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Determinants of women's participation in income generating activities in western Ethiopia

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Abstract. *Yaried AA, Bullo MS. 2025. Determinants of women's participation in income generating activities in western Ethiopia. Asian J Agric 9: 84-93.* Participating in various income generating activities can improve women's living standards by providing additional income, increasing agricultural productivity, reducing poverty and improving food security. This study focuses on assessing determinants of women's participation in income generating activities in Itang special district of Gambella region. Primarily, Itang Special District was selected purposively among thirteen districts and 168 respondents were selected by using simple random sampling method. The data for this study was collected from both primary and secondary data sources. The descriptive analysis revealed that 62 (36.9%) of the households were farm participants, 86 (51.2%) were non-farm, and 20 (11.9%) were off-farm participants, respectively. Correspondingly, the multinomial logit model indicated that education status, household size, land size, livestock holding, access to credit, access to extension contacts, distance to main road, access to training, access to infrastructures, and access to market information is enormously significant variables that affect women's participation in income generating activities. In conclusion, women's participation in income generating activities has a greater role on improvements of their means of living. Therefore, government agencies, policymakers, and NGOs should pay attention to strengthening rural women households' participation in various income generating activities to improve their means of living.

Keywords: Income generating activities, Itang Special District, livelihood, multinomial logit model

INTRODUCTION

Globally, agriculture is the main fiscal activity practiced by the rural community. Likewise, it is main sources of income for the majorities of rural people in Ethiopia (Wendimu and Moral 2021). Due to this, 83% of the population is engaged in agricultural sector (ILO 2014), and it contributes 39% of national GDP (UNDP 2018). Accordingly, only 27% of the population participated in non-farm economic activities (Tesfaye and Nayak 2022). However, agriculture as a primary source of income has failed to guarantee an adequate livelihood for most farming households in sub-Saharan African countries like Ethiopia (Babatunde 2013). This is because the agricultural sector is highly characterized by decreasing farm sizes, low output levels per land size, and a high degree of own consumption (Bekabil 2023).

In developing countries, women are less empowered than men among several dimensions, including sociocultural, economic, legal and political dimensions of development (Peterman et al. 2021). Thus, achieving the goal of reducing the level of poverty without effective involvement of women in different income generating activities (farm, non-farm and off-farm activities) is impossible to achieve comprehensive development of Ethiopian economy (Bogale and Lemma 2023). Therefore, their participation in income generating activities is more essential to improve their livelihood in developing countries by creating employment opportunities, production of locally needed commodities, income generation, growth of farm activities and reducing poverty (Tesgera et al. 2024). In addition to this, income generating activities can improve the living standards of the poor by increasing income, improving nutrition, savings, education, and fulfill basic necessities of the rural people (Mengistu and Belda 2024).

In rural society, rural women usually play a greater role in the household by performing several types of income generating activities, including cultivation of crops and vegetables, livestock and poultry rearing, small business, and handicraft (Vimefall and Levin 2023). However, women walk against their male's guardian decision because they are depended on their husband's income (Kuma and Godana 2023). So, the participation of women in income generating activities can contribute to enabling households to cope with income shocks, ensure food security, reduce the level of poverty and bring economic growth and sustainable development (Bryan et al. 2023). However, rural women participation in different income generating activities has been limited by education, resources, and support for their pursuit of various income generating activities and this leads them to engage in a low-profit livelihood activity (World Bank 2015; Chekol 2024). Additionally, a study by Alemu et al. (2021) described that education, total land holding, amount of credit and average time spent in domestic work are the main factors that condense the level of women's participation in income generating activities. In most cases, still there is gender

economic inequality is associated with disadvantages for women in access to cash, credit, and other forms of wealth compared to men, and there is a restriction on earning and saving money from income-generating opportunities (Haley and Marsh 2021).

Agriculture is the main fiscal activity for the rural people in Gambella region, specifically in Itang special district. But the study area is mostly characterized by unpredictable rainfall and relatively higher temperature (Dangia and Dara 2020). Therefore, rain-fed dependent agriculture alone cannot reduce the high level of poverty; hence, participating in other income generating activities is equally importance (Asmah 2011; Sisay 2024). In rural Ethiopia, if there is no other source of income away from agricultural production in order to generate additional income and minimize agricultural risks, it is impossible to feed and fulfill household needs (Woleba et al. 2023). However, women's participation in various livelihood diversification strategies in Gambella region is very low (Addisu 2017). Therefore, the main objectives of this study is to assess the major determinants of women's participation in income generating activities in Itang special district of Gambella region.

MATERIALS AND METHODS

Study area

The study was conducted in Itang special district which is 45 km away from Gambella regional city, Ethiopia (Figure 1). It encompasses 24 villages with an area of 2,188 km^2. Itang is one of the special districts found in Gambella region of Ethiopia and it is bordered on the northwest by South Sudan, the south and southeast by the Anuak Zone, on the north by the Oromia Region, and on the west by the Nuer Zone. The district is located at 8015'N latitude & 34010'E longitude in the region. The Itang Special District landscape is normally flat with the altitude ranging from 350 to 480 meters above sea level. The total population of Itang Special District is around 42,000 people (Gatdet et al. 2024). Within these populations, approximately 20,589 are females whereas 21,411 are males. While 5,958 or 16.7% are urban inhabitants, a further 278 or 0.78% are pastoralists. The main ethnicities of this district are the Nuer (63.96%), Anuak (25.17%), and foreigners from Sudan (4.62%), Shita (2.66%), and all other ethnic groups 3.59%. Languages spoken in this district include Nuer (68.72%), Anuak (25.75%), and Opuuo (2.66%). The religion with the largest number of believers is Protestant, with 81.63% of the population, while other groups with sizable followings are traditional beliefs (7.54%), Orthodox Christian 6.27%, and Roman Catholic 2.62%.

Like other rural areas of Ethiopia, the area's main economic activity is agricultural production. Cereal crops (sorghum and maize) vegetables, animal herding and fishing are the main activities implemented in the district. However, it is one of the districts that has been highly affected by floods. Hence, in addition to farm activities, the area is also suitable for construction of various income generating activities. Due to this reason, this district was selected from Gambella region to identify the determinants of women's participation in income generating activities in Itang special district of Gambella region.

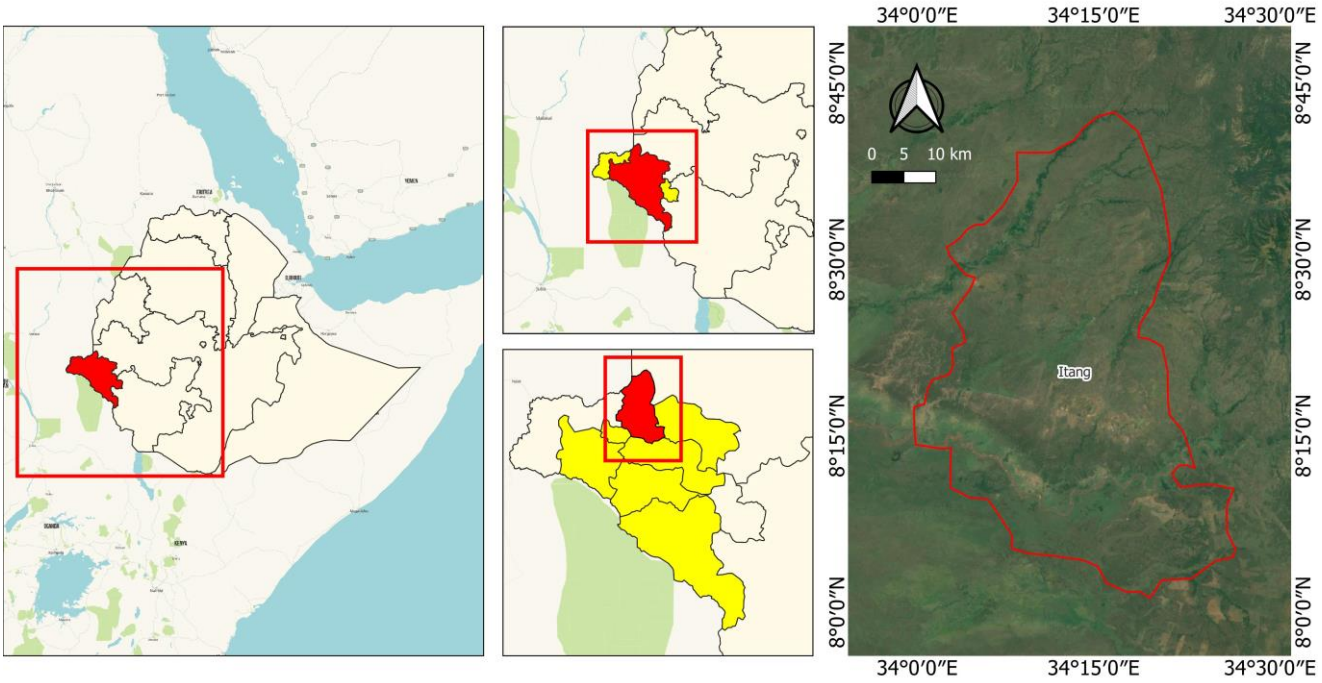

Figure 1. Maps of the study area in Itang special district, Gambella region of Ethiopia

Data collection and sampling techniques

A cross-sectional research design was employed to collect the data from sampled households at a single point in time. Both qualitative and quantitative data collection methods were used to obtain primary and secondary data. The primary data were collected through different data collection methods such as field observation, household survey, and focus group discussion. Whereas a secondary source of data was collected from various documents available in districts and villages, different books, journals, articles, and academic research papers to understand more about the determinants of women's participation in income generating activities. The study employed multi-stage sampling techniques. At the first stage, Itang special district was selected among thirteen districts using purposively sampling method because of its potential for income generated activities such as agricultural production, petty trade, and charcoal making. Similarly, at the second stage, three villages (such as Pulkode, Pilwall, and Achua villages) were selected from 24 villages in the district using purposive sampling technique because of its great potential and suitability for construction of different income generating activities. In the third stage, in order to select the sample respondent from each village, the study used a simple random sampling technique. Due to this, 168 sample respondents were selected among 946 households found in the selected villages and to calculate the sample size (Yamane 1967) formula was used:

$$n = N/(1+Ne^2)$$

$$\mathbf{n} = \frac{\mathbf{946}}{\mathbf{1 + 946(0.07)^2}} = \mathbf{168}$$

Where:
n: sample size required
N: number of people in the population
e: allowable error

Data analysis

Descriptive statistics (frequency, percentage, means and standard deviation) were used to analyze the socioeconomic characteristics of the households. Likewise, multinomial logit models were employed to analyze the determinant factors that affect women's participation in income generating activities in the study area (Table 1). Nevertheless, before running the multinomial logit model, variance inflation factor and contingency coefficient were employed to check multicollinearity among explanatory variables. The Variance Inflation Factor method was employed to distinguish the problem of multicollinearity for continuous variables. When the VIF value is greater than 10, there is more significant multicollinearity among explanatory variables. The contingency coefficient is calculated to see the degree of association between the dummy or discrete variables (Gujarati 2004). The values of VIF for continuous explanatory variables were found small (that means VIF values of a continuous variable are less than 10). Therefore, based on the VIF result, the data have no serious problem of multicollinearity. Due to this, all seven continuous explanatory variables were taken and entered into a multinomial logit model analysis.

Similarly, the contingency coefficients measure the association among discrete or dummy variables. The value of contingency coefficient ranges between 0 and 1. Hence, with the values of zero show no association between variables, and values close to 1 indicate a high degree of association. Accordingly, the results of the contingency coefficient disclose that there was no serious problem of association among discrete or dummy explanatory variables. Therefore, all six discrete or dummy explanatory variables were entered into multinomial logit model analysis.

Table 1. Description of variables used in the multinomial logit model

Name of dependent variable	**Types of variables**	**Definition and measurement**
Income Generating Activities	Polychromous	0 for farm activity 1 for non-farm activity 2 for off-farm activity
Name of independent variable	**Types of variables**	**Definition and measurement**
Ages of the household	Continuous	Age in years
Education status of household	Categorical	0 for illiterate, 1 for grade (1-4), 2 for grade (5-8), 3 for grade (9-12), 4 for diploma, and above
Marital status of the household	Categorical	0 single 1 for married 2 for divorced 3 for widowed
Land size of household	Continuous	Total land size in ha.
Distance to the nearest market	Continuous	Market distance in km.
Livestock holding	Continuous	Number of livestock in TLU
Access to credit	Dummy	1 for users and 0 non-users
household size	Continuous	Numbers of family members
Access to extension services	Continuous	Number of contacts with DAs
Distance to main road	Continuous	Road distance in km
Access to training	Dummy	1 for yes 0 for no
Access to infrastructures	Dummy	1 for yes 0 for no
Access to market information	Dummy	1 for yes 0 for no

The multinomial logit (MNL) model is the most commonly used model for the analysis of discrete choice data that is often used when the dependent variable has more than two nominal categories (Cameron and Trivedi 2005; Anas and Hiramatsu 2012). As explained by Greene and Hensher (2003), either multinomial logit or multinomial probit regression model can be utilized when there are more than two dependent variables. However, multivariate normal distributions and multinomial probit models are rarely used in empirical studies Alemu et al. (2021). Accordingly, in this study, multinomial logit model was employed to analyze the determinants of women participation in income generating activities. The model specification is given as follows:

$U_{ij1*} = \beta_{1Xi'} + \varepsilon_{i1}$

$U_{i2*} = \beta_{2Xi'} + \varepsilon_{i2}$

$U_{i3*} = \beta_{3Xi'} + \varepsilon_{i3}$

Where:

U_{i1}: If households are involved in farm activity

U_{i2}: If households involved in non-farm activity

X_i: Vector of explanatory variable that affects income generating activities

U_{i3}: If household involved in off-farm activity

β: A parameter to be estimated and

ε_i: Is the error term

To express the MNL model, Y denotes a random variable which takes the values of {0, 1, 2...J} for J, a positive integer, and X denotes a set of explanatory variables. In this case, Y denotes income generating activities like farm, non-farm, and off-farm activity and X contains household attributes like ages of the household, educational status, marital status, and others. Since the probabilities must sum to unity, $P(Y = j/x)$ is determined the probabilities for j=2...J. Let x be a 1× K vector with first unit. The MNL model has response possibilities:

$$P(Y = j/x) = \frac{\exp(X\beta_j)}{[1 + \sum_{h=1}^{j} \exp(X\beta_j), = 1 \dots \dots . j}$$

RESULTS AND DISCUSSION

Socio-demographic characteristics of the households

As stated in Table 2, about 54.8% of the respondents were Illiterate, while 30.6% were enrolled from grade 1-4, whereas 8.1% completed their grades from 5-8, and 6.5% were attended their educational status from grade 9-12 from farm households. Although, about 18.6% of the respondents were Illiterate, while 23.3% were enrolled from grade 1-4, whereas 44.1% completed their grades from 5-8, 10.5% completed 9-12 grades, and the remaining 3.5% were found above diploma from non-farm households. Similarly, 30.0% of the respondents were Illiterate, while 45.0% were enrolled from grade 1-4, whereas 15.0% completed their grades from 5-8, and 10.0% attend their educational status from grade 9-12 from off-farm households. The chi-square test (Table 2) reveals that the educational status of the households was statistically significant at a 10% significance level,and this shows there is a significant connotation between the educational status of the households and their probability of participating in different income generating activities in the study area. This study was similar to the study of Alemu et al. (2021) and Bogale and Lemma (2023). They stated that when the schooling year of the women increases their confidence to participate in income generating activities would be also increased.

As stated in Table 2, 8.0% were single, 67.7% were married, 13.0% were widowed, and 11.3% were divorced from households' who participated in farm activities. While, 32.6% were single, 45.4% were married, 12.7% were widowed, and 9.3% were divorced from households' who participated in non-farm activities. Correspondingly, 25.0% were single, 60.0% were married, 5.0% were widowed, and 10.0% were divorced from households' who participated in off-farm activities. As chi-square test in Table 2 reveals that, marital status of the households was not statistically significant and this shows there is no association between the marital status of the households and their probability of participating in different income generating activities in the study area. The focus group discussants also argued that married households have more household members in the rural areas, and this led them to participate in different income generating activities. This result was consistent to the study of Alemu et al. (2021).

Access to credit plays a greater role in improving the livelihoods of farm, non-farm, and off-farm households. As stated in Table 2, about 29.0% of the farm households access a credit service from informal institutions, family, friends, and neighbors, and 71.0% of farm households did not get credit access due to several challenges such as lack of collateral, limited education, high transaction cost, and lack of information. On the other hand, 33.7% of non-farm households have credit access, and 66.3% of non-farm households did not get credit access. Similarly, 20.0% of off-farm households have credit access, and 80.0% of off-farm households did not get credit access due to the same challenges of farm households. The chi-square test (Table 2) reveals that credit access of the households was statistically significant at 10% significance level and this shows there is a significant association between credit access and their probability of participating in different income generating activities in the study area. This result was in line with the study of (Alene 2020). He indicated that women who have access to credit could participate in various livelihood activities to maximize their profit than credit non-users women households.

About 30.6% of the farm households have access to training, which can increase their agricultural productivity and 69.4% did not get a training access. On the other hand, 19.8% of non-farm households have training access, and 80.2% of non-farm households did not get training access. Similarly, 10.0% of off-farm households have training access, and 90.0% of off-farm households did not get training access. The chi-square test (Table 2) reveals that the training access of the households was statistically significant at a 10% significance level, and this shows there is a significant association between training access and their probability of participating in different income generating activities in the study area. A study by Akter et

al. (2022) indicated that women who had access to training opportunities had a greater probability to participate in various income generating activities and earned more income.

Access to infrastructure plays an energetic role in determining women's participation in varies income generating activities. As the survey result shown in Table 2, 25.8% of the farm households have access to infrastructural facilities such as roads and electricity, and 74.2% did not get training access. On the other hand, 76.7% of non-farm households have access to infrastructures, and 23.3% of non-farm households did not get access to infrastructures. Similarly, 20.0% of off-farm households have infrastructural access, and 80.0% of off-farm households did not get infrastructural access. As chi-square test reveals that, infrastructural access of the households was statistically significant at 10% significance level and this shows there is a significant association between infrastructural access and their probability of participating in different income generating activities in the study area. This result was consistent with the study of Kassie et al. (2017). They argued that households who have an access to infrastructural facilities i.e., road, have a greater probability to participate in non-farm and off-farm livelihood activities.

This is measured by whether a household can access available market information to enhance their income generating activities. Thus, the survey results revealed that 35.5% of farm households have accessed and used market information through different channels, and 64.5% have no access to market information. Likewise, 75.6% of non-farm households have accessed and used market information through different channels, and 24.4% have no access to market information. Correspondingly, 56.0% of off-farm households have accessed and used market information through different channels, and 44.0% have no access to market information. The channels of market information for all farm, non-farm, and off-farm households were neighbors, radio, TV, mobile phone, and marketplaces. A chi-square test reveals that, access to market information was statistically significant at 1% significance level and this shows there is a significant association between access to market information and their probability of participating into different income generating activities in the study area (Table 2). This result was in line with the study of Argaw et al. (2021). They stated that households who have access to market information can get enough information to sell and buy the different outputs that can be produced from non-farm and off-farm income generating activities.

Table 2. Descriptive statistics results for dummy explanatory variables by income generating activities

Variables	Response	Women's participation in income generating activities						X^2 –value
		Farm activity (N=62)		Non-farm activity (N=86)		Off-farm activity (N=20)		
		Freq.	%	Freq.	%	Freq.	%	
Educational status	Illiterate	34	54.8	16	18.6	6	30.0	39.08
	Grade 1-4	19	30.6	20	23.3	9	45.0	
	Grade 5-8	5	8.1	38	44.1	3	15.0	
	Grade 9-12	4	6.5	9	10.5	2	10.0	
	Diploma and above	0	0	3	3.5	0	0	
Marital status	Single	5	8.0	28	32.6	5	25.0	14.02
	Married	42	67.7	39	45.4	12	60.0	
	Widowed	8	13.0	11	12.7	1	5.0	
	Divorced	7	11.3	8	9.3	2	10.0	
Access to credit	Yes	18	29.0	29	33.7	4	20.0	1.52
	No	44	71.0	57	66.3	16	80.0	
Access to training	Yes	19	30.6	17	19.8	2	10.0	4.50
	No	43	69.4	69	80.2	18	90.0	
Access to infrastructure	Yes	16	25.8	66	76.7	4	20.0	46.25
	No	46	74.2	20	23.3	16	80.0	
Access to market information	Yes	22	35.5	65	75.6	7	56.0	27.55
	No	40	64.5	21	24.4	13	44.0	

Table 3. Descriptive statistics results for continuous explanatory variables by income generating activities

Variable	Women's participation in income generating activities						F-Value
	Farm (62)		Non-Farm (86)		Off-Farm (20)		
	Mean	Std. Err	Mean	Std. Err	Mean	Std. Err	
Ages of the household	32.73	7.78	29.69	5.38	30.8	5.79	1.17
Household size	2.63	1.50	4.03	2.44	2.75	2.71	1.47
Land size of household	1.37	.59	.51	.49	1.05	.49	6.63
Livestock holding (TLU)	3.37	2.70	.55	1.14	.85	1.30	2.79
Access to extension contacts	.53	.88	.30	.65	.3	.80	1.32
Distance to the nearest market	5.02	2.36	2.95	1.96	4.85	1.60	2.31
Distance to main road	4.19	2.33	2.25	1.85	4.3	1.56	1.03

Age is one of the demographic characteristics that influence the participation of women's in varies income generating activities. As shown in Table 3, the average age of women households who participated in farm, non-farm and off-farm activities was 32.73, 29.69, and 30.8, with a standard deviation of 7.78, 5.38, and 5.79 respectively. A one-way ANOVA was also conducted to investigate the impact of age on the women's participation in income generating activities (F=1.17, P=0.27). This shows that older women are less likely to participate in diverse income generating activities. Previous research results indicated that, as the ages of women gets older their probability to actively participating in various economic activities become declines (Alemu et al. 2021; Tesgera et al. 2023).

Women's participation in income generating activities differs with their variation in landholding size. The survey result in Table 3 shown that women who are participating in farm, non-farm and off-farm activities have an average land size of 1.37, .51, and 1.05 ha with standard deviations .59, .49, and .49, respectively. This implies that women who have more cultivable land size highly participated in farm activities and moderately in off-farm activities. Hence, having higher farm size lowers their concentration to participate in other income generating activities (non-farm and off-farm). A one-way ANOVA was also conducted to investigate the impact of land size on the women's participation on income generating activities and was statistically significant at a 1% significant level (F=6.63, p=0.000). This result was similar to the study ofAlemu et al. (2021). They stated that as the size of land increases, the income obtained from agricultural production increases and the possibilities of women to search additional livelihood activity declines.

Household size in this study is considered as the number of individuals who live together in the respondent's home. The survey result in Table 3 shown that women who are participating in farm, non-farm and off-farm activities have an average mean household size of 2.63, 4.03, and 2.75 ha with standard deviation of 1.50, 2.44, and 2.71, respectively. A one-way ANOVA was also conducted to investigate the effect of household size on the women's participation on farm and off-farm activities and was statistically significant at 5 and 10% significant level, respectively (F=1.47, p=0.072). This is in line with the study of (Lechmann and Schnabel 2012). They indicated that, as the size of family increases the workload for women associated with children care becomes increased and this consumes their time that could have been invested in income generating activities.

Livestock is among the most important economic assets for the livelihoods of rural people. As shown in Table 3, the average means of livestock holding of women households who participated in farm, non-farm and off-farm activities were 3.37, .55, and .85, respectively. This implies that those households who participated in farm activities owned more TLU as compared to the rest groups. The minimum and maximum numbers of livestock in TLU for farm, non-farm and off-farm households were (0) (9.8), (0) (7.09) and (0) (5), respectively. A one-way ANOVA was also conducted to investigate the impact of livestock holding on the women's participation on income generating activities and was statistically significant at a 1% significant level (F=2.79, p=0.002). This result contradicts with the study of Sariyev et al. (2022). They indicated that increased number of livestock limits the probability of women's involvement market-oriented activities.

For this study, extension contact is the number of contact that a household has with an extension agent within a year to get agricultural extension service. Based on the survey result shown in Table 3, women who are participating in farm, non-farm and off-farm activities have an average mean of extension contacts with extension agent of .53, .30, and .3 with standard deviation of .88, .65, and .80, respectively. A one-way ANOVA was also conducted to investigate the impacts of extension contacts on the women's participation on farm and non-farm activities and was statistically significant at 1 and 10% significant level, respectively. This indicates that women households' who participated in farm and non-farm activities were more frequently contacted by extension agents and had more potential to get more information about their livelihood activity. As indicated by Eneyew and Bekele (2012) households who have gained frequent extension contact with an extension agent can choose diverse income generating activities than their counterparts.

It is obvious that access to road is very important infrastructure to transport easily from place to place and to implement different income generating activities. The survey result presented in Table 3 shown that, the average distance to the main road of women households who participated in farm, non-farm and off-farm activities was 4.19, 2.25, and 4.3 km with a standard deviation of 2.33, 1.85, and 1.56, respectively. A one-way ANOVA was also conducted to investigate the impacts of distance to the main road on the women's participation in income generating activities and was statistically significant at 10% significant level (F=1.03, p=0.098). This result is in line with the study of Minyiwab et al. (2024).

The survey result presented in Table 3 shown that, the average distance to the nearest marketplace of women households who participated in farm, non-farm and off-farm activities was 5.02, 2.95, and 4.85 km with a standard deviation of 2.36, 1.96, and 1.60, respectively. A one-way ANOVA was also conducted to investigate the impacts of distance to the nearest market on the women's participation to income generating activities, and it was not statistically significant (F=2.31, p=0.023). This means there is no relationship between distance to the nearest market and women's participation in income generation activities (farm, non-farm and off-farm activity). This is in agreement with (Gecho 2017; Montanari and Bergh 2019). They described that, when the market place is far away from their home to buy inputs for their business and sell their output, they are less likely to be participate in non-farm and off-farm activities.

Determinants of women's participation in income-generating activities – Explanation of significant variables

Education status of household (EDUSTAT)

As the multinomial logit model result indicated in Table 4, educational status of the household had a negative relationship with women's participation in farm activities, and was statistically significant at 5% significance level. Despite this fact, the educational status of the household was also statistically significant at a 10% significance level and had a positive relationship with women's participation in non-farm income generating activities. This implies the women household who are illiterate involved in farm activities and women who are attending the formal education have more knowledge and skill to perform in different types of non-farm activities. It means that, as the level of education increased, the probability of women household participation in non-farm or farm income generating activities would be increased or decreased by -.011, and .228, respectively. Similarly, Demissie and Legesse (2013), and Bogale and Lemma (2023) indicated that education increases the skill and knowledge of a person thereby, increases the productivity of income generating opportunity to engage in diversification.

Household size (HHSIZE)

Household size has a negative association with women's participation in farm and off households, and positive relationship with non-farm activities, and it was statistically significant at a 5 and 10% significant level, respectively (Table 4). This implies that small household size enables rural households to choose farm and off-farm activity as a source of income. The possible reason was that the household head having large household size invest capital for food, health and clothing to fulfill the needs of this large household size. To do this, the income gained from agriculture only is not enough rather choose non-farm income generating activities. According to the result of multinomial logit model, keeping the influence of other variables constant, as the numbers of household increased by one person, the probability of women to participate in farm, and off-farm activities would be decreased by .105 and -.160 in farm and off-farm activities, respectively and increased by .054 for non-farm activities. This is in line with the study of Lechmann and Schnabel (2012). They indicated that, as the size of family increases the workload for women associated with children care becomes increased and this consumes their time to invest in income generating activities.

Land size of household (LANDSIZE)

Land size has a positive association with women's participation in farm households, and negative relationship with non-farm and off-farm activities, and it was statistically significant at 1, 5 and 10% significant level, respectively. As the model result revealed that, as the land size of the household increases by one hectare, women participation in farm activity would be increased by 2.23 units, and decreased by .339 and 1.89 unit for non-farm and off-farm activities, respectively (Table 4). This shows that, as the size of land increase the income gained from agricultural production increases, and the probability women to involve in other income generating activities would be decreased, because they have no income problem as they can get it from farm activities Alemu et al. (2021).

Livestock holding (TLU)

Livestock holding determine women probability to participate in farm income generating activities positively and negatively with off-farm activities, and was statistically significant at 1% significance level. That means, as the livestock holding of the households' increases by one unit of TLU, the probability of women to be engaged in farm activities increases by .348 units, and decreased by .432 units for off-farm activities by keeping the other factors constant (Table 4). This result contradicts with the study of Sariyev et al. (2022). They indicated that increased number of livestock limits the probability of women's involvement market-oriented activities.

Access to credit (ACCREDIT)

In the study area, access to credit determines the likelihoods of women household to participate in non-farm income generating activities negatively and significantly at 10% significance level (Table 4). As the multinomial logit model result shows that, the probability women households' participation in non-farm activities is less by a factor of .272 units for those who did not have access to credit service. This shows that women households who have no credit access are less likely to participate in income generating activities such as non-farm activities. This result is similar to the study of Anshiso and Shiferaw (2016).

Access to extension contacts (EXCONTAC)

Access to extension contacts has a negative association with women's participation in farm activities, and positive relationship with farm activities, and it was statistically significant at a 1 and 10% significant level, respectively. As the multinomial logit model result shows that, the probability women households' participation in farm activities is less by a factor of 1.145 units for those who did not have an access to extension service. Similarly, the probability women households' participation in non-farm activities could be increased by .075 units for those who have an access to extension service (Table 4). Similar research outputs were revealed by Asfaw et al. (2017). They showed that access to extension contact with an extension agent provides important information related to agricultural production and technical assistance on agricultural activities and this makes the women farmers give more attention to agricultural works.

Distance to main road (DMROAD)

According to the multinomial logit model result, distance to main road has a positive association with women's participation in off-farm income generating activities, and statistically significant at 10% significance level. This shows that women households who are near to the main road can easily get transportation service. Keeping the influence of other variables constant, as distance to the main road increase in one km, the

probability of women's participation in off-farm income generating activities would be increased by .282 km (Table 4). This result is in line with the study of Minyiwab et al. (2024). They stated that proximity to the main road has a greater relationship with households' participation in various livelihood activities.

Access to training (ACCTRAIN)

Access to training has a negative relationship with women's participation in farm activities and has a positive association with women's participation in off-farm activities. Access to training was also among statistically significant explanatory variable for farm, and off-farm activities at a 5 and 10% significant level, respectively (Table 4). As the multinomial logit model result shows, the probability women households' participation in farm activities is less by a factor of 1.173 units for those who did not have an access to training. Likewise, the probability women households' participation in off-farm activities would be increased by 2.058 units for those who have a training access. A study by Akter et al. (2022) indicated that women who had access to training opportunities had a greater probability to participate in various income generating activities and earned more income.

Access to infrastructures (ACCINFRA)

A multinomial logit model result revealed that access to infrastructures has a positive association with women's participation in off-farm income generating activities, and statistically significant at 10% significance level (Table 4). This shows that women households who have an access to infrastructures such as road can easily get a transportation service to implement their income generating activity (off-farm activity). That means the probability women households' participation in off-farm activities would be increased by .223 units for those who have an access to infrastructures. This result was consistent with the study of Kassie et al. (2017). They argued that households that have access to infrastructural facilities, i.e., road, have a greater probability of participating in non-farm and off-farm livelihood activities.

Access to market information (MARKINFO)

Access to market information has a positive association with women's participation in farm households, and negative relationship with non-farm and off-farm activities. It was statistically significant at 1 and 5% significant level, respectively. As the model result revealed that women households who have an access to market information can improve agricultural production and productivity to meet their family necessities. That means the probability women households' participation in farm activities would be increased by 1.778 units for those who have an access to market information. Alike, the probability women households' participation in non-farm and off-farm activities would be decreased by .160 and 1.617 units, respectively for those who did not have an access to market information (Table 4). This result was in line with the study of Argaw et al. (2021).

In conclusion, largely, income-generating activities have a greater role in the improvements of sustainable livelihood outcomes in the study area by increasing income the household, improving food security, for provision of basic necessities, by reducing vulnerability of risks, and by reducing poverty level of women. The findings of the study show that, from the total sampled women households 36.9% participated in farm activities (included crop production, livestock production, vegetable and fruit production, and poultry production), 51.2% participated in non-farm activities (including petty trade, wage laborer from constructions, hairdressing, selling of food and drinks, and selling of tea and coffee) whereas 11.9% of women household participated in off-farm income generating activities (included charcoal making or selling, and selling of firewood). Factors such as education status of household, household size, land size of household, livestock holding, access to credit, access to extension contacts, distance to main road, access to training, access to infrastructures, and access to market information were statistically significant and affects women's participation in different income generating activities. Whereas, ages of the household, marital status of the household, and distance to the nearest market were not statistically significant. Hereafter, Education, Access to training, access to Land, and Availability of infrastructures have a greater role on the participation of women households in various income generating activities. Therefore, the government should encourage women households to participate in various types of income generating activities by non-formal education programs, trainings, and building different infrastructural facilities like a road to increase women's participation in various income generating activities in the study area. Finally, this study was conducted only in one district (Itang Special District). Therefore, similar studies may be conducted in other parts of the district found in Gambella region in particular and in different parts of Ethiopia in general to get clear idea about the participation of women in various income generating activities.

Table 4. Multinomial logit model result on women's participation in income generating activities

Variables	Women's participation in income generating activities											
	Farm-activities				Non-farm activities				Off-farm activities			
	Marginal effect	Coeff	Standard error	P-value	Marginal effect	Coeff	Standard error	P-value	Marginal effect	Coeff	Standard error	P-value
Agehh	.014	-.059	.165	0.722	-.011	.089	.157	0.571	-.003	-.031	.111	0.785
Edustat	.228	-1.253	.632	0.047**	-.042	.979	.586	0.095*	-.185	.273	.471	0.562
Maristat	.283	-1.400	1.006	0.164	-.122	1.459	1.017	0.151	-.161	-.059	.638	0.926
Hhsize	.105	-.747	.354	0.035**	.054	.196	.349	0.575	-.160	.552	.308	0.073*
Landsize	-2.232	12.445	3.893	0.001***	.339	-9.338	3.697	0.012**	1.893	-3.111	1.864	0.095*
Tlu	-.348	2.250	.718	0.002***	-.084	-.977	.637	0.125	.432	-1.273	.412	0.002***
Accredit	-.887	4.636	2.931	0.114	.272	-4.192	2.508	0.095*	.615	-.445	1.890	0.814
Excontac	1.145	-6.951	2.502	0.005***	.075	3.922	2.181	0.072*	-1.219	3.029	2.048	0.139
Distmark	-.177	1.116	1.059	0.292	-.029	-.546	1.011	0.590	.206	-.570	.718	0.427
Dmroad	.104	-1.020	.975	0.296	.179	-.246	.925	0.790	-.282	1.265	.764	0.098*
Acctrain	1.173	-8.956	4.438	0.044**	.886	1.184	3.392	0.727	-2.058	7.772	4.608	0.092*
Accinfra	-.130	-.031	1.465	0.983	.352	-1.707	1.342	0.203	-.223	1.738	1.024	0.090*
Markinfo	-1.778	10.162	3.314	0.002***	.160	-7.054	2.923	0.016**	1.617	-3.108	1.569	0.048**
_cons		-6.166	5.177	0.234		11.085	5.644	0.050		-4.919	4.740	0.299

Note: Log-likelihood: -41.02, Number of observations: 168, LR chi^2 (26): 241.87, Prob>chi^2 = 0.000***, Pseudo R^2: 0.75, ***, **, * indicates significant at < 1, 5, and 10% probability levels, respectively

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