

Determinants of Participation Decision in Non-Farm Income Generating Activities in Guji Zone: The Case of Dama District

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ABSTRACT

The objective of this study is to examine the determinants of participation decision in non-farm income-generating activities among rural farm households in Dama district. Multi-stage sampling techniques were applied to select 274 rural farm households. Descriptive and binary logistic econometric models were used to examine the data. Descriptive statistics show that, among the total sample households, 168 households participated in non-farm income-generating activities and 106 did not. The results of the binary logistic model revealed that education and family size had positive and significant effects on participation decisions. The remaining variables, such as sex, age, land size, access to transport, tropical livestock units, farm income, and distance to the market, had a negative but significant effect. Based on the results, the regional and local governments have to work on creating awareness about the benefits of participation in non-farm activities, providing agricultural markets and rural infrastructure facilities, promoting higher quality education, and motivating farmers to pursue business in value addition, processing, and livestock production.

Keywords: Non-farm activities, Participation, Binary logistic model, Dama district

BACKGROUND OF THE STUDY

Agriculture is the backbone of Ethiopia's economy, accounting for 83% of exports and 43% of GDP, and an estimated 79% of the labour force is generated by this sector (Fasika, 2024). Even though agricultural output increased significantly between 1993 and 2018, Ethiopia's food system and agriculture were ill-prepared to sustain the country's rapidly urbanizing population's access to a healthy diet or to promote widespread economic transformation (Bor & Adan, 2023). Agricultural production continues to be low due to several factors, including small private investment, lack of financial services, subsistence farming, inadequate infrastructure, unfavorable agricultural markets, environmental degradation, shrinking farm sizes, and frequent shocks. Conflict and the greatest drought in history have worsened these problems (Fasika, 2024). Mixed farming, crop production, and livestock husbandry are the three main agricultural activities in these nations (Adem et al., 2021). Ethiopia's agricultural industry

is distinguished by traditional farming practices, which mostly rely on rain-fed agriculture and animal traction. Family labour is the most common type of input used in agriculture (Adem et al., 2021).

The status of deprivation and ongoing food insecurity cannot be solved by agriculture alone, nor can it provide widespread economic growth. In Ethiopia, non-farming activities support farming operations on a cyclical basis. At the national level, 34% of the households are employed in jobs other than farming (Neglo, 2021). Due to land deterioration and inadequate revenue from agriculture, the degree of participation in non-farm activities is increasing daily (Fentahun et al., 2018; Broeck and Kilic, 2019; Adefris & Woldeyohannes, 2023). This strategy is defensive, particularly in rural areas, where the majority of households are already at risk and need to diversify their sources of income to achieve food security. Lack of financial availability (35%), inadequate facilities for product marketing (30%), and inadequate roads (14%) are the main obstacles to starting non-farm businesses in Ethiopia (Fentahun et al., 2018; CSA, 2017; Adefris & Woldeyohannes, 2023).

For many landless and small-farm households in Ethiopia and other rural areas in developing countries, employment in the labour market serves as the primary source of income. The non-farm sector has great potential for job creation, income generation, enhancing farm income activities, and reducing poverty. Off-farm activities can benefit households, but there are no clear-cut development policies in Ethiopia that recognize and include them as a source of jobs and a vital component of the rural economy (Adem et al., 2021). In our country, officials almost exclusively focus on the agricultural sector plan because it is the primary strategy for lowering rural poverty and ensuring food security. But given the risk and uncertainty of Ethiopian subsistence farming, households that diversify their revenue streams by engaging in non-farm pursuits are more resilient to adverse shocks (Fasika, 2024).

Ethiopia's rural farming systems face various issues such as ongoing population increase, urbanization, economic inequality, and land degradation, rain-fed declines in farm area and productivity, and unpredictability in weather patterns. The majority of individuals who live in rural areas are susceptible to a variety of dangers, such as unpredictability in the weather, lack of other sources of income, and scarcity of irrigation water pumps (Fasika, 2024). Rural residents can now access new revenue streams, most of which are owned by wealthy farmers. One of the best and most useful ways for rural people to deal with weather shocks is income diversification. Participating in non-farm revenue-generating activities can increase income diversification and lessen the effects of weather disasters. It can also improve capacity to predict and recover from droughts, make rural households' livelihood systems more stable, and provide new ideas for rural disaster management (Fentahun et al., 2018).

The empirical literature on the determinants of participation in and intensity of rural non-farm economic activity is not unclear. But coming up with different criteria and scales, researchers identified demographic factors (age, gender, marital status, and family size), socioeconomic factors, and Institutional factors as the important determinants of non-farm economic activities in Ethiopia. Several studies (Abdulaziz et al., 2019; Abera et al., 2021; Asare et al., 2021; Asfaw et al., 2017; Asfaw, 2021; Getnet et al., 2021; Anang & Yeboah, 2019; Atamanov & Van den Berg, 2011; Danso-Abbeam et al., 2020; Gansonré, 2021; Jayne et al., 2014; Nkegbe et al., 2018; Oladimeji et al., 2015; Broeck & Kilic, 2019; Vasco & Tamayo, 2017; Zahonogo, 2011) examined the determinates of participation decision in non-farm activities. Mixed results of findings have been observed in the relationship between dependent and independent variables. Furthermore, structural obstacles that women and young people encounter while trying to access non-farm possibilities are frequently overlooked in current research. Effective rural development strategies may be difficult for policymakers and development practitioners to create without a comprehensive grasp of the factors that encourage or discourage participation in non-farm income-generating activities. Further empirical research that pinpoints these factors in a more inclusive and geographically representative setting is desperately needed.

In the Dama district, agriculture remains the primary livelihood source for the majority of rural households. However, it is increasingly recognized that agricultural income alone is insufficient to sustain rural livelihoods due to land scarcity, climate shocks, low productivity, and limited access to agricultural markets. As a result, rural households are progressively diversifying their income sources by participating in non-farm income-generating activities (NFIAs) such as petty trade, wage employment, handicrafts, and informal services. Understanding the determinants of non-farm activity participation is crucial for policymakers and stakeholders aiming to design effective rural development strategies, promote economic diversification, and support inclusive growth. Thus, the objective of this research is to ascertain what factors determine farm household members' decisions to participate in non-farm income-generating activities in Guji Zone: the case of Dama District.

METHODOLOGY

Sources and Methods of Data Collection

This study included data from both primary and secondary sources. The structured questionnaire was used to gather the primary data. The cross-sectional data on socioeconomic, demographic, and institutional factors influencing off-farm participation were obtained using a structured questionnaire. In order to make the questions understandable to the enumerator and to make data collection during the

home survey easier, this questionnaire was first prepared in English and then translated into the widely used Afan Oromo language. To support the study, secondary sources of data were collected from various published and unpublished documents, including reports from the district administration office.

Sample Size Determination

To determine the sample size, Kothari's (2004) formula was applied. The total number of farm households of these three selected kebeles is 960. Based on this the sample size of this study is calculated as follows.

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

Where “n” is the sample size, “N” is the population size (Farm household), and “e.” margin of error, “Z” the value of the standard deviation at a given confidence level, “P” = sample proportion, q = 1-p

So, here we have N= 960, Z= 1.96(for confidence level of 95%), e= 0.05(since the estimate should be within 5% of the truth value), p= 0.5 and q= 1-0.5

$$n = \frac{(1.96)^2(0.5)(1 - 0.5)(960)}{(0.05)^2(960 - 1) + (1.96)^2(0.5)(1 - 0.5)}$$

$$n = \frac{(3.84)(0.25) (960)}{(0.0025)(959) + (3.84)(0.25)}$$

$$n = \frac{921.6}{2.3975 + 0.96}$$

$$n = \frac{921.6}{3.3575} \approx 274$$

Table 1: Farm households selected from three kebeles proportionally

No.	Name of Kebele	Household size	Sampled household head
1	Hanku Cabi	320	274(320/960) = 91
2	Qufi Dama	310	274(310/960) = 89
3	Ilalcha Haro	330	274(330/960) = 94
	Total	960	274

Source: own computation

The number of households from each kebele is selected using a proportionate sampling design technique.

Sampling Technique

A multi-stage sampling procedure was used to select a sample household. First, the purposive sampling technique was applied to select the Dama district due to a large number of households participating in non-farm generating activities, according to information obtained from the district. Second, out of the 21 kebeles in the district, three kebeles, Hanku Cabi, Qufi Dama, and Ilalcha Haro, were chosen using simple random sampling. Finally, respondents from each sample kebele were chosen using simple random sampling using a proportionate sample design.

Model specification

In econometric analysis, Probit models and binary logistic regression are commonly used when the dependent variable is a dummy (Gujaraty, 2004). In this study, a binary logistic model was applied to identify the key determinants of participation decision in nonfarm income-generating activities. With this model, one can use a set of continuous, discrete, categorical, or a combination of any of these variables to predict the log chances of the outcomes for a dependent variable (Gujaraty, 2004). The best aspect of a logistic regression model is that it does not require normally distributed variables or assume a linear relationship between the covariates and the outcome variable. The dependent variable was the participation decision in nonfarm income activities. The response

The variable is dichotomous. If the i^{th} individual is participating, the response variable (Y_i) takes the value of 1; otherwise, it takes the value of 0.

$$Y_i = \begin{cases} 1, & \text{if the HH participate in non farm income activities} \\ 0, & \text{if the HH not participate in non farm income activity} \end{cases}$$

Following Gujarati (2004), the logistic model would be written in terms of the odds ratio and the log of the odds ratio, which enables one to understand the interpretation of the coefficients. In this study, the odds ratio is the ratio of the probability that they were participating (P_i) to the probability that he/she was not participating ($1 - p_i$)

$$P_i = f(Z_i) = f(\alpha + \beta_i X_i) = \frac{1}{1 + 1e^{(-\alpha + \sum \beta_i X_i)}}$$

Since $Z_i = \alpha + \beta_i$, the above formula can be rewritten as shown below for easy understanding.

$$1 - P_i = \frac{1}{1 + e^{Z_i}}$$

$$\left(\frac{P_i}{1 - P_i}\right) = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} = e^{Z_i}$$

Therefore, $\left(\frac{P_i}{1 - P_i}\right) = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} = e^{(\alpha + \sum \alpha + \sum \beta_i X_i)}$

By taking the natural logarithm of the equation

$$Y_i = \ln\left(\frac{p}{1-p}\right) = \alpha + \sum_{i=1}^k \beta_i X_i + \mu_i$$

Where: K=the number of explanatory variables; Xi= vector of independent demographic, institutional, socio-economic, and locational variables of individuals, μ = the error term, α = is the value of the log odds ratio when X or explanatory variable is zero, and β_i = measures the change in Logit for a unit change in explanatory variables (X).

Description of variables and their measurement

The decision of rural households to participate in non-farm income diversification activities has been greatly influenced by demographic, socioeconomic, and institutional variables. Both the dummy and continuous variables in the analysis are discussed in Table 2 below.

Table 12. Summary of independent variables and hypothesis

Variable Description	Variable type	Measurement of a variable	Expected sign
Dependent variable	Dummy	It is a treatment variable, which is participation in off-farm (participants=1, if yes; =0 non-participants)	
Independent variable			
Sex of Household Head	Dummy	Dummy(1=male, 0 =female)	+ve
Education of the household head	Categorical	Formal education in the year of schooling grade	+ve
Age of Household	Continuous	Age of respondent in years	+ve
Household size	Continuous	Total household members in adult equivalent	+ve
Cultivated Land size	Continuous	Size of cultivated land in hectares	+ve
Total livestock owned in TLU	Continuous	The respondents' total livestock owned in tropical livestock unit	+ve

Access to Credit	Dummy	If the respondents did have access to credit (1= if yes; 0=if no)	+ev
Marital Status	Dummy	If the respondent is married (1=Yes, 0=No)	+Ve
Farm Income	Continuous	Mount of money obtained in Birr	+ve
Distance from the main market	Continuous	Walking from home to the nearest market in minute	-ve
Access to electricity	Dummy	If the respondents did have access to electricity power (1= if yes; 0=if no)	+ve
Training on non-farm activities	Dummy	If the respondents get training (1= if yes, 0= if no)	+ve

Source: Own Design

RESULTS AND DISCUSSION

Description of the study area

Situated 405 kilometers southeast of Addis Ababa, the capital of Ethiopia, and 226 kilometers from Nagele town, the capital of Guji Zone, the Dama District is part of the Oromia Regional State in southern Ethiopia. It lies between 6°040' and 6°20'30"N Latitude and 38°21'0° and 38°37'30° E Longitude with an altitude range of 2300 m to 3200 m above sea level. The Dama District Agricultural Office (2020) unpublished report states that 115,471 people are living in 21 kebeles in the district, with 58,891 (51%) men and 56,580 (49%) females. 96.96% of the district's total population lives in rural areas, with the remaining 3.04% residing in the urban areas of the district. Agriculture is the backbone of the economy of the district. It is characterized by mixed farming and economic activities. Most of the population bases its livelihood on agriculture and livestock rearing. As the Dama District people lead their lives based on crop production and livestock, in addition to crop production, they earn their living from non-farm income-generating activities such as small shop keeping, small bars, traditional drinks, pottery items, and various small services. The climatic condition of the study area is characterized by highland agro-ecology with the maximum and minimum temperature ranging from 12°C to 17°C and a bimodal rainy season, with summer/kiremt extending from June to November and spring/belg from March to May, with rainfall ranges between 1200mm and 1800mm.

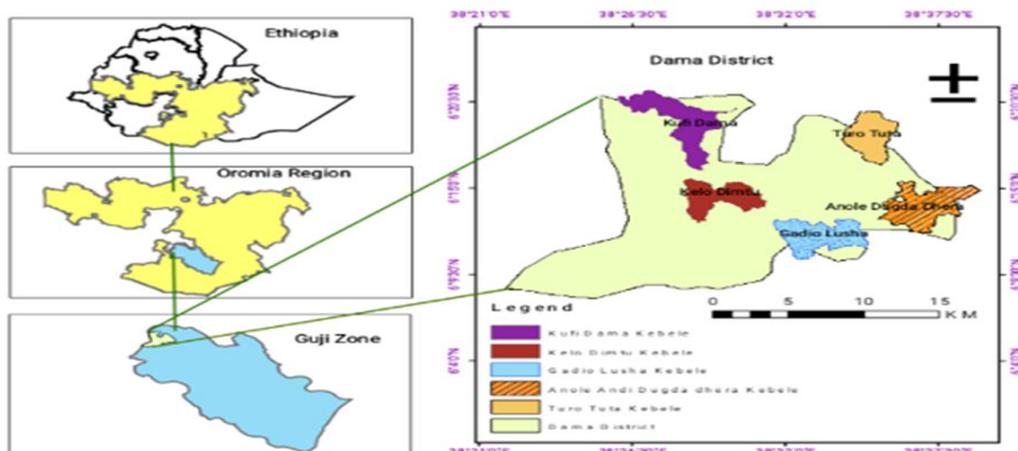


Figure 1: Map of the study area

Descriptive Results

The descriptive analysis of the survey data, as mentioned in Table 3, reveals that 168 (61.3%) of the total sampled households are participants in different non-farm income-generating activities. Among the major activities, making and selling crafts (17.3%), selling firewood and/or charcoal (15.5%), making and selling food and drink items (12.5%, small rural shops (11.9%, and transport (motorbikes) (10.7%) were the dominant non-farm income activities. Other non-farm income activities are make and sell crafts (17.3%), selling firewood and/or charcoal (15.5%), making and selling food/drink (12.5%), small rural shop (11.9%), Transport (motor bicycle) (10.7%), skilled and unskilled nonfarm laborers (10.6%), collecting and selling non-timber forest products (8.3%), salary work (6%), rent (4.8%), a traditional healer (livestock/human) (1.2%) , and horse-drawn(cart) (1.2%).These shows the majority of the sample households are engaged in different non-farm income generating activities.

Table 3: Major non-farm income activities adopted in the study area

Non-farm activity	Frequency	Percent
Make and sell crafts	29	17.3
Selling firewood and/or charcoal	26	15.5
Collecting/selling non-timber forest products	14	8.3
Traditional healer(livestock/human)	2	1.2
Salaried work	10	6
Skilled and unskilled non-farm laborers	18	10.6
Horse-drawn(cart)	2	1.2

Transport(motor bicycle)	18	10.7
Rent (land, house...)	8	4.8
Making and selling food/drink items	21	12.5
Small rural shops	20	11.9
Total	168	100

Source: Own computation

Bivariate Estimation for Dummy Variables

The sample size of this study was 274, with 100% return rate. As indicated in Table 4, out of 274 sampled households, 29% were male, and 71% were female-headed households. Further, the result revealed that 21% of participant of non-farm income diversification activities were male, the remaining 79% was female households. Female respondent covers 58% of non-participant of non-farm activities, and the rest 42% were male. Moreover, the chi-square test revealed a significant difference in the non-farm activities decisions of farm households regarding the gender of sample households and found to be significant at 5% probability level.

Regarding marital status, the result shows that most of the sampled household heads in the study area are married. Accordingly, males or females who are single and heads of household are less likely to engage in non-farm activities than married individuals. The chi-square test showed that there was no statistically significant difference between the marital status of non-participants and participants.

Training on participation in non-farm income-generating activities is necessary to create awareness among farmers as well as motivation among farmers (Adem et al, 2021). Participation in training is one of the ways farmers gain new knowledge and skills about non-farm income-generating activities. It is a dummy variable that has a value of 1 if the participant has participated in training and 0 otherwise. Of the total sample of households, 10 (3.64%) had access to training, while 264 (96.3%) had no access to training. Of the households that participated in the activity, 161 (96%) were not trained, and the remaining 7 (4%) received training during the year following the date of the interview. From non-participant households, three (2.9%) received training, and the remaining 103 (97.1%) were not trained in the year before the date of the survey. The results of the chi-square test showed that there was no significant difference between participants and non-participants with respect to access to training.

Access to credit services is a source of finance for medium- and lower-income households to expand their non-farm income-generating activities. Access to credit is a dummy variable with a value of 1 if farm households have access to credit, and 0 otherwise. As presented in Table 4, about 134 (79.7%) and

83 (78%) participants and non-participants, respectively, had no access to credit, while about 34 (20.2%) and 23 (22%) had credit access. The test results revealed that there was no significant difference between participants and non-participants in accessing credit.

Access to electricity is an important variable that takes the value of 1 if a household has access to electricity, and 0 otherwise. Of the total sample of households, 12% had access to electricity, and the remaining 88% had no access to electricity. Of the households that had access to electricity, 15% participated in non-farm income-generating activities (i.e food processing, wood and metal work, etc.), and the remaining eight 85% did not participate in these activities. The test results revealed that there is no significant difference between participants and non-participants in accessing electricity.

Table 4: Bivariate estimation for dummy variables

Variable		Participants		Non-participants		Total		Chi ²
		Freq.	%	Freq.	%	Freq.	%	
Sex	Male	35	21	44	42	79	29	13.54***
	Female	133	79	62	58	195	71	
	Total	168	100	106	100	274	100	
Marital status	Married	149	89	104	98	253	92	815.4
	Otherwise	19	11	2	2	21	8	
	Total	168	100	106	100	274	100	
Access to training	Yes	7	4	3	3	10	4	33
	No	161	96	103	97	264	96	
	Total	168	100	106	100	274	100	
Access to Credit	Yes	34	20	23	22	57	21	84
	No	134	80	83	78	217	79	
	Total	168	100	106	100	274	100	
Access to electricity	Yes	25	15	8	8	33	12	330
	No	143	85	98	92	241	88	
	Total	168	100	106	100	274	100	

Source: own computation

Bivariate Estimation for Continuous Variables

The age of the household head is one of the variables explaining farmers' decisions to participate in non-farm income-generating activities. Older farmers do not have sufficient understanding of the advantages of non-farm income-generating activities because they have agricultural experience and mainly draw on farm income to make a living. In comparison to older households, youth respondents engage in socioeconomic activities more actively and with greater energy. The survey results show us that the

average age of the participants was 32 years, while it was approximately 38 years for non-participants. The t-test revealed a statistically significant mean age difference between participants' and non-participants' age at the 1% level. In addition, the reason is probably their experience of accessing information compared to older farmers. Household heads of lower ages are more likely to participate in non-farm income-generating activities.

Family size is one of the variables that illustrate a farm household's participation decision. The availability and quantity of family labor play a significant role in determining participation in non-farm income-generating activities. The presence of an active workforce in rural households usually encourages them to participate in nonfarm income-generating activities. The influence of labor availability on participation depends on the characteristics and availability of non-farm income-generating activities. The survey results show that, as family size increases, the average number of people who participate in non-farm income-generating activities increases. The average family size of the participants was 7.05 people, while it was approximately 4.76 people for non-participants. The t-test of family size between the participants and non-participants was significant at the 5% level (Table 5).

Education influences farmers' knowledge, abilities, and attitudes. It also improves the investigative and problem-solving skills of the farmers. In addition, education increases the locative ability of decision makers by enabling them to think critically and use information sources efficiently. Hence, learned producers are expected to be in a healthier position to obtain and use information, which will contribute to improving their participation practices. The t-test results in Table 5 indicate that the education level of households was significantly different between participants and non-participants at the 1% level of significance. This means that, as the number of years of schooling increases, there is a greater chance of participating in non-farm income-generating activities.

Cultivated farmlands are important to the rural economy. Participation cultivated land sizes (3.48) are substantially less than non-participant land sizes (5.69). A t-test revealed that statistically significant mean cultivated land size difference between participant and non-participant households' cultivated land size at 5% significant level. This means that participants owned less land than non-participants. This is because the income from agricultural output rises with the size of cultivated land, and households have less opportunity to seek out other sources of income because they already have enough money from these sources.

Livestock size is also an indicator of the wealth status of households in the study areas. As confirmed in many studies, farmers with better livestock ownership status are not likely to participate in non-farm income-generating activities because they are busy with livestock protection. In our case, the average livestock ownership of participants was 5.77 and 6.58 TLU for non-participants. The t-test showed that statistically significant mean of livestock holdings between participants and non-participants at the 1% level.

The market distance of the respondents is important for makers to obtain an attractive market price through a reduction in transportation costs. An increase in market distance causes farmers to obtain out-of-date market information and become unable to participate in non-farm income-generating activities. The mean market distance for non-participant and participant households was 16.03 km and 9.11 km, with a standard deviation of 7.261 and 5.624, respectively. The t-test of distance to the nearest market between participants and non-participants is significant at the 1% level of significance, indicating that non-participants travel more hours to reach the nearest market than do participants.

Respondents' farm income is an important variable in determining farmers' participation in non-farm income-generating activities in rural households. Farmers who earn a higher income from agricultural activities are less likely to participate in nonfarm income-generating activities. In other words, as farm income increases, farmers' participation in nonfarm income-generating activities decreases. The mean farm income for participants and non-participants was 9840.48 and 13013.2 birr, respectively. The t-test of farm income between participants and non-participants was significant at the 1% level, indicating that there was a significant mean difference between non-participants and participants.

Table 5: Bi-variate analysis for continuous variables

Variable	Participants		Non-participants		t-test
	Mean	Std. Dev.	Mean	Std. Dev.	
Age of Household	32	10.331	38	10.756	5.065***
Household size	7.05	3.015	4.76	2.393	-6.596**
Education	2.1	0.974	0.56	0.957	-12.82***
Land size	3.48	2.765	5.69	2.235	7.271**
Livestock unit	5.77	2.556	6.58	1.967	2.942***
Farm Income	9840.4	80.3	13013.2	118.00	2.648***
Distance to market	9.11	5.624	16.03	7.261	8.853***

Note:*, **and*** level of significant level at 10%, 5% & 1% (Source: Own calculation result based on survey data)

Econometric Results

Post-Estimation Diagnostic Test

A binary logistic model was used to identify determinants of participation decisions in non-farm income-generating activities in the study area. Before running the logit model, the existence of multicollinearity was tested. A variance inflation factor (VIF) was applied to check if there was a multicollinearity problem among the explanatory variables. When the value of VIF tops 10, this indicates severe multicollinearity among the continuous explanatory variables. The VIF values for the continuous explanatory variables included in the model were much less than 10, with an average VIF of 1.08, indicating the absence of multicollinearity problems among the continuous explanatory variables (Gujarati, 2004). In the case of dummy variables, the contingent coefficient was used to check the existence of multicollinearity. The contingency coefficients for dummy variables were less than 0.75, which indicates the absence of multicollinearity problems among dummy variables.

We tested the model's goodness of fit using the Hosmer-Lemeshow test. According to the Hosmer-Lemeshow goodness-of-fit test, the smallest P-values mean the model is a poor fit. The test is used to accept or reject the alternative hypothesis that "the model adequately describes the data." If the significance level of the test is less than 0.05, it indicates that the alternative hypothesis is rejected and the null hypothesis, which states the inadequacy of the model to describe the data, is accepted (Gujarati, 2004). In our case, the significance level of the test was found to be 0.7639, which is much larger than 0.05. We do not reject the null hypothesis, which states that the model is adequate to describe the data, and we conclude that the model is a good fit.

Heteroscedasticity is a common problem in cross-sectional data. In cross-sectional analysis, where data is collected from different individuals or entities at a single point in time, it is often the case that the variability of the error term differs across different groups or observations. In a logistic regression model, the assumption of equal variance of the error term, known as homoscedasticity, is not required. However, if heteroscedasticity is present in the model, it can lead to biased standard errors, which in turn affects the significance of the coefficient estimates and hypothesis tests. To address the issue of heteroscedasticity, the researcher used robust standard errors (Gujarati, 2004).

Binary Logistic Regression Result

As presented in Table 6, out of the total explanatory variables included in the model, eight significantly influenced farmers' decisions to participate in non-farm income-generating activities at 1% and 5% significant levels. The variables include sex, age, education, household size, land size, tropical livestock unit, farm income, and distance to the nearest market.

The sex of the household head has a negative and significant effect on the probability of the non-farm activities participation decision. The results imply that female-headed households are more likely to participate in rural, non-farm income-generating activities than male-headed households, and this may be connected to the challenges associated with farming or the physical strength required in farming activities. The result is the same as the study by Adefris and Woldeyohannes (2023).

Age has a negative and significant influence. The marginal effect of age indicates that the likelihood of engaging in non-farm activities for each additional year decreases by 0.37 units. Older farmers do not have enough understanding about the benefits of non-farm income-generating activities because they have agricultural experience and mainly draw on farm income to make a living, rather than non-farm activities. The finding is in line with the study by Asfaw et al. (2017) and Tshabalala & Sidique (2020).

Table 6: Logistic Regression Estimates for participation in non-farm activities

Independent variables	Coefficient	Robust St.Err	Marginal effect (dy/dx)	P> z
Sex	-0.1986724	0.0377966	-0.1245923	0.001***
Age	-0.0067728	0.0015434	-0.0037478	0.015***
Marital status	-0.2475898	0.0861477	-0.0787434	0.361
Education	.087496.87	0.0118667	0.1107551	0.000***
Household size	0.0039097	0.0055139	0.0147167	0.008***
Cultivated land size	-0.0377992	0.0076474	-0.0228106	0.003***
Access to Training	-0.1431365	0.0976135	0.0481825	0.622
Tropical Livestock Unit	-0.042238	0.0081969	-0.0261723	0.001***
Access to credit	-0.0586718	0.0403505	0.0204136	0.613
Access to electricity	-0.06316	0.0570576	0.0486708	0.394
Farm Income	-9.13E-06	1.62E-06	-5.97E-06	0.001***
Distance from the market	-0.0153068	0.0023825	-0.0106372	0.000***
Constant	7.853377	2.078457		0.0000
Number of observations	274			
LR chi2(13)	239.75			
Prob > chi2	0.0000			
Pseudo R2	0.6556			

p<.01, **p<.05, * p<.1*, **and significant level at 10%, 5% & 1%

Source: Own calculation result based on survey data

Education is one of the major variables of livelihood diversification in non-farm activities. From Table 4, the result revealed that education has a positive and significant effect on the probability of non-farm participation decision. Adding one year of education level can increase the chance of participating in non-farm income activities by 11%, *ceteris paribus*. The heads of off-farm participant households are better educated than those of non-participant households. The finding is similar to the studies by Ana & Demmelash (2017), Dufera et al. (2023), Zewdie (2017), and Weldegebriel & Folloni (2015).

Household size had a positive and significant effect on households' participation in non-farm income diversification activities. The marginal effect showed that if the family size increases by one, the chance of participating in non-farm income activities increases by 1.5%, *ceteris paribus*. The probable justification is that households with a large household size have a better chance of participating in non-farm income activities than households with a small household size. Because households with a large household size have a better chance to allocate their labor force to different non-farm income activities, they need additional income to overcome the problem of food scarcity that is caused by large family members. Moreover, an increase in family size lowers agriculture's carrying capacity, which causes disguised unemployment. The finding is in line with the studies by Abdurezak (2020), Fami et al. (2020), Teji (2020), and Zewdie (2017).

Landholding size had a negative and significant influence on household participation in non-farm income-generating activities. The marginal effect showed that if the cultivated land size increases by one hectares the household participation in non-farm income-generating activities decreases by 2.2%. This is because households who cultivated more farmland earn more income to fulfill family requirement including food and non-food consumption expenditure from agriculture, than other income-generating non-farm activities. This study is in line with Fentie & Rao (2015).

Tropical Livestock Units (TLU) had a positive and significant effect on participation decisions on non-farm income-generating activities. The marginal effect revealed that the likelihood of seeking non-farming employment decreased by 2.6% with every increase in one herd of livestock. Wealthier families who can afford family needs through earnings from livestock may not engage in other income-generating businesses unless their objective is to increase their asset holdings. However, households with fewer livestock had to stabilize and increase their portfolio by engaging in non-farm business, and this accelerates the rate of diversification. The result is the same as the study by Abdulaziz et al. (2019; Abdurezak, 2020; Weldegebriel & Folloni, 2015).

Farm income had a negative and significant effect on household participation in non-farm income-generating activities. The marginal effect revealed that if the amount of income earned from agriculture increases by one birr, the household participation in non-farm income-generating activities decreases by 5.9. This finding is in line with Zahonogo (2011).

Distance to the market center has a negative and significant relationship with the probability of participation in non-farm income-generating activities. This shows that the nearer the distance to the market, the stronger the incentive to participate in non-farm activities. This is due to the fact that there are more opportunities in the labour market and lower commuting costs. Specifically, the probability of a household participating in off-farm activities decreased by 1.06% as the distance to the nearest market increased by one minute, all other explanatory variables being held constant. This is also similar to the study of (Abdulaziz et al., 2019; Abdurezak, 2020; Fami et al., 2020; Kerorsa, 2022; Teji, 2020; Tshabalala & Sidique, 2020).

CONCLUSIONS AND POLICY RECOMMENDATIONS

Non-farm diversification is essential for Ethiopian farm households to improve their food security. Therefore, to support and carry out effective initiatives by stakeholders to increase farm households' food security in the nation, it is imperative to look into the determinants of participation decisions in non-farm diversification activities. This study analyses the determinants of participation decisions in non-farm income-generating activities among rural farm households, based on the sample of 274 households drawn from three rural kebeles in the Dama district of the Guji Zone, Oromia region, Ethiopia. According to the descriptive analysis form of sampled households, 168 are participants in non-farm activities, whereas 106 are non-participants. The analysis also confirmed that the major non-farm income-generating activities that rural households engage in in the study area include making and selling crafts, selling firewood and charcoal, making and selling food and drink items, and small rural shops and transport (motor bicycles). The binary logistic model results show that participation decisions in non-farm economic activities among rural farm households are significantly determined by gender, age, education, land size, family size, tropical livestock units, distance from the main market, and farm income. Consequently, non-farm economic activities may be a reliable addition to agricultural activities, even though this study does not support them as a replacement for farming. So based on the findings, the following policy recommendations are given to increase participation of households in non-farm income-generating activities.

- The regional and local governments have to work on awareness creation about the importance and benefits of rural non-farm income diversification activities. Training on business ideas has to be given for men to build their skills to increase the participation of males.
- Policymakers are better off encouraging households to engage in non-farm activities by providing adequate funding, agricultural markets, and rural infrastructure facilities.
- Promotion of higher-quality education: Given that education has a positive impact on participation in non-farm income-generating activities, it is necessary to strengthen access to higher education. To this end, the government has to support compulsory education for children and upgrade the educational infrastructure by renovating school buildings, empowering current teachers, hiring more qualified teachers, and maintaining close supervision to ensure that every child has access to a high-quality education.
- The government might also support and motivate farmers to pursue businesses in value addition, processing, and livestock production.

Limitations and Future Research Direction

Using cross-sectional data analysis, this empirical study examined determinants of participation decisions in non-farm income-generating activities in the Guji zone: the case of the Dama district. The study's focus on a single district may make it difficult to conclude the whole spectrum of issues surrounding determinants of participation decisions in non-farm activities on a national and regional level. Getting full information regarding the variables included in the model was the main problem encountered over the course of this investigation. This triggered the researchers not to capture important information on the variables. The other difficulty we faced was a lack of willingness to cooperate during data collection as a result of the frequent interviews conducted by several researchers. So, it is crucial to do additional research on analyzing determinants of participation decisions in non-farm income-generating activities by broadening the scope of the study and employing in-depth data analysis in order to generalize the entire issue at the national and regional levels.

ABBREVIATIONS

GDP: Gross Domestic Product, VIF: Variance inflation factor; NFIGAs: Non-Farm Income Generating Activity, TLU: Tropical Livestock unit

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