer. In the case of perfect markets, the household first selects various combinations of income-generating activities according to its resources and prices in order to maximize profit, and then chooses among different consumption and leisure levels based on those profits in order to maximize utility. Nonetheless, if the markets are imperfect, decisions regarding production and consumption become intertwined [26, 61, 62].

Off-farm activities also affect the levels of poverty and income inequality. If the poor have equal access to participate in high-earning off-farm activities, its effects on reducing poverty and income inequality will be significant. However, if those in poverty are barred from lucrative off-farm activities because of limited resources, access, and capabilities, then economic growth could lead to greater inequality. In off-farm activities, human capital, such as training, has a positive impact, as effective training empowers everyone involved in these activities [17, 27, 72].

Good training that has linkages with the ongoing activity on going by farm households helps the individual to be profitable. The training might be different from formal education, i.e. uneducated farm household can be profitable in an off-farm activity that he/she choose to do, when trained in the related training with activities. In other words, farm households cannot be limited in participating in off-farm activities because of a lack of educational status. The education status of the head has no significant impact on the participation decisions of the members of the family, as most of the off-farm activities do not require formal education [28, 29, 82].

Even though the attention of participating in off-farm activities is not paid to our country, off-farm activity is one category of work type that can increase the income of farm households at different levels or categories. Therefore, it is better to encourage farm households living in rural areas to increase their income. According to the joint study by Members of the household members should be motivated to engage in off-farm activities to supplement their income and improve their living standards. Establishing accessible credit schemes

can help set up off-farm businesses. Off-farm activities ought to be diversified, and rural households should be adequately informed about their benefits for their livelihood. Additionally, all stakeholders should address some of the challenges pointed out by the households to elevate their living standards [30, 31].

Off-farm activities vary widely and differ in their returns, ranging from highly lucrative to low-earning endeavors such as poorly compensated unskilled labor. This is due to the diversity of personal, regional, and national factors that personalize household decisions regarding participation in equal activities. Consequently, the effect of off-farm activity on individuals' standard of living may vary based on the specific activities they choose to pursue, influenced by the factors that drove their participation decisions, specifically, the predominance of distress-push diversification in rural areas [21-24].

2.2. Empirical Literature Review

In rural societies, particularly for households focused on subsistence, income generated from off-farm activities is more significant for their livelihoods. Off-farm income has a direct impact on household income and an indirect effect on agricultural production, with potential implications for policymakers [56, 65]. As stated by [18, 81], off-farm income can assist farmers in acquiring modern inputs, hiring labor, and mitigating fluctuations in farm income while smoothing consumption.

The other study identified the predominant factor affecting household off-farm income in Myanmar through the application of a Logistic regression model and the Cobb-Douglas functional form. Among these factors, the educational level, age, and gender of the head of household, land holding size, number of crops, and whether a new enterprise has been established significantly affect household income [57].

The majority of research conducted on off-farm business has shown that demographic characteristics, along with the household's financial and resource bases, are regarded as key determinants of the decision to engage in off-farm activities. Further, it investigated the determinants of non-farm income by using data from 200 households chosen across 40 villages in Southeast Nigeria. Their findings indicate that the age of the household, education level, farm size, and hours dedicated to farm activities are the most significant factors influencing both farm and off-farm income. Specifically, the size of farmland shows a positive correlation with farm income and a negative correlation with off-farm income [15, 16, 51].

This suggests that as the size of farmland increases, farmers are more inclined to engage in farming activities rather than off-farm ones. This may further demonstrate that small-sized farmers are being pushed out of farming businesses in the study areas. They also discovered a positive correlation between household size and farm income, as well as a negative correlation between the age of the household and off-farm income, suggesting that older farmers participate less in

off-farm activities [17, 19].

In order to surmount their credit constraints, agricultural households in developing countries frequently engage in off-farm activities. Revenues generated from these activities can be allocated to agricultural production. The mechanisms through which off-farm income impacts agricultural production and the livelihoods of rural populations have not been extensively studied in empirical research within the field of development economics. It also investigated how rural off-farm activities, especially wage employment, help households in developing countries overcome cash constraints on farm investment and contribute to agricultural development [35, 36].

Moreover, empirical studies identified factors influencing the choice to engage in off-farm work in western Ethiopia. The results of their research indicate that factors such as household characteristics, access to credit, and the size of farmland are key determinants of decisions to engage in off-farm activities. They also mentioned that off-farm income is crucial for mitigating the issues associated with low agricultural productivity in the study area [32, 33, 37].

Empirical studies further investigated the determinants of involvement in non-farm activities in Burkina Faso. His findings suggest that such participation is primarily linked to farm income, agricultural production technologies, the age and educational level of the household head, the number of working members in the household, and rainfall amounts. As a result, it was determined that income from farm activities negatively influenced participation in non-farm activities, while other variables were discovered to positively influence participation in non-farm activities regarding his examination of elements influencing choices to engage in off-farm activities in Ethiopia [82, 84].

The other empirical study investigated estimated distinct models for male and female members of specific farm households. His result indicates that training related to participants' health status and off-farm activities significantly affects their involvement in such activities. Alongside the human capital variables, it was also discovered that access to credit and income transfers positively influenced participation in off-farm activities [27, 28].

As a result, farmers who have received training are more inclined to engage in off-farm business activities. Moreover, transfer income and credit positively influence engagement in off-farm activities. He also confirmed that cultural factors and the influences of the household head make it less likely for female members of households to engage in off-farm activities. However, his study does not demonstrate how participating in off-farm activities affects farm activities. However, in Ethiopia, numerous factors limit off-farm rural income [38, 39].

The determinants of off-farm participation variables are applied when calculating the household's income from various types of off-farm income. Since the variables that affect the likelihood of engaging in off-farm work also determine

income from such work [22, 23]. Numerous studies indicate that factors such as age, education level, family size, size of land holdings, availability of information, distance to town, security of landownership, fertility of land, farm output value, access to formal credit, and electricity influence rural households' off-farm participation and off-farm income [41, 42].

With the advancing age of the household, the farmer gains more knowledge and experience, which may positively affect off-farm income. The likelihood of working off the farm will rise at a younger age. As people age, the total number of hours worked will decrease, and the demand for leisure time will rise. Ultimately, this will result in the emergence of a

humped-shaped life cycle profile.

2.3. Conceptual Framework

Farm households opt to diversify into off-farm activities when the income from these activities surpasses their on-farm earnings. This indicates that the likelihood of engaging in off-farm work is influenced by both farm characteristics and the socio-economic traits of the household. Decisions in this regard are based on comparing the returns from farm and off-farm activities. The conceptual framework is indicated in Figure 1 below.

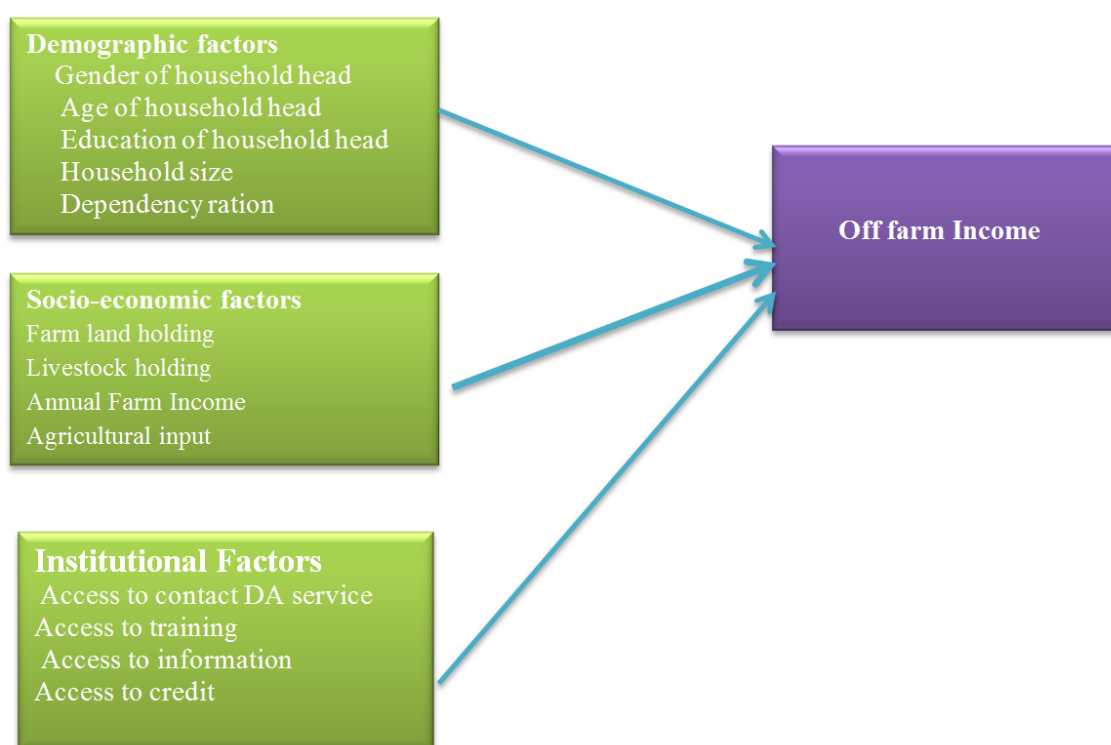


Figure 1. Conceptual Framework of the study. Source: Adapted from [70].

3. Research Method and Data

3.1. Description of Study Area

Guto Gida district is located in the Oromia Regional State of Ethiopia. It is one of the 17 districts of the East Wollega Zone, Western part of Ethiopia. It is the nearest of all the Districts to the zonal office. Its capital city is Uke. The district administration office is located in Nekemte town. Guto Gida district has a total land area of 105,750 hectares. From this land, 87,725 hectares were issued for agricultural purposes; 6080.30 hectares are covered with mountains and sand. The rest is occupied by forest. From the land, which is used for

agricultural purposes, 18,336 hectares is being developed by private investors for maize production. It also has attractive synthetic and natural areas like Lake Sarga, "Sombo Arara", Komto Mountain Forest, and Dugule Cave [37, 73]. This district is subdivided into 20 kebeles. It has a total population of about 101,276, of which 52,846 are male and 48,430 are female. Three main roads cross this District, passing from Addis Ababa to different areas like: Addis Ababa to Gimbi, Dambidollo, Asossa, Jimma, and Bahir Dar [36, 63].

All of the Guto Gida district kebeles have access to some infrastructure like telephone, health center, schools, urban-rural road, and agricultural facility services. Access to rural roads has reached all kebeles of the district. The district weather condition indicates 53% medium, 0.26% highlands, and 46.74% are lowlands. A major type of crops grown in the

district, maize, barley, pea, bean, corn, wheat, sorghum, etc., and cash crops like “selit, coffee, nug, leuz, and telba”. It is

also favorable for livestock production and other agricultural activities [36, 37].

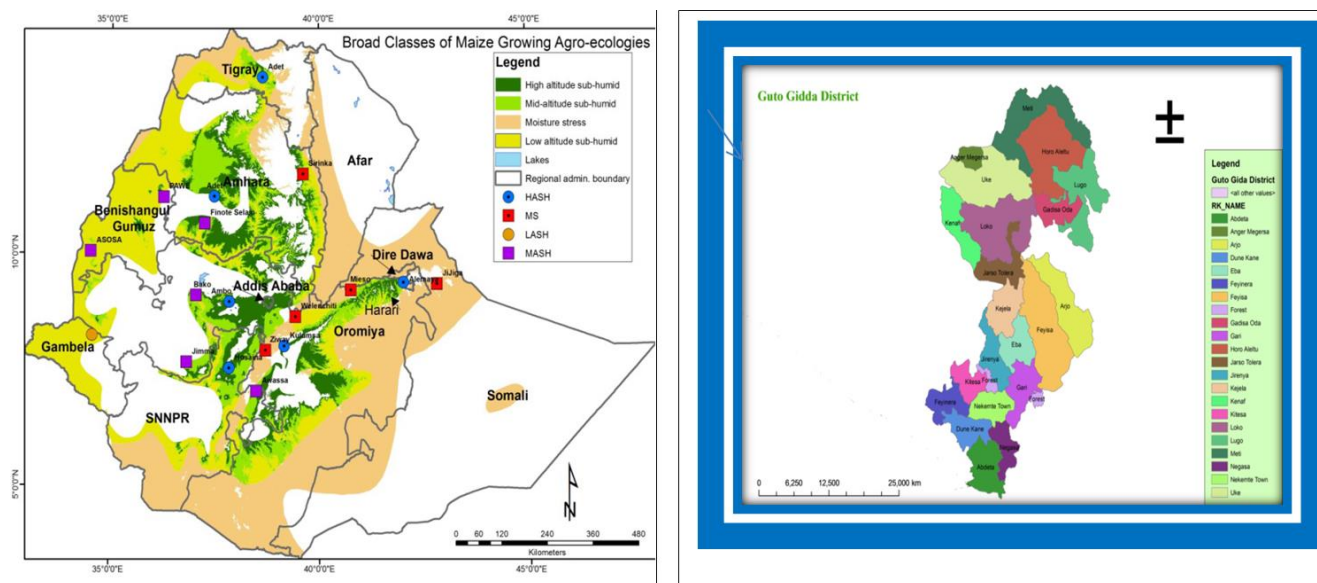


Figure 2. Map of the study area.

3.2. Research Design

This specific study utilized a cross-sectional survey design that included both off-farm participants and non-participants. This means that both off-farm and farm activities will be analyzed for the treatment group (the participant's household) and the control group (the non-participant's household). Quantitative data was gathered following the study's goals, and the analytic result would be bolstered by qualitative data to ensure its credibility [55, 59].

3.3. Definition of Terms and Variables

Off-farm: refers to activities that generate income for farmers outside of their agricultural work, or income derived from sources not related to their land. It can encompass agricultural wage labor on others' farms, non-agricultural paid work, or self-employment in areas such as commerce, mining, manufacturing, transport, and services. Off-farm income includes all activities related to agriculture that take place outside the farm. When considering the value chain perspective, off-farm income encompasses the “middle” and “end” stages of the process, as agricultural products depart from the farm to ultimately arrive at the consumer. Off-farm employment includes being a wage employee outside of the farm-household (off-farm wage employment) as well as operating a non-farm enterprise (NFE) (i.e., off-farm self-employment). Off-farm income and enterprises include extension services, processing, packaging, storage, transportation, distribution, and retail sales [15, 50].

Off-farm wage employment: We characterize off-farm wage employment as any work performed by an individual in the last year for payment (in cash or kind) from a source outside of their household. Off-farm wage employment can occur in the agricultural sector (working for pay on a farm not owned by the household) or in the industrial or services sectors [51, 60].

Non-farm: encompasses all activities apart from agricultural work on one's farm and labor on another farm, from which farmers derive income. As a rule, involvement in off-farm activities is vital for boosting the income of households in the study area [25, 52, 53].

Full-time off-farm workers are individuals who held some form of off-farm employment, whether as a wage earner or self-employed, and did not work on the farm. In contrast, part-time farmers are those who have off-farm jobs and work on the farm either occasionally or during peak seasons [35, 38, 53].

Income from livestock: comprises the net revenue generated from the sale of live animals as well as raw animal products that are consumed and sold, such as meat, eggs, milk, skin, etc. Net livestock income is calculated by deducting gross production expenditure from the total value of sold animals (calculated using producer median prices) and the total value of raw animal products produced (calculated using consumer median prices) in the relevant region, such as Oromia [45, 54].

Household: It is made up of one or more individuals, regardless of their relationship to each other, who typically reside together in the same housing unit or a set of connected housing units and share cooking arrangements [34, 43].

Household income: encompasses all cash, in-kind, or service receipts received by the household or its members at least annually.

Head of household: This term denotes an individual who financially sustains or oversees the household, or who is regarded as the “head of household” by its members due to age or respect, or who claims to be the head of a household. In this context, a head of household can be either male or female [14, 25, 44].

Household member: This term denotes individuals who reside and share meals with the household for a minimum of six months, including those not present at the time of the survey but expected to be away for less than six months [45].

Participation: the act of engaging in or sharing in some activities. Rural: refers to any locality that primarily serves the agricultural hinterland or parts of the countryside available for agriculture [26, 46, 76].

Rural household: a household residing in the countryside that may engage in both farming and non-farming activities, as well as a household located in the kebele of the countryside that can participate in these two types of activities [47].

District: a district-level administrative unit that encompasses several Kebeles. **Kebele** represents the least administrative division in a settled rural area [48].

3.4. Data, Methods of Data Collection, and Target Population

For this study, both quantitative and qualitative data from primary and secondary sources were collected. The source for primary data was collected from the sample farmers in Guto Gida district through distributed questionnaires, and the source for secondary data was collected from the local offices, higher governmental organizations, different publications, and policy documents. The study would assess determinants of smallholder farmers' participation in off-farm activities and their effect on their income in the case of the Guto Gida district; therefore, the target population of the study was smallholder farmers residing in the district [58, 78, 79].

3.5. Sampling Method and Sample Size

The farming households are the ones making day-to-day decisions on farm activities. Therefore, a household is the

basic sampling unit. In this study, a three-stage sampling procedure was employed. In the first stage out of 17 Districts, the current administration structure in East Wollega Zone, Guto Gida District was selected purposively because the District has a potential area for off-farm activities of East Wollega zone, where they can gain off-farm employment activities more than other Districts, because of different NGOs and institutional organizations that appeared in their District. In the second stage, out of 20 rural kebeles that are found in Guto Gida District categorized into three groups based on their topography, i.e., high land, mid land, and low land ecology of the areas, 6 PAs, 4 PAs, and 10PAs, respectively. Then, four PAs were selected by a random sampling technique based on their ecology ratio of the area. In the 3rd stage, the lists of households in the four sample kebeles were identified, and then a sample of 355 was selected by using a Random sampling method from the four kebeles [20, 60, 64].

3.6. Sample Size Determination

The sample from the chosen kebeles in the study area is selected using a random sampling method. The sample size for this study was determined to be 355 using Kothari (2004)'s statistical formula, from a total of 4703 households across the four [38, 37, 83]. It is indicated in Table 1 below.

$$n = \frac{z^2 \cdot p \cdot q \cdot N}{e^2 (N-1) + z^2 \cdot p \cdot q}$$

Where: n- sample size

N - Total households of the four kebeles

, e -Precision level = 5%

z = 1.96 (as per the table of area under the normal curve for the given confidence level of 95%).

P - The proportion of defectives in the universe = 0.5 based on the most conservative sample size.

q = (1-p) = 0.5

$$n = \frac{(1.96)^2 (0.5)(0.5)(4703)}{(0.05)^2 (4703-1) + (1.96)^2 (0.5)(0.5)}$$

$$n = \frac{4516.7612}{12.7154}$$

$$n = 355$$

Therefore, the sample is 355. The proportional contribution of the four kebeles to the sample is as presented in the table below.

Table 1. Sample size from each kebele.

S.no	Sub town	Number of households	Percentage contribution to the total sample	Sample household
1	Ho/Alaltu	1155	$\frac{1155}{4703} \times 100 = 24.6\%$	87
2	Nagasa	814	$\frac{814}{4703} \times 100 = 17.3\%$	62
3	Fayisa	1865	$\frac{1865}{4703} \times 100 = 39.7\%$	140

S.no	Sub town	Number of households	Percentage contribution to the total sample	Sample household
4	Mexi	869	$\frac{869}{4703} \times 100 = 18.5\%$	66
Total		4703	100%	355

Source: own construction, 2025

3.7. Probit Model Specification

This study's dependent variable is farmers' involvement in decisions regarding off-farm work. This variable is binary: it takes the value of 1 if the household has engaged in off-farm work and the value of 0 otherwise. For analyzing farmers' decisions regarding participation, one can utilize either the binary logit or the binary probit model [78, 79]. Because the probit and logit models are very alike, they often yield predicted probabilities that closely resemble one another. However, due to the advantageous normality assumption of the error term and the fact that several specification issues are more easily examined using the probit model because of the characteristics of the normal distribution, the probit model is more widely used than the logit model in econometrics.

The study examines participation in off-farm work by breaking it down into two categories: off-farm wage employment and off-farm self-employment activities. The researcher separates them because they assume the determining factors differ between the two sets of off-farm employment activities. The researcher utilized a bivariate probit model to determine the variables that influence households' participation in two categories of off-farm employment activities and to assess their marginal effects. This is because it is assumed that households' decisions to participate in those activities may not be independent. The bivariate probit model is appropriate for estimating two participation equations that have correlated disturbances [77, 80, 81].

Several variables are identified to analyze whether they explain smallholder farmers' decisions to engage in off-farm employment and their income, treating the household's choice to participate in off-farm work and farmers' income as two distinct dependent variables. It is proposed that certain characteristics of the farm and household—such as entry costs, age of the household head, information access, family size, educational attainment of the household head, nonfarm income sources, training availability, livestock ownership, credit access, and farm land size—are significant factors influencing a household's choice to engage in off-farm employment (Y_1). In the model, Y_1 is a dichotomous dependent variable that equals 1 if the household participates in off-farm activity and 0 otherwise. In the same vein, the market's distance and the availability of electricity are recognized as significant factors influencing a household's income [74-76].

Conventionally, linear regression analysis is widely used in most economic and social investigations because of the availability of simple computer packages, as well as the ease of interpreting the results. However, according to [68, 69, 77], the linear probability model has an obvious defect in that the estimated probability values can lie outside the normal 0-1 range and that it models the probability of $Y = 1$ as being linear: $Pr(Y = 1|X) = \beta_0 + \beta_1 X$. If we were to use an OLS regression line, we would get some straight line - perhaps at high values of X we would get values of Y above 1, and for low values of X we would get values of Y below 0. But, a probability cannot be less than 0 or greater than 1. This nonsensical feature is an inevitable consequence of the linear regression model. Thus, the predicted probability should remain within the (0, 1) bounds, i.e., $0 \leq Pr(Y = 1|X) \leq 1$ for all X . This requires a nonlinear functional form for the probability, such as an "S-curve".

According to some studies, probit and logit regression models can address these problems. All three models-linear probability, probit, and logit-are just approximations to the unknown population regression function $E(Y/X) = Pr(Y = 1|X)$. Logit and probit regression functions are nonlinear functions of the coefficients, specifically designed for binary dependent variables. If we assume that the probability density function of the error term is the standard $\mu \approx N(0, 1)$ normal distribution, the model is called the probit model. According to a leading author, there are no compelling grounds for preferring logit to probit or vice versa. The selection depends on the researchers' interest. For this study, the researcher has selected the probit model. According to, probit regression uses the standard normal cumulative distribution function and can be expressed by the formula [58, 59]:

$$Pr\left(Y = \frac{1}{X_i}\right) = \Phi(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k) \quad (1)$$

Where the dependent variable Y is binary, representing smallholder farmers' participation decision, Φ is the cumulative standard normal distribution function, and $X_1, X_2, \dots, X_k$ are determinants of off-farm participation. The probit coefficients $\beta_0, \beta_1, \beta_2, \dots, \beta_k$ do not have a simple interpretation. The model is best interpreted by computing predicted probabilities and the effect of the change in regressors. The predicted probability that $Y = 1$ given values of $X_1, X_2, \dots, X_k$ is calculated by computing the z value:

$$Z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k. \quad (2)$$

Using the concept of latent variable (Y^*), the probit model to be used to examine the farmers' decision to participate in off-farm activity is specified as: $Y_i^* = \beta_i X_i + U_i$, where Y^* is an unobservable magnitude, which can be considered the net benefit to individual i of participating in off-farm activity ($\beta_i X_i$, U_i is participation index). We cannot observe that net benefit, but we can observe the participation decision of the individual having followed the decision rule:

$$Y_i = \{ (0 \text{ if } y_i^* < 0, 1 \text{ if } y_i^* \geq 0) \} \quad (3)$$

This decision rule reveals that if an individual's participation index exceeds zero, he or she participates in off-farm activity; otherwise not, i.e., we observe that the individual did ($Y = 1$) or did not ($Y = 0$) participate in off-farm activity. We speak of Y^* as a latent variable, linearly related to a set of factors x and a disturbance term U . In the latent-variable model, we must assume that the disturbance process has a known variance, σ_u^2 . In the latent variable model, we model the probability of an individual making each choice.

3.8. Description of the Study Variables

The variables of the study are described as follows.

1. *Off-farm Participation (OFP)*: This is the dependent variable, which is a dichotomous or a dummy variable assigned the value label of '1' for smallholder farm households who are participants of off-farm activity and '0' otherwise.
2. *Age of Household Head (age)*: This is a continuous variable, quantified by the age in years of the household head, and it is a key factor influencing household participation in off-farm activities. With younger age, the likelihood of engaging in off-farm activities rises, while it falls with older age. Participation in off-farm work is more common among younger individuals in farm households, but as they age, their on-farm work increases [16, 17, 71]. This observation is corroborated by [29, 38, 49], who found that the age of the household head has a significant negative impact on the participation of farm households in off-farm activities.
3. *Gender of Household Head (gender)*: This pertains to the traits of an agricultural household; this concerns the gender of the head of the household. Therefore, its sign is anticipated to be more positive for male-headed households than for female-headed households [1, 3].
4. *Education of Household Head (educ)*: The variable Education is categorical and indicates the educational status of education. It is anticipated that education will have a positive effect on off-farm participation for both types of farm households [85].
5. *Off-farm Training (off train)*: This is a dummy variable indicating whether households have received training

for off-farm work activities. It is anticipated that training will improve the involvement of farm households in off-farm work [70].

6. *Location of Market (mdst)*: This is a continuous variable that indicates the relative distance of the nearest market from the farm. It is anticipated that a long distance (in kilometers) will have a negative impact on farm households' participation in off-farm activities [86].
7. *Credit (crac)*: This serves as a dummy variable indicating whether farm households have access to credit. Therefore, the presence of credit is expected to have a positive effect on farm households' off-farm participation [87].
8. *Family Size (famsz)*: The size of the family is a continuous variable that denotes the number of family members in the household. It is anticipated that the large size of the family will have a positive impact on the off-farm participation of the households [31, 32].
9. *Dependency ratio (dependent no)*: This is a continuous variable. The dependency ratio indicates the share of the economically inactive population (those under 14 and over 65 years of age) to that of the active labor force (aged 15 to 65) in a household. With the rise in the number of dependents, those in the active labor force (i.e., ages 15-64) are obligated to provide support for these dependents. As a result, this causes the proportion of resources and income acquired by the active labor force to increase, leading to an average decline in household well-being. It was thus hypothesized that a high dependency ratio negatively impacts income diversification [40, 41].
10. *Farm size (famsz)*: This indicates the total of owned cultivated land, rented land, and land obtained through sharecropping arrangements by the household during the survey period. It is a continuous variable, with its measurement unit being hectare. Individuals with sizable farming operations can enhance their output by taking advantage of economies of scale; they tend to use more inputs and opt for the row-planting technique, which is more suitable for boosting productivity, rather than the conventional broadcasting method. It is thus hypothesized that the income of smallholder farmers will increase with the size of their farms [46, 47].
11. *Ownership of oxen (Owno)*: It is a continuous variable quantified in numbers. To cultivate land, a household requires a pair of oxen. The ownership of oxen has a direct impact on agricultural production [45, 48]. It is therefore hypothesized that a household's income increases with the number of oxen it possesses.
12. *Agricultural labor input (Agli)*: It denotes the total count of household family members who have been directly engaged in agricultural production activities. The more the labor force is employed in the farm production process, the more land preparation for farming will occur. Thus, we put forward the hypothesis that agricultural labor positively influences income generation.

13. *Educational level of Household head (EHH)*: It denotes the total count of household family members who have been directly engaged in agricultural production activities. The more the labor force is employed in the farm production process, the more land preparation for farming will occur. Thus, we put forward the hypothesis that agricultural labor positively influences income generation.

14. *Gender of household head (GHH)*: It is a dummy variable: it takes the value “1” if the household head is male and “0” otherwise. Male-headed households are more physically robust and capable than their female counterparts; thus, the former have greater opportunities to improve their agricultural productivity. Moreover, apart from the established biological gender differences, households led by males demonstrate greater mobility, engage in various meetings, and have increased exposure to information regarding superior farming inputs and practices. Hence, the hypothesis is that households headed by males are more productive in producing farm output.

15. *Credit access (Cra)*: Access to credit is assessed based on whether at least one household member has obtained credit in the 12 months preceding the survey period. It is crucial for agricultural development to obtain financial loans from the government, banks, and other financial institutions for the primary production, processing, and distribution of agricultural products, as well as for the production and distribution of agricultural inputs [58, 60, 63]. Consequently, we anticipated a beneficial connection between credit access and income.

16. *Frequency Das service (Fdas)*: The extension service is a dummy variable that takes on the value of “1” if households receive visits from an extension worker, and “0” in other cases. Households that can utilize extension services throughout their farming production process would anticipate a greater likelihood of enhanced farm productivity. It is therefore hypothesized that the utilization of extension services has a positive effect on agricultural productivity. Table 2 below shows the variables of the study.

Table 2. Variables of the study.

Variable			Units of measurement	Expected Sign
Income			Continuous; measured in Birr	
Participation in off-farm			Dummy: 1 for off-farm, 0 if not	
1	Gen	Gender of household	Dummy: 1 if male, 0 otherwise	+ve/-ve
2	Age	Age of household head	Continuous	+
3	Heduc	Education level of household	Continuous	+
4	Famsize	Family size of the household	Continuous	-ve
5	Farmsz	Farmsize	Continuous in hectares	+
6	Oxown	Oxen own	Continuous	-ve
7	Agli	Agricultural labor input	Continuous	+
8	Offfar	off-farm	Continuous: 1 if participating in non-farm, 0 otherwise	+ve
9	Cra	Credit access	Dummy (No=0, Yes =1)	+ve
10	Distan	Distance to market	Continuous: walk hours	-ve
11	AccIrrin	Access to Irrigation	dummy (No=0, Yes =1)	+ve
12	Tlu	Livestock holding	Continuous measured in tlu	+ve
13	Infacess	Informationaccessof respondent	Dummy (No=0, Yes =1)	+ve
14	Oftrain	Getting trained on off-farm income	Dummy (No=0, Yes =1)	+ve
15	Frecdas	Frequency of contact Das	Continuous	+ve

Source: own construction, 2025

4. Results and Discussion

4.1. Demographic Characteristics

The first part of the data collection tool was designed to collect information about the demographic characteristics of sample respondents. The analysis of demographic factors starts with the cross-tabulation of the gender of sample respondents with participation in off-farm activity. Accordingly, the result of the study shows that 245 (69.01%) of the sample respondents were male, whereas 110 (30.98) of respondents

were female. Of male-headed respondents, more of them, 155 (43.6%) of male-headed sample respondents were off-farm activity participants compared to 50 (14.08%) of non-participants of off-farm activity.

But, from the total of 110 (30.98) female-headed respondents, the majority, 60 (16.9) of them, were not participants in off-farm employment as compared to those females who participate in off-farm employment, 50 (14.08). The chi-square test result shows that there is an insignificant percentage difference in the gender of respondents concerning the participation in off-farm activities in the study area. [Table 3](#) below shows this.

Table 3. Gender distribution of sample household head.

Characteristics of the questionnaire	Values	Participant (N=205)	Nonpart. (N=150)	Total (%) (N=355)	Chi2 (χ^2)
Gender of the sample respondents	Male (1)	155 (43.6)	90 (25.35)	245 (69.01)	0.5654
	Female (0)	50 (14.08)	60 (16.9)	110 (30.98)	

Table 4. Distribution of marital status of households.

Variables	Values	Participant (N=205)	Nonpart. (N=150)	Total (%) (N=355)	Chi2 (χ^2)
Marital status of respondents	Married (1)	185 (48.1)	130 (27.8)	315 (75.9)	1.7044*
	Single (2)	5 (1.8)	7 (4.7)	12 (6.6)	
	Divorced (3)	7 (4.7)	8 (0.0)	15 (9.4)	
	Widowed (4)	8 (2.8)	5 (3.6)	13 (8.0)	

Source: own construction, 2025

This descriptive statistic shows that 315 (75.9%) of respondents were married farmers, whereas 13 (8.0) of respondents were widowed participants and 15 (9.4%) of sample respondents were divorced farmers, and the remaining 12 (6.6%) of them were single study participants. Of the 315 (75.9%) of married study participants, the majority, 185 (48.1)

of respondents, were off-farm activity participants compared to 130 (27.8) of non-participants of off-farm activity. The result of the chi-square test shows that there is a significant percentage difference in the marital status of respondents concerning off-farm activity participation at 5% significance. [Table 5](#) below shows the age distribution of the respondents.

Table 5. Two-sample test of age distribution.

Category	Obs.	Mean	Std. dev	t-test
Participant	205	44.12	13.21	1.6740***
Non-participant	150	41.31	13.54	
Combined	355	42.35	13.33	

Source: own construction, 2025

When the effect of the age of participants was considered, the result of the study revealed that there was a significant difference between the groups' mean age of the sampled respondents. On average, off-farm employment participants have a greater mean age in years (44.12) than non-participants of the off-farm activity (41.31). The t-test result indicates that the mean difference in the value of each of these variables is

statistically significant at 1% level of precision error. The finding of this study indicates that farm household heads with better more than 41 are more probability to participate in off-farm livelihood activities than household heads with older more than 65 are less participate in off-farm employment. Table 6 shows the age distribution of the study.

Table 6. Two-sample test of the education level of the respondent.

Category	Obs.	Mean	Std. dev.	t-values test for mean comparison.
Non- participant	150	3.32	4.05	-2.2134***
Participant	205	4.49	4.18	
Combined	355	4.18	4.16	

Source: own construction, 2025

Note: ** and * show variables are significant at 1* and 5% level.

When the effect of the educational status of the study participants was considered, the result of the study revealed that there was a significant difference between the groups' mean educational level of the sampled respondents. On average, off-farm activity participants have a greater mean educational level (4.49) than non-participants of the off-farm activity (3.32).

The t-test result indicates that the mean difference in the

value of each of these variables is statistically significant at 1% level of precision error. The finding of this study indicates that farm household heads with a better educational level are more probability to participate in off-farm livelihood activity than household heads with a lower level of educational achievements for the sampled respondents. It is indicated in Table 7 below.

Table 7. Two-sample test of Dependency ratio distribution.

Category	Obs.	Mean	Std. dev.	t-values test for mean comparison.
Non- participant	150	3.76	1.74	0.3254***
Participant	205	3.69	2.18	
Combined	355	3.71	2.07	

Source: own construction, 2025

Note: ** and * show variables are significant at 1* and 5% level.

Regarding the mean size of the number of dependents (less than 14 years and above 64 years) in the household, the result of the study in Table 7 revealed that there was a significant difference between the groups' mean for the number of dependents in the households. On average, participants of the off-farm activity have a greater mean size in the number of dependents (3.69) than non-participants of the off-farm activity (3.76). This difference in the mean size of the number of dependents in the household was statistically significant at 1% significance level. The result of the mean size of the number of dependents in the household was supported by the mean

difference of the dependency ratio of the smallholder farm households, 0.3254.

4.2. Socio-Economic Characteristics of the Sample Respondents

Similarly, to the demographic characteristics of the sample respondents, the categorical part of the socio-economic characteristics of the respondents discussed as follows. Concerning the result of the descriptive statistics for continuous socio-economic variables, such as the mean number of live-

stock holding measured in terms of tropical livestock unit (TLU), and annual farm income. The study result shown in Table 8 revealed that there was a significant difference between the group mean farm land sizes owned by the sampled respondents.

Regarding the association between livestock holding and off-farm activity participation, the result of the study shows that there was a mean difference between the total livestock owned by households on off-farm activity participation. On average, off-farm activity participants have a greater number

of livestock in terms of TLU (5.17) than non-participants in off-farm activity (3.41). This means the difference in the total livestock holding was statistically significant, 2.51 at 5% significance level. The study result was supported by household income from animal rearing. On average, non-participants of off-farm activity have a greater mean income from animal rearing (9.97) than participants of off-farm activity (9.54). The t-test result indicates that the mean difference in the value of each of these variables is statistically insignificant. Table 8 below shows this.

Table 8. Two-sample t-test for continuous socio-economic variables.

Variables	Category	Obser.	Mean	Stad. dev	t-test
Total livestock owned in terms of TLU	Participant	205	5.17	5.32	-2.51
	Non-participant	150	3.41	4.42	
	Combined	355	4.366		
Annual farm income	Participant	205	9.54	.91	0.8719
	Non-participant	150	9.97	.59	
	Combined	355	9.72	.79	

Note: *** shows variables are significant at 1% significance level respectively

Source: Survey output, 2025.

4.3. Institutional Drivers of Household Off-farm Activity Participation

Institutional factors that are identified as determinants of

household off-farm activity participation considered in this study include: access to extension service, access to credit, access to training, and access to information about off-farm, for which the results of the study were presented in Table 9 of the study.

Table 9. Descriptive statistics for the categorical institution factors.

Variables	Values	Participant (N=205)	Nonparticipant (N=150)	Total (%) (N=355)	Chi2 (χ^2)
Access to the contact DA service	Yes	150 (42.2)	105 (28.7)	255 (71.8)	0.025
	No	55 (15.4)	45 (12.6)	100 (28.2)	
Access to training regarding off-farm employment	Yes	130 (36.6)	90 (25.3)	220 (61.9)	.000**
	No	75 (21.12)	60 (16.9)	135 (38.0)	
Access to information about off-farm	Yes	135 (38.070)	80 (22.5)	215 (60.57)	.000**
	No	70 (19.7)	70 (19.7)	140 (39.43)	
Access to credit in the farming season	Yes	125 (35.2)	85 (23.9)	210 (59.1)	.000**
	No	80 (22.5)	65 (18.30)	145 (40.8)	

Note: *** shows variables are significant at 1% significance level respectively

Source: Survey output, 2025

Separately, when household head access to contact DA service was cross-tabulated with household off-farm activity

participation, the result of the study in Table 9 shows that 255 (71.8) of the sample respondents acquired access to extension services, whereas 100 (28.2) of them did not. However, the chi-square test result revealed that there is an insignificant percentage difference between access to extension services and the off-farm activity participation of farmers at 5% significance level.

When household head access to training was cross-tabulated with off-farm activity participation, the study result in Table 9 shows that 265 (74.6) of the sample respondents have acquired access to training, whereas 90 (25.4) of respondents have not acquired access to training. The result of the chi-square test revealed that there is a significant percentage difference between household head access to training/the suppliers of training, and the off-farm activity participation status of household head at 1% significance level. The study implies that most of the sample respondents who have acquired access to training are participants in the off-farm income-generating livelihood activities.

Regarding the association between household head access to information and the household off-farm activity participation, the study shows that 250 (70.4) of the sample respondents have acquired access to information, whereas 105 (29.5) of the sample respondents have no access to information in the areas of off-farm income-generating activity. Out of the total of 205 almost more than 135 (38.0%) of sample respondents have acquired access to information participants as compared to 80 (22.5) of non-participants in the off-farm activity. The result of the chi-square test revealed that there is a significant percentage difference between access to information/source of information and the off-farm activity participation status of the household head at 1% significance level.

Moreover, when household access to credit was cross-tabulated with household decision of participation in the off-farm activity, the study result shows that 245 (69.0) of the sample respondents have acquired access to credit, whereas 115 (32.3.2) of respondents have not had access to credit in the past farming season. Also, from the total of 212 sample respondents who have acquired access to credit, the study

result shows majority of participants, 116 (54%), accessed credit from microfinance institutions. However, the result of the chi-square test shows that there is an insignificant percentage difference between access to credit/source of credit and the off-farm activity participation status of the household head.

4.4. Probit Model Results' Diagnostic Tests

Multi-collinearity is used to describe the problem when an approximate linear relationship among the explanatory variables leads to unreliable regression estimates (Verbeek et al, 2004). This approximate relationship is not restricted to two variables but can involve more or even all repressors, and a situation whereby there exist strong linear relationships among independent variables is more than 10% (Gujarati, 2004). Therefore, if two variables are highly collinear, then this will result in inefficient estimates. In this study, before running the probit and propensity score matching model, Multicollinearity was tested by using the variance inflation factor (VIF) method to assess the degree of association among continuous explanatory variables.

According to Gujarati (2004), as a rule of thumb, if the VIF is greater than 10, the variable is said to be highly collinear. Therefore, in this study, there was no evidence of Multicollinearity since there was no VIF value greater than 10.

Likely, to test the presence of collinearity, according to the study by Healy (1984), the contingency coefficient (CC) method was used to detect the degree of association among discrete explanatory variables. This means discrete/dummy variables are said to be collinear if the value of the contingency coefficient (CC) is greater than 0.75. Therefore, there was no evidence of collinearity since there was value of the contingency coefficient (CC) is greater than 0.75.

4.5. Results of the Econometric Model

The probit model of the study is provided in Table 10 below.

Table 10. Marginal effects result after probit model estimation.

Adoption	Coef.	P-value	Marginal effects (dy/dx)	Std. Err.
Gender of household	3.39	0.000***	0.863	0.034
Age of household head	.058	0.560	0.014	.025
Education level	-.045	0.614	0.003	.020
Family size of the household	.028	0.800	0.006	.018
Farm size	1.29	0.068**	.004	.048
Oxen own	-.225	0.075**	-.061	.022
off-farm	-.10	0.725	-.05	.013
Credit access	10.43	0.000***	-0.002	.004

Adoption	Coef.	P-value	Marginal effects (dy/dx)	Std. Err.
Distance to market	-2.89	0.000***	0.065	.033
Access to Irrigation	-4.79	0.000***	.041	.029
Livestock holding	.070	0.764	0.036	.093
Information access of the respondent	2.44	0.000***	.69	.089
Getting trained on off-farm income	-7.057	0.000***	-.79	.044

Source: Own computation, 2025

4.6. Drivers of Participation in Off-farm Activity

The parameter estimates of the probit model provided only the direction of the effect of the explanatory variables on the outcome variable, and they did not present the actual magnitude of change or the probabilities in the coefficients. Thus, the partial effect or the marginal effects (df/dx) from the probit model measures the expected change in the probability of determinants of off-farm participation decision of the households concerning a unit change in the independent variable was presented. Following this, the discussion of variables started with variables that significantly affect household participation in off-farm activity, such as age, credit access, gender, education, market distance, irrigation access, access to off-farm training, and access to off-farm information.

The education coefficient is significantly different from zero (at a 0.087%), and it suggests that a farmer with more years of schooling has a higher probability of participating in off-farm employment. One additional year of education will increase the likelihood of a farmer to participate by 8.7 percent marginal effect.

As the coefficient of gender is significantly different from zero with a positive sign, it suggests that males are more likely to participate in off-farm employment as compared to females. A Male's participation rate increases by the marginal effect of 25.5%, holding all other variables constant.

Access to training is significant at 1% level with a positive sign, and hence a farmer who has access to training is more likely to participate as compared to his/her counterpart. A change from no access to train increases the probability of farmers' participation in off-farm employment activities by the marginal effect of 29.41%, holding all other variables constant.

Market distance is significant at 1% level with a negative sign. An additional distance in walk hours reduces the probability of participation by 6.5%, *ceteris paribus*.

Access to credit raises the likelihood of engaging in off-farm activities by 0.74% compared to not having access, while keeping other variables constant at their average values. The outcome is corroborated by earlier research, including

that of Abebe (2010). It is probable that access to credit serves as startup capital for off-farm activities, especially among impoverished households. Put differently, credit resolves the liquidity issue in rural areas, thereby enhancing the likelihood of involvement in off-farm activities.

Access to information about off-farm employment is significant at 1% level with a positive sign, and hence a farmer who has access to information is more likely to participate as compared to his/her counterpart. A change from no access to information increases the probability of farmers' participation in off-farm employment activities by the marginal effect of 68%, holding all other variables constant.

Holding other factors constant at their means, households that have more livestock in TLU on average tend to participate more in off-farm activities. The probability of participation in off-farm activities increases by 3.6% if owning livestock, which is measured by the tropical livestock unit, increases by one unit.

An increase in the age of the household head decreases the average likelihood that the household participates in off-farm activities. The result is similar to (Woldenhanna, etal, 2001). The coefficient of marginal effect on probability was 0.7% which implies that holding other variables at their means, an increase in one year of a head's age decreases the probability of household participation in off-farm activities by 0.7%.

The probability of participation in off-farm employment decreases by 7.9% for a household that has access to Agricultural labor input, holding other variables constant at their means.

5. Conclusions and Recommendations

5.1. Conclusions

This study aimed to evaluate the factors influencing smallholder farmers' involvement in off-farm activities, which are impacted by various demographic characteristics, institutional conditions, and socio-economic factors. It suggests that participation in off-farm activities positively affects household income in the Guto Gida district of the East Wollega zone. Of the 355 total sample household respondents, 205 (57.74%) were engaged in off-farm activities, while 150 (42.25%) were

not. The descriptive result indicates that those who did not engage in off-farm activities were more affected than those who did, in terms of demographic, socioeconomic, and institutional characteristics. The result was analyzed through descriptive analysis and propensity score matching.

The estimated marginal effect from the probit model indicates that the educational level of the household head, access to off-farm training, and access to off-farm information are significant variables influencing smallholder farmers' decisions to participate in off-farm activities. Furthermore, the age and education level of the household head, access to livestock and training, market location, and gender significantly influence the likelihood of program participation at a 5% level. The accessibility of agricultural inputs and credit for households significantly influences the likelihood of program participation at a 10% probability level, while factors such as livestock holding size, annual farm income, access to formal credit, distance to the nearest market, and household involvement in off-farm activities significantly affect total household income.

5.2. Recommendations

Taking into account the results of both descriptive and econometric analyses conducted in this study, the following recommendations were made for further consideration and enhancement of off-farm activities in the study area. The research showed that farmers' participation is low due to various demographic, institutional, and socioeconomic factors in the study area.

At a 5% likelihood level, age, education status of the household head, access to livestock, market location, gender, and availability of training significantly influence the likelihood of participation in off-farm activities. At a 10% level, the likelihood of the program is significantly influenced by the household's accessibility to agricultural inputs and credit. The education status of the household, credit access, household income, and agricultural input negatively impact the likelihood of participating in the program.

The educational level of the household head was found to have a direct relationship with the household's decision to participate in off-farm activities. Raising the number of years spent in school would enhance the likelihood of household involvement in off-farm activities. In light of this finding, Government sectors should concentrate on aspects of adult education that aid rural farmers in acquiring off-farm knowledge to promote household involvement in revenue-generating off-farm activities.

It was determined that the decision of households to participate in off-farm employment was directly associated with access to off-farm training. Securing the chance to take part in off-farm training would raise the likelihood of the household head engaging in off-farm work. Consistent with this finding, government development agents should ensure appropriate training in off-farm activities to encourage household in-

volvement in revenue-generating off-farm endeavors.

It was found that access to off-farm information is directly linked to the household's decision regarding participation in off-farm employment. The results of this study indicate that access to off-farm information significantly and positively influences the households' decisions to participate in off-farm activities. An opportunity to access off-farm information would enhance the likelihood of households deciding to participate in off-farm activities. Given the strong correlation between these variables, awareness can be raised through agricultural extension agents, village meetings, and other pertinent events that serve as trustworthy information sources to boost households' involvement in off-farm activities in the study area.

5.3. Limitations of the Study

The limitations of this study are related to the fact that some farmers do not keep records, and due to a skill gap and a lack of data handling skills. However, maximum effort was made to maintain the quality of data.

Abbreviations

TLU	Total Livestock Unit
CC	Contingency Coefficient
ME	Marginal Effect

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Conflicts of Interest

The authors declare no conflicts of interest.

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