SOCIOMETRY | RESEARCH ARTICLE

Woman labor force participation in off-farm activities and its determinants in Afar Regional State, Northeast Ethiopia

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Abstract: Women have driven economic development around the globe through higher returns on human capital and education. However, women’s involvement in labor market was weak over time, generally in Ethiopia and particularly in Afar region. Therefore, this study intended to identify and analyze the determinants of woman’s participation decisions in off-farm activities. The data was collected from 473 sampled women using a multistage sampling technique. Both descriptive and logistic regression model was employed to analyze the determinants of woman participated decision in off-farm activities. Descriptive statistics revealed that, from the total sample, 270 (57.08%) of woman have participated in an off-farm activity, while, 203 (42.92%) of them do not participate. Whereas, the binary logit regression result that woman level of education and dependency ratio was positively and significantly determine woman labor force participation decision; however, a woman who had children less than five years aged, nonfarm training, distance to the market, woman marital status, access to credit, ownership of livestock and safety net adversely affected the participation decision of woman on off-farm activities. This study was recommended that: special attention for woman educational development, adopted family planning and parental benefits, provide and

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PUBLIC INTEREST STATEMENT

Globally, women play a vital role to enhance economic growth, food security, family wealth, reduction of poverty. Off-farm activities can reducing rural poverty, inequality, and income vulnerability. For example, in Latin America for example, 40–45% of rural household’s income a rise from nonfarm sources, in Africa off-farm employment income account for about 35% of rural incomes, and in Ethiopia, has reported that some 20% income of rural households originates from nonfarm sources. Despite of this importance, women are less likely to participate in the off-farm labor market by different social, institutional, economical, and woman related factors. In Ethiopia, labor force participation rate for female at national level decline radically in 2021 compared to the preceding years, for example, in 1999 (66.9%), 2005 (74.9%), 2013 (74.6%), and 2021 (56.8%). Therefore any responsible body should give response for those factors to address the problems.
properly follow up nonfarm training, developed marketplace nearby, provide credit for only productive activities, create awareness about off-farm activities in addition to livestock husbandry (mixed-farming), and provide safety net for only eligible woman.

**Subjects:** Sociology & Social Policy; Social Policy; Sociology of Work & Industry; Gender Studies

**Keywords:** Woman; labor force participation; off-farm activities; logit regression; Afar; Ethiopia

1. Introduction

Women's labor participation improves productivity, increases economic diversification, and income equality (International Monetary Fund [IMF], 2018). Women have contributed to activities that drive economic development around the globe through higher returns on human capital and education (World Bank, 2019); by advocating efficiency and equity to improve the socio-economic development of a nation (Gebreyes, 2019a); empower women, increasing their bargaining power within the household and improved household welfare (McCarthy & Sun, 2009), strengthen women economically can boost the well-being of entire families and communities. Globally, women play a vital role to enhance economic growth, food security, family wealth, reduction of poverty (Dessie, 2014). Off-farm activities can reducing rural poverty, inequality, and income vulnerability. In Latin America for example, 40-45% of rural household’s income a rise from nonfarm sources (Reardon et al., 1999), in Africa off-farm employment income account for about 35% of rural incomes (Haggblade et al., 2007), in Ethiopia, has reported that some 20% income of rural households originates from nonfarm sources (Davis, 2003).

Despite of this importance, women are less likely to participate in the off-farm labor market. If they were got the opportunity; they have participated in low-quality work, are underemployed, paid subsistence wages for long hours working and massive of unpaid household work (International Labor Organization [ILO], 2016, Bekana, 2019). More than 2.7 billion women are not allowed legally to select the same jobs as like as males, and also they are not considered by government policies and strategies (Beyene, 2008). Based on an assessment of 189 countries, 104 countries have legal laws to avert a woman from participating in specific jobs, 59 of them also have not legal enforcement on the workplace sexual harassment, and in 18 countries husband has a legal right to restrict their wives from working a job (World Bank, 2021).

Even though the government articulated national policy on women in 1993 to achieve the mission that woman equally participated with men in term of political, social, and economic life of their country, in general, woman have demoted and lessen role in decision-making processes at politically, socially, economically, physically, and psychologically by social norms and belief’s, religion and governmental policy (Kassa, 2015).

Internationally, the labor force participation rate between prime working-age women whose age 25–54 results in 63% and 94% of the male counterparts, in a line with this the payment difference (gender pay gap) is 23% globally (United Nation Woman, 2018). Women have been continuing to work more than male, that is, around 2.5 times more time spent on unpaid care and homework than men, For example, in Ethiopia, Mali, and Mauritius, women spend their time on unpaid domestic and care work estimated around 22%, 20%, and 19%, respectively; even though men spend 8.7%, 2.5%, and 4.8% of their day, respectively (Interantional Labor Organazation [ILO], 2017; United Nation Woman, 2018).

The labor force participation rate (LFPR) of 15 age and above was decreased over time for both men and women globally, which was 61.8% in 2018 and diminished by 1.4 percentage points over the past
decade. However, internationally in 2018 women’s labor force participation rate is even lower at 48.5%, which was 26.5 percentage points below that of men and the woman unemployment rate was 6%, and it was also higher than the male unemployment rate 5.2%. In sub-Saharan African countries woman labor force participation rate was 64.7%, which was below the male, i.e. 74.0%; the unemployment rate between females and males was 8.2% and 6.4%, respectively (ILO, 2018).

In Ethiopia, the amount of economically active persons during 2021 is 45,245,760 (64.7%) out of the total population aged ten years and above, whereas, the size of economically inactive persons\(^1\) account for 24,718,714 persons (35.3%). From the total economical inactive persons, the proportion of female account for 61.5%, which is higher than male (38.5%). The LFPR for female at national level decline radically in 2021 compared to the preceding years, for example, in 1999 (66.9%), 2005 (74.9%), 2013 (74.6%), and 2021 (56.8%; CSA, 2021).

Even though from those women’s, 84% of them have participated in the agricultural sector (only 26% have participated in off-farm activities) and 22% of them also participated in unpaid domestic work (Cherinet et al., 2002; United Nation Woman, 2018). Based on the report of Ethiopian labor force survey in 2005 unemployment rates of females and males were 7.8% and 2.5%, respectively, which was hypothesized that females are more exposed to unemployment (Central Statistical Agency [CSA], 2006; CSA, 2021).

Region wise, Benishangul-Gumuz (7%), South nation (74.4%), Gambella (65.2%), and Amhara (58.4%) regions show the highest woman LFPR above the national average (56.8%) in 2021. Notwithstanding, in Afar regional state as like as the national trend the woman LFPR has been reduced in 2021 as compared to the previous trend, that is, in 1999 (63%), 2005 (64%), 2013 (76%), and 2021 (46%), in a line with this in 2021 the woman LFPR was less than many region and the national average and an unemployment rate of a female also 28% (Central Statistical Agency [CSA], 2019).

Finally, such weak woman labor force participation and higher woman unemployment rate relative to men leads to a lack of alternative income sources, increasing unemployment, occupational downgrading (underemployment), a financial crisis in terms of unemployment (women earn below 50% of the median income), and poverty in the household, and a fall to addressed economic growth as a nation (ILO, 2016), (Gebreyes, 2019b), (Hegewisch & Gornick, 2013). In addition, Women’s unemployment has its drawbacks like family cohesion, level of poverty and results in different social problems like violence, prostitution, the breakup of families, and alcoholism due to hopelessness. It is conveyed by worst occupational views and impending economic deprivation exposed a risk on the future well-being of a family (Schmitt, 2008).

Identifying and examining the appropriate factors that determine women’s participation decision on the off-farm activities is crucial for households’ income diversification, livelihood improvement, overall economic performance, and policy interventions. Different studies were investigated determinants of labor force participation decisions in Ethiopia (Beyene, 2008; Broussard & Tekleselassie, 2012; Gebreyes, 2019a; Haimanot, 2007; Roy et al., 2015) and so on. Even though such studies were used different parameters to analyze participation decisions in different study areas, those parameters were not enough compatible in this study area, because, the study area was characterized by different agro-ecological zone (tropical), most of the societal way of life is pastoralist and agro-pastoralist, in addition, woman labor force participation also too low compared to the national rate of participation. Therefore, this study tries to fill such gaps, and identified and examining determinants of woman labor force participation decision in off-farm activities, in a line with this the paper also examine the status of woman labor force participation in the off-farm activity.
2. Methodology

2.1. Description of the study area

The study was conducted at Millie district in zone one and Dallol district in zone two. Mille is one of the districts found in Awsi Rasu at Zone 1 of the Afar Region state, Ethiopia. The name of the district was derived from Mille River, one of awash attribution. Mille is located on the south with Administrative Zone 3, on the southwest with Administrative Zone 5, on the west with Amhara Region, on the northwest to Chira, on the northeast with Dubti, and on the southeast with the Ethio-Somal Region. Millie both Mille and Eli Wuha including in Millie town. Millie district has a total population of 90,673, from those 49,705 are men and 40,968 women; the land size of 5,345.71 square kilometers, a district has a population density of 16.96. From the total population 14,208 or 15.67% are urban dwellers; a additional 66,212 or 73.02% are pastoralists. A total of 14,515 households were calculated in this district, which results in an average of 6.2 persons to a household, and 15,642 housing units. 98.72% of the population said they were Muslim, and 1.22% were Orthodox Christians (Central Statistical Agency [CSA], 2005).

Dallol is one of the districts found in Afar Region of Ethiopia. This district is entitled to the previous mining disbursement of Dallol, which set the record for the hottest occupied place on Earth, with an average temperature of 34°C. Found at the northernmost point of the Administrative Zone 2, includes part of the Afar Depression. This district is bordered on the south with Koneba, on the west with the Tigray Region state, on the north with Eritrea, and on the east and south with Berhale. Dallol district has a total population of 83,930, from this 46,973 are men and the remaining 36,957 are women; with a land size of 2,291.18 square kilometers, Dallol has a population density of 36.63. Of the total population, 1,757 or 2.09% are urban dwellers, a moreover 1,544 or 1.84% are pastoralists. In this district, 13,006 households were registered in this district, which results in an average of 6.5 persons to a household, and 13,281 housing units. 96.73% of the population said they were Muslim, and 3.21% were Orthodox Christians (CSA, 2005).

2.2. Sampling technique and sample size

Multistage sampling techniques were used in this study (see Figure 1). In the first stage, from the total of five zones in the Afar regional state, two zones had selected, i.e. zone one and two purposefully. The reasons for using the purposive sampling technique are: In these zones (zone one and two), there is higher amount of woman population compared to other zones, in addition, zone one and two are centers of economic, political and social activities (regional government headquarter, both governmental and nongovernmental office quarter, the place where the largest raw salt production area in Ethiopia) this helps for policy interventions. In the second stage, two districts that were Millie district in zone one and Dallol district in zone two were selected purposively, based on the total amount of woman populations (77,925) live in these two district. To minimize sample selection bias we have including both urban and rural dwellers. Therefore, in the third stage, two kebelles were selected from each two district (under Millie district one rural kebelle i.e. Bekereda and one urban kebelles, i.e. 01 and under Dallol district one rural kebelle, i.e. Berih and one urban kebelle, i.e. Adokuwa) were selected randomly. In the fourth stage, assigned 473 women were selected from those four kebelle based on population probability proportion, whose age is 15–49.

The intended sample sizes were determined by using Kothari (2004) sample size determination formula.

\[ n = \frac{Z^2 p(1-p)}{e^2} = \frac{(1.96)^2(0.73)(0.27)}{(0.04)^2} = 473.18 \approx 473 \]
Afar Region

Zone 1 (Awsi Rasu)

Millie District

Dallol District

Zone 2 (Kilbet Rasu)

Adokuwa Kebelle (Sample 110)

Berih Kebelle (Sample 114)

Bekereda Kebelle (Sample 149)

01 Kebelle (Sample 100)

Total Sample 473

Figure 1. Sampling techniques framework.
where: \( Z \) is the confidence level which is 1.96; \( e \) is the margin of error which is 0.05; according to the report of Global economy in 2021, women's labor force participation rate was 73.19% in 2019 in Ethiopia, therefore \( p \) is 0.73 and \( 1-p \) is 0.24, \( n \) is sample size which is 473.

### 2.3. Data types, sources, and methods of data collection

To achieve the objective of the study primary was used. Primary data were collected from 473 women aged between 15 and 49 in Millie and Dallol districts.

Both qualitative and quantitative data collection methods were used in this study. Under qualitative data collection method used a self-administered interview; and the quantitative data types also collected from 473 sampled household using structure questionnaire. To ensure the quality of data, two days of training were given to the four enumerators for each four sampled kebels on study subjects, the objective of the study, the content of the questionnaire.

### 2.4. Method of data analysis

The tools for analyzing the data in this study were both descriptive and inferential (econometrics model) statistical analysis. Descriptive statistical analysis was employed to analyze the survey data using measures of dispersion and central tendency like: percentage, frequency, minimum, maximum, mean, and standard deviation with the help of the STATA-16 software package. Regarding econometrics analysis, multivariable binary logistic regression was used to analyze the determinants of woman labor force participation.

Binary logistic regression is a type of logistic regression, that is used when the dependent variable is dichotomous (two) and the independent variables are of any type (dichotomous, trichotomous, polychotomous, and continuous (Hosmer et al., 1997). Logistic regression is better compared to multiple regressions for this study, because, it is flexible and easily mathematically, the predicted probability obey the law (between 1 and 0) and used less restrictive assumption and distribution that is, under logistic regression model normality, linearity, constant variance assumption is not as such required (Hosmer et al., 1997; Tabachnick et al., 2007). Regarding the probit model, the logistic model is preferable because it is less sensitive to outliers and easy to correct a bias (Agresti, 2007; Mulugeta, 2021).

### 2.5. Model specifications

According to the neoclassical farm household model, the decision of an individual to participating in off-farm activity or farm activity depends on additional benefit from the farm and off-farm activity (Singh et al., 1986). For an individual, the decision for involving in off-farm activity or not is based on the difference between the market wage rate and the reservation wage. The reservation wage can be defined as the incremental value of time when an individual is not participating in off-farm work. Therefore, the decision of participating in the off-farm activity is subject to reservation wage is lower than the market wage (Benjamin & Guyomard, 1994).

The decision of woman labor force participation in an off-farm activity is then modeled as a binary Logit model as follows (Equation (1)).

\[
WLP_i = \begin{cases} 
1 & \text{if } W_i > W_m \\
0 & \text{if } W_i \leq W_m 
\end{cases}
\]

Where: \( WLP_i \) is woman labor force participation decision on off-farm activity, i.e. if \( WLP_i = 1 \) woman will participate in an off-farm activity and \( WLP_i = 0 \) woman does not; \( W_i \) is reserve wage rate and \( W_m \) is the market wage rate.

The probability of the woman labor force participating in the off-farm activity is given under Equation (2)
\[ P_i = E(Y = 1/X_i) = \frac{1}{1 + e^{-\beta_1 + \beta_2 X_i}} \]  

(2)

Where: is the probability of women participating or not in off-farm activity; \( \beta_j \) is a coefficient to be estimated; \( X_i \) are the determinant variables of the \( i^{th} \) woman participation decisions (); \( i \) is the total number of a sampled women \( (i=1,2,3,\ldots,473) \); \( j \) is the total number of determinant variables \( (j=1,2,3,\ldots,13) \).

The probability of the woman labor force not participating \( (1 - P) \) in the off-farm activity is given under Equation (3)

\[ 1 - P_i = E(WLP = 1/X_i) = \frac{1}{1 + e^{\beta_1 + \beta_2 X_i}} \]  

(3)

Now calculate the odds ratio, simply the odds ratio \( (P_i/1 - P_i) \) is the probability that a woman will participate in an off-farm activity to the probability that a woman did not participate in an off-farm activity (Equation (4)).

\[ \frac{P_i}{1 - P_i} = \frac{1 + e^{\beta_1 + \beta_2 X_i}}{1 + e^{-\beta_1 + \beta_2 X_i}} = e^{\beta_1 + \beta_2 X_i} \]  

(4)

If generate the natural log of (Equation (4)), then obtain \( L \) is called the logit, and hence the name logit model.

\[ L_i = \ln \left( \frac{P_i}{1 - P_i} \right) = \beta_1 + \beta_2 X_i \]  

(5)

Logistic regression model for the determinants of women labor force participation in the off-farm activity (Equation (6)).

\[ WLP_i = \ln \left( \frac{P_i}{1 - P_i} \right) = \beta_1 + \beta_2 edu_i + \beta_3 chill5_i + \beta_4 acrob_i + \beta_5 age_i + \beta_6 agesq_i + \beta_7 nfartr_i + \beta_8 dstmk_i + \beta_9 msri_i + \beta_10 acr_i + \beta_11 olv_i + \beta_12 loc_i + \beta_13 depr_i + \beta_14 sfaid_i + e_i \]  

(6)

2.6. Definition of variables

\( WLP \) is woman labor force participation in off-farm activities, 1 if they are participating, 0 if not. Woman labor force participation is simply the sum of the number of a woman engaged in both self-employment and wage employment off-farm activities. Off-farm activities refer to women participating in activities, not on their farms. It includes employment on another farmer’s farm and also activities other than farming activities. Self-employment woman is a woman employed on their own off-farm business like: Among the major activities are trades in grain/general trade, making and selling firewood, dung cakes, charcoal, weaving/spinning, collecting and/or selling, straw, and trade in livestock/livestock products. Other activities are handicrafts, making and selling of farm implements, broker, selling araki, bakery, salt trade, shuriba sira, pottery, etc. A wage employment woman is a woman employed by another organization (governmental, private, and NGOs) for payment in cash or in kind.

\( edu \) is years of schooling of woman, woman level of education is determine the chance of women for participation in the labor force. Women with a lower level of education will reduce the chance of getting jobs (Mulugeta, 2021).

\( chill5 \) is a dummy variable that is if a woman has a child less than five years aged 1, and 0 for otherwise. Women with the child whose age is less than five years is difficult to participate in the labor market, this might be most of their time spent on child care and home works (Beyene, 2008; Kapsos et al., 2014).
acbf is the total number of the economically active labor force in the family. A family member with a lot of active labor force in the family has a chance to be involved in the labor market (Dessie, 2014).

age is a continuous variable that is the age of a woman, if women become aged, they are not willing to participate in the labor market (Kapsos et al., 2014).

agesqr is age square of woman.

nfartr is a dummy variable 1 if a woman gets nonfarm training, 0 otherwise. Women with different off-farm training will make a woman more skilled labor and enhanced their participation in the labor market (Dessie, 2014; Tanaka & Muzones, 2016).

dstmk is the distance from the home to the nearest market in a kilometer. If the market place were located far away from woman, makes them not eager to participate in the labor market (Gebreyes, 2019a).

mrst is a marital status of woman and dummy variable (1 if a woman is married, 0 otherwise), married women are less likely to participate in the labor market because they would be busy with home duties (Tanaka & Muzones, 2016).

acrd is representing access to credit, it is the dummy variable indicating 1 if a woman received and used credit and zero otherwise. Woman with the access of credit is more likely to participate in the labor market because they would have the initial capital to start their own business (Gebreyes, 2019a).

olv represents ownership of livestock and measured by Tropical Livestock Unit (TLU);

loc is dummy variable and location of a woman resident if they are living in urban 1 and rural 0;

dep is a dependency ration. The dependency ratio is a demographic measure of the ratio of the number of dependents population (whose age is less than 14 and above 64) to the total working-age population in the region.

aftaid is a dummy variable that woman received safety net. If a woman gets Safety Net aid (both in-kind or money) 1 if not 0.

3. Results and discussions

3.1. Socioeconomic and demographic characteristics of respondents

From the total sampled women 270 (57.08%) of them had less than five years of children, whereas the remaining 42.92% had not. Access to non-farm training was devoted to only 41.86% of the total, and 58.74% of sampled women does not get nonfarm training. If we look at the sampled woman 50.32% were engaged married, only 42.49% of them get credit availability, this might be due to 59% of them were settled in a remote rural area of the region; therefore, 57.51% had not credit opportunity, only 41% were urban dwellers, 49.68% of them are not engaged marriage currently. Safety net aid in the regional state is going to be practice intensively, 45.03% of them had safety net aid, and however, 54.97% are not got as such merits. As postulated above most of the respondents were rural dwellers, caused on average the educational level of a sampled woman was 3.39 grade, market access also 7 kilometers on average away from their destinations, owned 46.09 TLU of livestock on average. Another important characteristic of sample women was, on average they are economically active aged (33.16), and 3 active labor force individuals exist per household, on average, the dependency ratio was more than half (58%) on average (see Tables 1 and 2).
| Variables                        | Category        | WLP decision | Total   | Chi-square value |
|---------------------------------|-----------------|--------------|---------|------------------|
|                                 |                 | Not participated | Participated |               |
| WLP                             |                 | 203 (42.92%)   | 270 (57.08%) | 1.7932          |
| Children < 5 years               | No              | 124 (40.66%)   | 181 (59.34%) | 203 (42.92%)    |
|                                 | Yes             | 79 (47.02%)    | 89 (52.98%)  | 270 (57.08%)    |
| Nonfarm training                 | No              | 88 (32.00%)    | 187 (68.00%) | 275 (58.74%)    | 31.962*** |
|                                 | Yes             | 115 (58.08%)   | 83 (41.92%)  | 198 (41.86%)    |
| Woman marital status             | Others††        | 30 (12.77%)    | 205 (87.23%) | 235 (49.68%)    | 173.314*** |
|                                 | Married         | 173 (72.69%)   | 65 (27.31%)  | 238 (50.32%)    |
| Access to credit                 | No              | 39 (14.34%)    | 233 (85.66%) | 272 (57.51%)    | 213.402*** |
|                                 | Yes             | 164 (81.59%)   | 37 (18.41%)  | 201 (42.49%)    |
| Location                         | Urban           | 45 (16.19%)    | 234 (83.87%) | 193 (41.00%)    | 199.402*** |
|                                 | Rural           | 157 (81.35%)   | 36 (18.65%)  | 280 (59.00%)    |
| Safety net                       | No              | 27 (10.38%)    | 233 (89.62%) | 260 (54.97%)    | 249.438*** |
|                                 | Yes             | 176 (82.63%)   | 37 (17.37%)  | 213 (45.03%)    |

***, **, and * stand for significance at P < 0.001, P < 0.05, and P < 0.1, respectively.

where: †† is singles, widowed, or divorced

Source: Own survey, 2021
Table 2. Woman labor force participation with continuous independent variables

| Variables                      | WLP decision | t value | total |
|-------------------------------|--------------|---------|-------|
|                               | Participated | Not participated |       |
|                               | Mean | Std. Dev | Mean | Std. Dev. | Mean | Std. Dev. |
| Woman level of education      | 5.08 | 0.386 | 2.38 | 0.201 | -5.639*** | 3.39 | 5.310 |
| Woman age                     | 33.62 | 0.475 | 32.54 | 0.535 | -1.495 | 33.16 | 7.749 |
| Woman age square              | 1191.36 | 31.49 | 1117.24 | 34.73 | -1.57 | 1159.50 | 508.756 |
| Economical active labor force | 3.47 | 0.113 | 2.37 | 0.115 | -6.62*** | 3.00 | 1.850 |
| Distance to the market        | 3.32 | 0.297 | 12.07 | 0.448 | 16.873*** | 7.08 | 7.062 |
| Ownership of livestock (TLU)  | 33.86 | 0.656 | 62.36 | 1.593 | 18.094*** | 46.09 | 22.056 |
| Dependency ratio              | 0.59 | 0.049 | 0.57 | 0.062 | -0.2572 | 0.58 | 0.871 |

***, **, and * stand for significance at P < 0.001, P < 0.05, and P < 0.1, respectively
Source: Own survey, 2021

3.2. Status of woman labor force participation in the off-farm activity

According to this study, From the total sample, 270 (57.08%) have participated in an off-farm activity, while, 203 (42.92%) of them do not participate. Of the total woman, 59.34% who had not a child less than 5 years aged have participated and 52.98% of them who had a child less than 5 years aged have participated in off-farm activities. Even though there is no one-to-one association between this variable and WLP (the chi-square test is insignificant at 5%) (see Table 1).

Nonfarm training build know-how and enthusiasm for starting an off-business; however, 41.92% of a woman who took nonfarm training have participated and 58.08% of them also not participated. The chi-square test shows that there was a strong relationship between Non-farm training and WLP. Married women are less likely to participate in off-farm activities than their counterparts, only 27.31% of the total married woman have participated and 87.23% of the total nonmarried woman have participated, this may be due to a higher load in homework than off-farm activities when they get married. The chi-square test revealed that the association between woman marital status and WLP was significant at 5% (see Table 1).

If we look at the access of credit, 85.66% of women without access to credit participate and 81.59% of women who got credit access have not participated in off-farm activities, this might be the reason that the money from credit was spent on unproductive purposes (like household consumption). The chi-square test of association of access to credit and WLP is significant. The destination of women are more sensitive to the issue like access of training, information, market, social development aid, and so on, in this study woman labor force participation varied across the urban and rural dwellers, 83.87% of urban woman dwellers have to participate and 81.35% rural woman inhabitants also not participate in off-farm activities. There was also an association between location and WLP due to chi-square significance at 1% (see Table 1). Safety new aid had its contribution to improving the welfare of the society, however, it has negative implications in the eye of off-farm participating, i.e. 89.62% of none safety net recipients were involving in off-farm activities, whereas, 82.63% of safety net recipients did not participate. There was also a significant association between the safety net and WLP (see, Table 1).
Table 3. Percentage correctly predicted

| Decision        | Actual number | Predict by the logit model as |        |
|-----------------|---------------|-------------------------------|--------|
|                 |               | Participated                  | Not participated |
| Participate     | 272           | 261                           | 11     |
| Not participate | 201           | 9                             | 192    |

- Sensitivity: 96.67%
- Specificity: 94.58%
- Overall correctly classified: 95.77%

Source: Own survey, 2021.

From the total sampled women, the average educational level for participants and nonparticipants are 5.08 and 2.38 grades, respectively. The result of the t-test showed that participation in off-farm activities is significantly different across woman’s educational levels. On average, participant’s women on off-farm activities are relatively aged (33.62) than those not-participants (32.57) with 0.475 and 0.535 standard deviations, respectively. The mean difference of women’s age across participants and not-participants was insignificant based on the t-test (see Table 2).

Under participants women, the number of the active labor force was 3.47 persons per household, which was higher than that of not-participants in off-farm activities (two person per household approximately), on average. This may be because, if there was enough labor force in households, some of them will have participated in off-farm activities. The result of the t-test showed a significant difference between the mean active labor force on participation and not-participating decisions (see Table 2).

The market was available 3.32 and 12.07 kilometers away from woman’s destinations on average, respectively. This result showed that there was a higher distance to the market difference between participants and not-participants and also it is a statistically significant effect on participation decision of woman based t-test. The regional state is characterized by agro-pastoralist ways of life, due to this on average ownership of livestock for the participant and not-participant women were, 33.86 and 62.36 TLU, and the difference between them also statistically and significantly affect woman labor force participation decision, which was proofed by t-test (see Table 2).

Dependency ratio across woman participation decision also different, i.e. 59% and 57% under participants and not-participants woman respectively on average. This indicated there was participation under a higher dependence ratio and not-participate when the dependence ratio was lower compared to counterparts (see Table 2).

3.3. Model fittest test

(a) Chi-square Assumption: Before running a regression result, the one curtails thing was to pretest/select the variables that were eligible/candidate predictors for logistic regression with the help of the chi-square test. Based on the cross-tabulation result indicated in Table 1 all explanatory variables were fulfilled the chi-square assumption and become eligible/candidate predictors for logistic regression.

(b) Sensitivity test

Sensitivity (True Positive rate) measures the proportion of positives that are correctly identified (i.e. the proportion of participated women in off-farm activities in actual data set are correctly predicted as participants by the logit model.). In this study, the logit model predicted 261 women as
participants in off-farm training from the total of 272 actual data, or/and the logit model was predicted 96.67% correctly as participants (see, Table 3).

(a) Specificity test

Specificity (True Negative rate) measures the proportion of negatives that are correctly identified (i.e. the proportion of not-participated women in off-farm activities in actual data set are correctly predicted as not-participants by the logit model). From the total 201 not-participants women in off-farm activities, the logit model able to predict 192 as not-participants, or/and 94.58% of nonparticipants was predicted as not-participant by logit model.

Finally, the overall corrected prediction by logit model was 95.77% (from the total 473 sampled woman 95.77% of them were correctly predicted whether participated or not-participated by logit model in this study) (see Table 3).

(a) Hosmer-Lemeshow test:

Hosmer-Lemeshow test is a statistical test for goodness of fit for logistic regression models. In this study, the Hosmer-Lemeshow goodness fit test P value was less than 5% (0.966); therefore, the logistic regression model is fittest to the given data set (see Table 4).
3.4. Multivariable binary logistic regression

To achieve the objective of this study, a logistic regression model was applied. Before we have proceeded to an analysis, we have checked problems of multicollinearity and degree of associations for the continuous and dummy variables using variance inflation factor (VIF) and contingency coefficient (CC), respectively. The result revealed that, there is no strong multicollinearity and degree of association between the continuous and dummy variables, respectively. In his study, 13 variables were used as determinants factors for a woman to have participated in the labor market or not. From those determinants factors, the logit model revealed that 9 of them were statistically significant factors for woman labor force decision; level of education, dependency ratio, and children under five years have a positive and significant effect on woman labor force participation decision. Whereas nonfarm training, distance to the market, marital status, access to credit, ownership of livestock, and the mean Safety Net also have negative and significant implications for a woman to have participated or not in the labor force market (see Table 4).

3.4.1. Women level of education

According to the findings of this study level of education has also been found as a positive and significant effect on WLP at a 1% level of significance (see, Table 4). As woman years of schooling goes up by a year, the odds of a woman being participated in off-farm activities increased by factors of 1.37. Education could create know-how for the woman about market and business ideas; how to generate an additional source of income and profit other than farm activities to enhance the welfare of the families. An educated woman has a chance of being employed by public/private organizations and easily disseminated training and skill that can make enthusiastic women participate in off-farm activities. Several studies also found the same result (Babalola & Akor, 2013; Fentie & Rao, 2016; Gebreyes, 2019b; Mulugeta, 2021; Roy et al., 2015).

3.4.2. Have children less than five years

The result of the study showed that have children less than five years is significant at a 1% probability level and negative influence participation of women on off-farm activities (see Table 4). In this study, the odds of women who had a child less than five years aged was 0.998 times lower compared to a woman who had not a child less than five years aged. This may be because the woman sent most of their time to child care and other household chores and this would lead to the woman decreasing the rate of participation in off-farm activities. This finding is supported by a study conducted by (Beyene, 2008; Hosney, 2016; Kapsos et al., 2014).

3.4.3. Nonfarm training

There was a significant and negative association between these variables and WLP at a 1% significance level (see Table 4). Keeping other things constant, a woman who got nonfarm training decreased the labor force participation by 83% than those who did not get nonfarm training. This might be due to, firstly, most of the off-farm training was rendered for those woman who are not participated in off-farm activities before, this makes as when woman labor force participation is high, there were delivered extensive amount of the off-farm training. Secondly, those trainers do not offer specific training related to enhance women to participation in off-farm activities rather, they might give political propaganda’s about the ruling parties for those women, this makes a woman does nor acquired a required off-farm training reduced to participate. In addition, agricultural and rural development bureaus receive the performance report from DAs without further checkup whether women have fully participated or not in the training program and disseminated training (Zewdie & Sivakumar, 2017). This is inconsistent with a study conducted by (Dessie, 2014; Tanaka & Muzones, 2016), which found that training can bring skills and knowledge that increases the participation of woman in nonfarm activities.

3.4.4. Distance to the market

Distance to the market significantly and negatively affect WLP at a 1% significance level (see Table 4). The market center far away from the woman’s destination by a kilometer, the likelihood
of a woman being participated in off-farm activities decreased by 15%. Market closeness and the availability of physical infrastructure are location advantages for those woman to participate in labor market (Haile, 2012). When the market place a way from woman residency, difficult to get market information timely about the price, demand, and supply (market information asymmetry) in a line with this, a woman participating in such labor market will lead to bankruptcy, costly, waste their time for nonprofitable activities and finally they were wipe out from labor market.

These findings are similar to studies conducted in Ethiopia (Alemu et al., 2021; Fentie & Rao, 2016; Haile, 2012; Tadesse et al., 2020). Which were found that, if the marketplace was far away from women residence; transportation for both input and output was too costly, it takes time to reach the market to sold and bought a product focused on their income-generating activities, due to this, women are not enthusiastic to go a long distance and waste their time and money and participating in off-farm activities.

3.4.5. Woman marital status
Woman marital status also had a significant influence at 1% probability level and negatively affect women's participation in off-farm activities (see Table 4). This study indicated that a married woman was 0.05 times less likely to participate in off-farm activities than others (singles, widowed, or divorced). This finding was similar to studies conducted in different settings (Ejaz, 2011; Sumule & Syafitri, 2013). As many other developing countries married women is responsible for domestic and homemade duties like cleaning, washing, cooking, and childcare; however, the possibility to work away from the home and doing for wage exclusively given to husbands (Hosney, 2016; Khadim & Akram, 2013; Lopez-Acevedo et al., 2021). Therefore, a married woman was too busy by home duties, less access to educations, and no autonomy to participate in off-farm activities by their husband. Consequently, a married woman has less likely to participate in off-farm activities compared to others or participated in unpaid work.

3.4.6. Access to credit
A woman with access to credit had a 96% decreased in off-farm labor force participation than a woman without credit availability (see Table 4). Credit can help ease financial constraints, allows a woman to purchased inputs for nonprofitable activities, and source for startup capital (Malefiya et al., 2017). Notwithstanding, in the study area, a woman with access to credit has less likely to participated in off-farm activities compared to the counterpart, due to the reason that, response from interviewee woman borrowing interest rate charged by the financial institution was higher than what they expected and this makes the woman unable to repay its debt and obliged to sell their collateral by auction and become poorest, finally woman kick out from market participation. Furthermore, financial institutions had less post-follow-up the woman after they offer credit, this would become a case for woman spent this amount of money for nonprofitable and unproductive activities and become indebted.

3.4.7. Ownership of livestock
The result of the study showed that ownership of livestock of a woman was significant at 1% probability level and negatively influence participation of woman on off-farm activities (see, Table 4). The number of livestock increased by 1 tropical livestock unit, the odds of woman labor force participation decrease by 0.09%. Livestock production is the hallmark of the Afar regional state and also had a total of 327,370 cattle and more than 85% of the societies were pastoralist and agro-pastoralist (CSA, 2005). Such availability of cattle provides drought and draft power, source of food, and income, which could be a substitution for off-farm income; therefore, a woman who have large amount of livestock population are not willing to participate in off-farm activities. And also livestock production were labor-intensive by their nature hence it would be diminished the number of women to participate in off-farm activities when the population of livestock increased. These findings are similar to studies conducted in Ethiopia that showed livestock holding is an indication of household wealth and women were not eager to participate in off-farm activities (Abraha, 2007; Haile, 2012).
3.4.8. Dependency ratio
It had a significant influence at the 5% probability level and positively affect women's participation in off-farm activities (see Table 4). The dependency ratio of a household has incremented by 1%, the odds of women who are participating in off-farm activities about 2.03-fold. This finding is consistent with the result of (Lopez-Acevedo et al., 2021; McCarthy & Sun, 2009; Van Den Berg & Kumbi, 2006). This might be justified by an increasing number of dependents in the household would be caused economic pressure for the woman (increasing expenditure on food, cloth, and material needs) so women must have been participated in off-farm activities to get an additional income (Sumule & Syafitri, 2013). Therefore, as a woman has a higher level of dependency in the households, they were obliged to participate in off-farm activities other than farm activities to feed and sustain the family members.

3.4.9. Safety net
For a woman who received a safety net, the odds of a woman being participating in off-farm activities had decreased by 98% as relatives to a woman who does not receive a safety net (see Table 4). The government of Ethiopia launched the safety net program in 2005 to help chronically food-insecure households by transfers food, cash, or both based on need and season either through direct support or public work activities (Food and Agricultural Organization [FAO], 2012). However the selection procedure to be eligible for safety-net aid was not quite fearful and rational, this might be the reason that women who were previously participated in off-farm activities become not participants. This was because, when ineligible women get safety net aid both in-kind/cash, they are not eager to work because, they would be addressed their financial as well as material constraints, this would cause a woman out of participation in off-farm activities gradually.

4. Conclusions and recommendations
Women's labor participation improves productivity, increases economic diversification and income equality. Despite the importance of this, women are less likely to participate the labor market, if they were got the opportunity to participate; they have employed in low-quality work, are under-employed, and paid subsistence wages for long hours working compared to the counterpart. Therefore, this study tried to investigate status women's labor participation and its determinants factor by using a binary logistic regression model. The study revealed that more than half of sample woman were participated in off-farm activities, and the logit model also found that, woman’s level of education and the dependency ratio was positively and significantly determine women's labor force participation decision. Whereas, a woman who had children less than five years of age, nonfarm training, distance to the market, woman marital status, access to credit, ownership of livestock, and safety net adversely affected the participation decision of women on off-farm activities.

Based on the above finding, this study was recommended the following policy implications: government should give special attention to educational development, adopted family planning, find alternative ways of handling child care and other household chores (example Parental benefits like maternity and paternity leave); provided nonfarm training should be related to the enhancement of women to participation in off-farm activities such as masonry, carpentry, weaving, carpentry, pottery, blacksmithing), rather than political propaganda's about the ruling parties for those women, developed market place nearby woman dwelling, financial institution must have provided credit to a woman at a relative lower borrowing interest rate only for productive purpose and fewer collateral requirements, create awareness about mixed-farming, and off-farm activities, develop a habit to support woman by their husbands for participation in labor market, selection procedure to be eligible for safety-net aid should be quite fearful and rational to provided safety net.
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Notes
1. Who are neither engaged in productive activities nor available to furnish their labor due to homemaking activities, attending school, old age/pensioned, illness, too young to work, etc.
2. Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia more than 55% of the total female population is found in zone one and two.
3. Smallest political administrative unit of Ethiopia.
4. According to CSA of Ethiopia adult population were belongs to the age of 15–49.

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No potential conflict of interest was reported by the author(s).

Data availability statement
The datasets and articles used to support this study are available from the corresponding author upon reasonable request.

Abbreviations and acronyms
CSA—Central Statistical Agency; NARS—National Agricultural Research System; FAO—Food Agricultural Organization; ANRIS—Afar National Regional State; LR—likelihood-ratio test; TLU—Tropical Livestock Unit; VIF—Variance Inflation Factor; CC—Contingency Coefficient; OLS—Ordinary Least Square.

Ethics approval and consent to participate
Ethical clearance was obtained from the college of business and economics, Samara University.

Authors’ contributions
The corresponding author was done all aspect of the manuscript solely.

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