

Effect of Non-farm Income on Rural Household Livelihood: A Case Study of Moyale District Oromia Regional State, Ethiopia

Ana Damena^{a*}, Demmelash Habte^b

^a Department of Economics, college of Business and, Arsi University

^aEmail: ana430d@gmail.com

Abstract

The study attempts to investigate the link between household livelihood and nonfarm employment and income from nonfarm using the survey data collected from 170 systematically selected households from four villages of Moyale district, Oromia Regional state, Southern Ethiopia. Considering the objective of the study, given a household participated in nonfarm employments to generate income and the effect of generated income on household livelihood, Probit and Heckman selection model (two stage) are used respectively. To examine, first the household decision with respect to participation in nonfarm employment using probit model, the researcher found that age, family size, credit, livestock holding, education, marital status, distance to market and main road are the most influencing variables in determining households to participate in nonfarm activities. Further, the effect of nonfarm income on rural household livelihood is examined. The study indicates that nonfarm employment provides additional income that enables farmers to spend more on their basic needs include: food, education, clothing and health care. The result of the study implied that nonfarm income has a role which is significant in maintaining household livelihood and to change their living standard. In addition the result show that about 4.7% of sample households primary occupation is Nonfarm activities.

Keywords: Heckman selection model; livelihood; nonfarm employment, nonfarm income; probit model.

* Corresponding author.

1. Introduction

In attempt to alleviate poverty in the developing countries of the world, efforts should be directed towards the promotion of rural well-being and this requires an integrated plan that goes beyond mere agricultural development. Although agriculture remains the main source of income and employment in rural areas of the developing countries, It is a universally accepted fact that agricultural sector is incapable of creating sufficient gainful employment opportunities amidst of increasing population in the developing countries. Thus, the nonfarm sector is increasingly becoming important. Based on a review of a number of studies using rural household surveys conducted between the mid 1970s and the late 1990s reference [1] state that non-farm income as a share of total household income averaged 42 per cent for Africa, 32 per cent for Asia and 40 per cent for Latin America. At the start of the new millennium, 30-40% of rural full-time employment was attributed to non-farm economic activities in developing countries. Employment in non-farm activities is essential for diversification of the sources of farm household's livelihood. The reasons for this observed income diversification include declining farm incomes and desire to insure against agricultural production risk [2].

In Sub-Saharan Africa the diversification can be represented as a failure of agriculture as means of providing livelihood for a substantial proportion of rural inhabitants. This diversification in Africa expressed as an active process of "de-agrarianization" whereby farming becomes a part-time, residual, or fall-back activity and livelihoods become increasingly oriented to non-farm and non-rural activities [1].

Ethiopia is one of the most agrarian country. even if the country practice agriculture for a long period of time no more change in the livelihood of the households and food insecure until now a day. Many researchers in the field of rural development tend to agree that the number of poor people in rural areas of Ethiopia exceeds the capacity of agriculture to provide sustainable livelihood opportunities.[3]. Whilst there is a potential for out-migration, urban centers cannot be assumed to be capable of providing adequate livelihood opportunities for all those unable to make a living in agriculture [4]. It has become increasingly difficult to expand agricultural employment in Ethiopia. Because of rapid population growth, the average farm size has declined to less than one hectare. Sub-economic holdings, landlessness, soil degradation, low level of technology utilization and increasingly unreliable and erratic rainfall have resulted in widespread poverty and vulnerability [3]. This indicates a potentially important role for rural nonfarm activities in reducing poverty in rural areas.

However; households have been found to diversify their income sources due to both push and pull factors[4,8]. A further study, reference [6] state that farmers' vulnerability to climate change also shows the importance of pull factors; here, a greater degree of access to technology and proximity to infrastructure were found to be critical for engaging in non-farm diversification in rural Ethiopia. References [5,9] state that the determinants of diversification in rural Ethiopia vary according to wealth status. Moreover, looking at the wealthier groups, rich households tended to engage more in non-farm activities that require investment and skills (such as carpentry) for accumulation. However, reference [10] state that very poor households may be pushed into non-farm activities, especially if they are landless and cannot work in agriculture. Thus, nonfarm income may not necessarily have a positive linear correlation with wealth status but rather a U-like pattern.

Likewise, in the study area more than 80% of the population earns their livelihood from farming both agriculture and livestock rearing. Despite the sector remains the main source of livelihood in the region, production is far from being adequate. The area was well known for its food insecurity. Agricultural production in the area was highly constrained by factors such as inadequate rainfall. Mainly Livestock and livestock production was the primary activity of the households in the area [6]. The consequence of engaging in livestock rearing in a drought-prone environment was that, households face substantial risk. Formal livestock insurance is not available or widely distributed to mitigate this risk. The lack of such insurance is thought to be due to the high spatial covariance of rainfall shocks and to moral hazard problems associated with farming insurance in general [6]. Uncertainty combined with missing markets for risk creates incentives to diversify income activities [1].

Households in the rural area were diversifying by engaging in migration, and nonfarm activities like petty trading, firewood collection, charcoal production, wage employment and other activities [7] Likewise in the study area, the primary occupation of household was incapable of feeding the households. Low productivity of livestock rearing and seasonal crop production in long dry season made households to diversify their livelihood strategy. In such area; merely depending on farming is not a panacea, therefore to reduce dependency on subsistence farming, specially livestock rearing, nonfarm employment can be an option [5] Even if, the participation of household in nonfarm activity was not equally distributed, the households participate in nonfarm activities for different reasons [6]. However, the studies were not in full agreement on the reason of diversification and level of participation. Thus, this study needed to investigate the effect of nonfarm income on household livelihood in general and used to answer the following research questions particularly;

- Is nonfarm income worsen or improve household livelihood?
- What are the wealth classifications and indicators for wealth?
- Which community class participate in nonfarm activities more?
- To what extent the nonfarm income contributes to households total income?
- What are the major factors that lead to household livelihood diversification?

The basic purpose of this research is;

- To examine the reason why households participate in nonfarm activities
- To examine constraint of entry in nonfarm activities in the district
- To investigate the contribution of nonfarm income to total household income

Having this purpose the study has some constraint or limitation ; The household is not a homogeneous block; rather, it is internally complex with different members (men, women, and children) having different roles and autonomy of control over resources including those crucial for diversification. The fact that a disaggregated approach to the family was not adopted. The study is also cross-sectional, no consideration in the changes of variables over a specified period of time. Finally, no claims can be made about the statistical representativeness of sample findings with respect to populations in the entire District or for the country as a whole.

The rest part of these research explained as follows: Section 2 is the literature review; Section 3 explains data collection methodology and model specification. Section 4 discussion of the results. Section 5 clarifies the conclusion and recommendation.

2. Literature review

2.1 Empirical Literature

Over the last three decades, the non-farm economy has been gaining a wider acceptance in issues of rural development due to its positive implication in poverty reduction and food security. Participation in rural non-farm activities is one of the livelihood strategies among poor rural households in many developing countries. Empirical research found that non-farm sources contribute 40-50% to average rural household income across the developing world [7]. For example reference [11] state that non-agricultural activities account for 30 percent to 50 percent of income in rural areas. The rural nonfarm sector plays a vital role in promoting growth and welfare by slowing rural-urban migration, providing alternative employment for those left out of agriculture, and improving household security through diversification [1]. Reference [7] state that nonfarm activity is typically positively correlated with income and wealth in rural Africa, and thus appears to offer a pathway out of poverty if non-farm opportunities can be seized by the rural poor. Moreover, the key poor in land and capital face an uphill battle to overcome entry barriers and steep investment requirements to participation in nonfarm activities capable of lifting them from poverty [10].

The empirical evidence on the effect of nonfarm income on rural income inequality shows mixed results. Reference [10] opines that this may be due to the heterogeneity of the non-farm sector and the wide range of contexts in which the question has been posed. Reference [12] state that nonfarm income increases inequality because nonfarm income is unequally distributed in favour of the rich. On the other hand, reference [13] find that nonfarm income decreases rural income inequality. Reference [1] observes that the assertion that non-farm income reduces income inequality is premised on three empirical assumptions: 1)-nonfarm income is large enough to influence rural income distribution, 2) –nonfarm income is unequally distributed, and 3) - this unequally distributed nonfarm income favours the poor. Reference [1] state that in rural Africa non-farm income constituted a greater share of total income for richer households compared to poorer households. However, very poor households may be pushed into non-farm activities, especially if they are landless and cannot work in agriculture [10].

However, other households are pushed into the non-farm sector due to a lack of opportunities on-farm, as a result of drought or smallness of land holdings [14]. One of the components of rural nonfarm activities, in which the poor can participate because it does not require any complementary physical capital, is wage employment. The study on the livelihood diversification of pastoral communities found out that in both pastoral and semi-agro-pastoral communities, the contribution of livestock and livestock products to the households income is the highest for the rich and smallest for the poor owing to the size of livestock they hold. The livelihood of the pastoralists diversified into petty trades, casual work, remittance, firewood selling, charcoal production and incense collection [15]. The evidence from southern Ethiopia also show that; non-farm and off farm activities

are carried out by significant proportion of adults and makes an important contribution to livelihoods. [16]

2.2 Empirical Model

The starting point of the theoretical framework of this study is the Farm Household Model (FHM). It is based on a simple non-separable household model where market is imperfect [17]. Consider a household that derives utility from consumption of home produced goods (C), purchased goods (M), and leisure (L). Hence, the household utility function can be specified as [17, 12].

$$U = U(C, M, L; Z^h) \dots\dots\dots 1$$

Note that the household utility (U) is a function of household consumption (C), (M) and leisure (L). The household is assumed to maximize utility subject to constraints imposed by the production technology, the total time endowment of the household; and the household's cash income (budget). This model provides a theoretical framework for capturing and prediction of household's (farmer's) farm, off farm / nonfarm work participation and hours of work decisions. The intuition is that the farmer's labor supply decisions are determined by maximizing a utility function subject to technology, time and income constraints.

The production technology of the farm represents the constraint on the household's consumption possibilities. Farm output depends on the labor hours allocated to farm production, T_f a vector of purchased input factors, X, capital employed on the farm, K, land, A, and farm specific characteristics, Z_q . The production function is assumed to be strictly concave. The Production technology constraint can be specified as [17,12]

$$Q = Q(T_f, X, K, A, Z^q) \geq 0 \dots\dots\dots 2$$

The household allocates its total time endowment (T) among farm work (T_f), market work (T_m), nonfarm employment (T_n) and leisure (L). Hence, the time constraint is:

$$T = T_f + T_m + T_n + L \dots\dots\dots 3$$

Non-negativity constraints are imposed on farm work, market work, nonfarm work and leisure of household: $T_f \geq 0$, $T_m \geq 0$, $T_n \geq 0$ and $L \geq 0$.

Consumption is constrained by household income, composed of: (i) farm income (Y_f), which is a function of each household member's farm labor supply; (ii) off farm labor income, which is the sum of off-farm earnings of all household members (Y_{mi}); nonfarm labour income, which is the sum of nonfarm earnings of all household members (Y_{ni}); and (iii) other income (Y_o). The resulting budget constraint is:

$$C = Y_f(T_f; Z_f) + Y_{mi}(T_m; Z_m) + Y_{ni}(T_n; Z_n) + Y_o \dots\dots\dots 4$$

The household optimization problem is to maximize $U(C, M, L; Z^h)$ subject to the time, budget, and non-negativity constraints, where Z_j are exogenous shifters of function j. The optimal solution is characterized by the Kuhn-Tucker conditions, which are the first-order conditions for maximizing the Lagrange function:

$$\phi = U(C, M, L; Z^h) + \delta(L_f, L_h, K, X, A, Z^g) + \lambda [Y_f(T_f; Z_f) + \sum_i Y_{mi}(T_{mi}; Z_{mi}) + \sum_i Y_{ni}(T_{ni}; Z_{ni}) + Y_o - C] + \mu_t [T - T_f - T_m - T_n - L] + \mu_f T_f + \mu_m T_m + \mu_n T_n \dots \dots \dots 5$$

Where, δ = the marginal utility of the production constraint

t = the shadow wage rate (value) of every job obtained in farm, off farm, and nonfarm

λ = marginal utility of income (liquidity) constraint

The first order conditions for interior solutions imply:

$$\partial \phi / \partial T_m = -\mu_t + \mu_m = 0 \quad \text{optimality condition for off farm labour} \dots \dots \dots 6$$

$$\partial \phi / \partial T_n = -\mu_t + \mu_n = 0 \quad \text{optimality condition for nonfarm labour} \dots \dots \dots 7$$

$$\partial \phi / \partial T_f = \delta - \mu_t + \mu_f = 0 \quad \text{optimality condition for farm labour} \dots \dots \dots 8$$

$$\partial \phi / \partial L = \partial U / \partial L - \mu_t + \mu_l = 0 \quad \text{optimality condition for leisure} \dots \dots \dots 9$$

Assuming labor time is exhaustively used in the three activities.

3. Methodology of the study

3.1 The study area

The study area, Borana pastoral /agro-pastoral system lie within the Borana administrative zone (3°36' and 6°38'N and 36°43' and 41°40'E) which is located in southern Ethiopia in the tropic and shares boundary in the northern Kenya. This zone is broadly divided into two agro-ecological zones; the high altitude humid land to the north and semi-arid lowland to the south.

The area has two rainy and two dry season. These seasons are; long dry spell from December to February, short dry spell from June to August, long rainy period from March to May and short rainy period from September to November with remarkable inter annual variation is seasonal condition [18].

This district has total population of 208,093, in which female account for 50.16%. The rural population account for 63.67% which is 132,498 in number.

This study undertake in the rural of the pastoral farming society, which lie in Sami -arid lowland to the south and in long dry season. The district found in the southern Ethiopia and Northern Kenya boarder.

The rationale for the choice of Moyale district for the study is presence of non-farm activities to be studied and existence of representative or typical rural livelihood patterns so that findings have policy relevance on a broad scale.

3.2 Data Selection

The data required for this study was collected at the household level and consist of household composition like; types of primary occupation and non-farm economic activities, level of participation and employment status of the sample population, household income, education status, household age and marital status, family size, possession of special skill, sex, livestock holding, distance from near market and main road, motivation for participation in non-farm activity, occupational mobility amongst the sample population, sources of funding for the non-farm activity, potentials and constraints of the non-farm economic activities are collected data .

3.3 Sources of Data

The study made use of primary and secondary sources of data. The primary data collected with the help of a structured questionnaire with face to face interview and survey of sample household in study area.

Secondary data which complement the primary data are gathered from administrative body of the district and from the sources such as archives, text books, journals, conference papers and relevant documented materials.

3.4 Sample Size and Sampling Techniques

Moyale district has 20 rural and 3 urban village. Out of 20 rural village in the district, four villages are purposively selected depending on the characteristic of the village like proximity to town and main road. Dambi and Bokkola were the village found far away from town and main road.

The two village, Tille Maddo and Camuq were more close to town and main road. The systematic sampling technique employed in selecting a targeted rural households that engaged in various economic activities from each village. Depending on the size of village households ,which account for 4095,the researcher use [18] formula at 92.5% confidence level and 7.5% acceptable error to calculate the sample size. That is;

$$n = \frac{N}{1+N(e^2)} \quad \text{where; } N\text{-household size}$$

n- sample size

e- acceptable error

$$\text{Then , } n = \frac{4095}{1+4095(0.075)^2}$$

$$n = \frac{4095}{1+4095 \times 0.005625} = \frac{4095}{1+23.034375} = \frac{4095}{24.034375} = 170.38 \sim 170$$

This sample size was considered as representative of the entire heads of households in the study area. Depending on the above calculated sample size and number of household head in the village, the sample household selected proportionally with the household number from each village. The respondents live in the same ecological zone and they are homogeneous population.

Table 1: The sample size from each selected village.

No.	Name of village	Climate zone	Number of household in the village	Sample size
1	Dambi	Desert	1200	50
2	Bokkola	Desert	1075	44
3	Tille maddo	Desert	860	36
4	Camuq	Desert	960	40
Total			4095	170

Source; survey, 2016

By dividing household number from each village for their respective sample size , every 24th household selected until the required number reached from each village.

3.5 Methods of Data Analysis

3.5.1 Descriptive Analysis

The descriptive statistics such as mean, averages, percentage and frequency distribution was used to summarize the characteristics of both farm and non-farm participation of households.

3.5.2 Econometrics analysis

In addition to the descriptive analysis, the probit model employed to analyze the household decision to participate in nonfarm activities and Heckman selection model (two stage) also used to examine the effect of nonfarm income on household livelihood.

3.5.2.1 Econometric model specification

Probit and Heckman selection model were used to empirically analyze and seek answers to the research questions. Probit model employed to determine the factors influence rural households to participate in nonfarm employments. The probability of participation in nonfarm activities given the explanatory variables is captured by running a probit regression model. In this model, the response variable is binary, taking only two values, 1 if the household participate in nonfarm employment, 0 if not. The participation in nonfarm activities determine by different explanatory variables. This expressed as;

$$Hp = \beta_1 + \beta_2age + \beta_3sex + \beta_4edu + \beta_5sps + \beta_6ms + \beta_7fs + \beta_8Lh + \beta_9Cr + \beta_{10}Dm + \beta_{11}Dr + e_i \dots\dots\dots 1$$

Where; Household participation(Hp) is dependent variable age, sex, education(edu), special skill(sps), marital

status(ms),family size(fs),Livestock holding(Lh),Credit(Cr),Distance to market(Dm) and Distance to main road(Dr) are explanatory variable, e_i denotes error term.

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

$$P_i = P(H_p = 1 | X_i) = P(H_p^* \leq H_p) = P(Z_i \leq \beta_1 + \beta_2 X_i) = F(\beta_1 + \beta_2 X_i) \dots \dots \dots 2$$

$X_i \dots \dots \dots$ denotes explanatory variables in equation one

Where, $P(H_p = 1 | X_i)$ means the probability that an event occurs given the value(s) of the X_i , or explanatory, variable(s) and where Z_i is the standard normal variable, i.e., $Z \sim N(0, \sigma^2)$. F is the standard normal CDF, which written as follows .[19]

$$P_i^* = F(H_p) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x_i} e^{-\frac{z^2}{2}} dz \dots \dots \dots 3$$

P_i^* Cannot be observed; it can only be observed if the farmer works nonfarm or not. Then $p_i = 1$ if $p^* > 0$, $p_i = 0$ otherwise.

Considering the objective of the study, given a household participated in nonfarm employments and its effect on household livelihood, the Heckman selection model was employed. The Heckman selection model is specified as.[20]

$y_i = x_i' \beta + u_i$ Outcome/regression equation. Assume that Y is observed, if a second unobserved latent variable exceeds a particular threshold

$$Z_i^* = w_i^* \alpha + e_i$$

$$z_i = 1 \text{ if } z_i^* > 0, \quad 0 \text{ otherwise.}, \text{ Selection equation}$$

3.5.2.2 Description of variables

3.6 Research Hypotheses

Explanatory variables which are expected to reflect the household participation in nonfarm activities at household level. Age, Education, Family size, Distance to main road, Possession of special skill, Credit and Marital status are expected to positively influence participation in nonfarm activities. Whereas Sex, Distance to

nearest Market, and Livestock holding are expected to have a negative influence on diversification.

Table 2: Variables Measurement

Variable	Measurement
Dependent variable	
Participation in nonfarm activities	1 if the household is participated in nonfarm employment, 0 if not.
Explanatory variables	
Age of household head	Age at time of interview
Sex of household	1 if male and 0 otherwise
Education	1 if literate ,0 otherwise
Possession of special skill	1 for those with transferable skill,0 if not
Marital status	1 if married, 0 otherwise
Family size	Number of household members
Livestock holding	Number of livestock owned
Credit	1 if the household has taken credit, 0 if not
Distance to the nearest market	1 if close to the town, 0 otherwise
Distance to the main road	1 if close to the main road, 0 otherwise

4. Result and Discussion

4.1 Descriptive Analysis

4.1.1 Household primary occupation

The primary occupation of the majority of sample households is livestock rearing. See table 3 below

Table 3: Primary occupation of sample households

Primary occupation	Freq.	Percent
Livestock rearing	101	59.41%
Crop production	-	0%
Both (crop and livestock)	26	15.29%
Trade	9	5.29%
Civil servant	3	1.765%
Daily labor	13	7.65%
Firewood collection and charcoal production as primary	8	4.7%
Others (like broker contraband...etc...)	10	5.88%
Total	170	100.00%

Source; survey result ,2016

Small farmers in the study area grow crops under rain fed condition. Farmers plant a few crops, of which the major ones are maize and wheat. If there is rain once throughout the year, few of them earn some cash income through the sale of vegetables like cabbage, onion, tomato and potato in the near market once a year. Livestock production is the main means of livelihood of the people. Farmers in the area were also widely undertaking nonfarm activities as farming income is seasonal and low.

The survey result depicts that the average age of sample respondents was about 39 years with the minimum and maximum ages of 17 and 80 years, respectively. Of the respondents' also the average years of education is 2.1456, which ranges from zero to maximum 10 years. The main activity of the majority of the household heads is farming. About 81.76% households in the study area have livestock. The livestock they hold range from minimum of zero to 85 maximum and 20 in average. Although farming is the major source of livelihood, nonfarm activities were becoming additional source of income. The Household family size ranges from minimum of two to a maximum of fourteen individuals and the average family size is 6. The size of a family may suggest that the level of dependency in the household and/ or the labor force in the household .See the detail in table 4

Table 4: Descriptive Statistics of households' socio-economic attributes

Household features	No. Observation	Mean	Minimum	Maximum	Std. Deviation
Household head sex (1= male, 0=female)	170	0.7588	-	-	0.4290609
Household head education(years of schooling)	170	2.1456	0	10	0.43598
Age	170	39.01765	17	80	14.91494
Family size	170	5.817647	2	14	2.701465
Livestock holding	139(170)	20.20863	0	85	16.05136
Household Expenditure per year	170	7538.959	2000	24000	4542.884
Expenditure for food	170	2425.429	650	9600	1663.918

Source; survey result,2016

The results of the analysis showed that the annual average household expenditure on education, domestic household basic needs totally 7538.959 birr per year. The Expenditure for food consumption was also 2425.429 in average .This expenditure on food exclude food from aid.

4.1.2 Wealthy classification and indicators of sample households

Number of Livestock is the most determining factor for wealth classification. Land and other assets are not

considered as indicator of wealth in pastoral communities of the study areas. The wealth status is determined by sources of income and major occupations. According to the local criteria the households classified as rich, medium, poor and destitute/ very poor depending on livestock they hold. More than half percent of average yearly expenditure was also from rich household who own more livestock. The poor and destitute households expend only 19.12% per year. See table 5 below

Table 5: Wealthy classification and indicators of sample households

No.	Household classification	Indicators				
		Number of livestock	Average Expenditure per year			
			Sample household	Amount in birr	Percent	%participati on in NF
1	Rich	> 30 livestock	23	14210	52.47%	13.53%
2	Medium	>10 and <30 livestock	79	7690	28.40%	46.47%
3	Poor	<10 livestock	37	3225	11.90%	21.76%
4	Destitute	No livestock	31	1954	7.22%	18.24%
Total			170	27079	100%	100%

Source ; survey result ,2016

As shown in figure 1 below 46.47% sample household were medium in wealthy classification and 40% were poor and destitute. The rich account only for 13.53%. This classification is so powerful to identify level of participation of households by wealthy after accessing nonfarm participation of households.

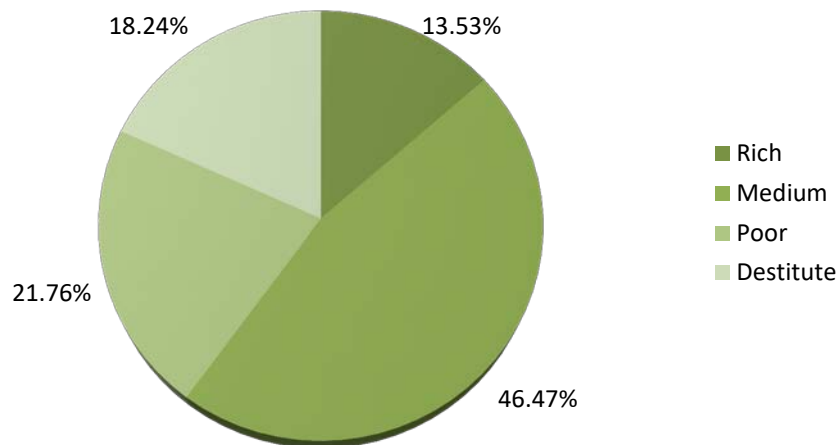


Figure 1: Wealth Classification of sample household

Source; survey result ,2016

4.1.3 Nonfarm participation of sample households

Almost more than half sample household head participate in nonfarm activities. Even if livestock rearing is the most primary occupation of sample household it could not meet livelihood strategy of households, because of drought and short season rain.

Firewood collection and Daily labor were the most common and widely observed nonfarm activity in the area (Table 6). As it can be seen in the table below about 26.56 and 25.78 percent of the respondents participated in daily labor and firewood collection activity respectively. Firewood collection and charcoal production are more widespread than that of other nonfarm activities.

Table 6: type of nonfarm activities

No.	Nonfarm activities	Number of households	Percent
1	Petty trade	23	17.97%
2	Firewood collection	33	25.78%
3	Charcoal production	7	5.47%
4	Transportation	15	11.72%
5	Daily labor	34	26.56%
6	Craft work	-	-
7	Liquor and food for sale	3	2.34%
8	Others(such as contraband....etc)	13	10.16%
	Total	128 (104)	100%

Source ; survey result ,2016

The number of households participated in firewood collection and charcoal production is larger than those participated in other nonfarm activities both in the case of all village and individual households. But, because of government program to protect forest and environment balance almost all sample household being out of charcoal production excluding 4.7% household whom depend on these occupation as primary.

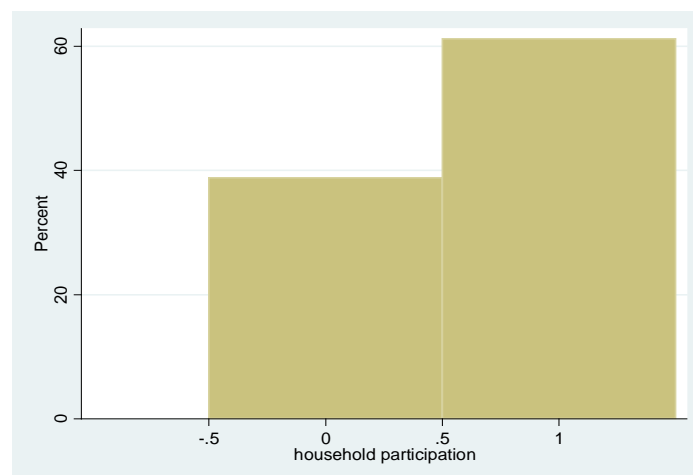


Figure 2: percentage of household participation

Source ; survey result,2016

Of the total 170 sampled households 104 (61.18%) households were participated in nonfarm employments while 66 (38.82%) households were not participated in nonfarm activities. The figure which show 128 in table 6 above indicate that there was sample households who participated in more than one nonfarm activities. Out of this sample households 24 household heads participated in more than one nonfarm activities because of growth of family size and existence of labor force in the family. Even if daily labor was the mostly used nonfarm activities which was followed by firewood collection ,the sample households participate in nonfarm activities such as petty trade (17.97%),transportation(11.72%), others such as contraband trade (10.16%) ,charcoal production (5.47%) and liquor and food for sale (2.34%). Having this participation in nonfarm activities, full time employment in nonfarm activities account for 25.29 % which means 43 household heads devote their full time in nonfarm for their livelihood strategy. This participation of the sample households differ with different variables.

4.1.3.1 Non-farm employments participation by sex

The participation of sample households in nonfarm activities was not bounded by gender. Even if, no equal participation in the number, both male headed and female headed households were participate in nonfarm activities.

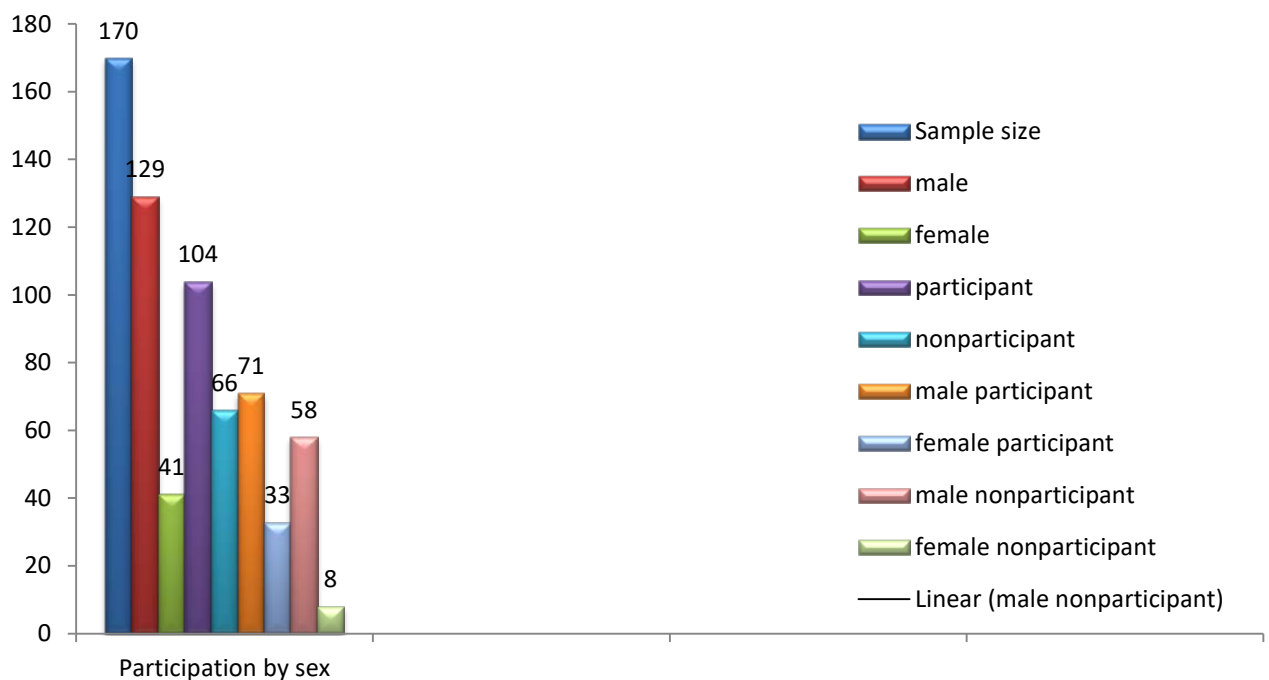


Figure 3: Non-farm employments participation by sex

Source ; survey result,2016

The above figure show the participation and nonparticipation of both male and female headed households in nonfarm activities in number. The female number both in household heading and participation was so smaller than that of male headed households. Out of 170 sample households only 41 were leading by female.129 of the

sample households were leading by male and participate more in nonfarm activities. The above figure show 71 male headed households participate in nonfarm activities while female headed was 33 only. The number of nonparticipant male headed household was also greater than female headed. But the percentage of participation by female was greater than that of male.

Table 7: percentage of participation by sex.

Category	Sample HH head	Participant in Nonfarm	Percentage by sex	Percentage out of participant
Male	129	71	55.038%	68.27%
Female	41	33	80.48%	31.73%
Total	170	104	-	100.00%

Source; survey result, 2016

Out of the nonfarm participant household heads 71 (68.27%) were male and 33(31.73%) were female. Although it seems male headed households participated more in nonfarm employments than female headed households, all most , all female headed households were participated in nonfarm activities which account 80.48%(33 out of 41) .The participation of male headed households were only 55.038% which is 71 out of 129. This participation show the attractiveness and diversification of female headed households toward nonfarm activities than male headed.

4.1.3.2 Nonfarm employment participation by Age, Education and livestock holding

The participation in nonfarm employment by age, education and livestock holding was vary with in individual households. Without the children from 0-15 years, every age group has their own participation. Even, if there was no equal participation, both literate and illiterate, and those who hold livestock and not hold households also participate in nonfarm employment. As shown in the table below, out of 104 sample household who participate in nonfarm activities 45 of the household aged from 15-30 while 39 were between 30-45.The rest participant were between 45-60 and above 60.This account for 13 and 7respectively. There is significant difference between age group in participation in nonfarm activities. Even if there is no participation by first group , the second age group participate by difference of 43.27% and 5.77% from first group and third group respectively. The third group has also significant participation than the fourth group by 25%. The participation by age is decreasing as the household age become old. The fifth group participation is less than the fourth group by 5.77%.The participation by education also show that participation of illiterate household is greater than that of literate.77 illiterate household participate in nonfarm employment while 27 were literate. There is significant participation difference between the group by 48.08%.

The livestock holding has also its greater share in participation in nonfarm employment. Out of the participant 59 household hold livestock which is maximum of 30 and minimum 1.Thehousehold who hold more than 30

and less than 50 is 8 in number and 6 of them hold more than 50 livestock. The rest household who participate in nonfarm employment has no livestock. 31 households' livelihood is totally depend on nonfarm employment. In evidence they told that more of them loss their livestock by drought. The significant difference between the group show the level of participation between poor and rich household. The participation of first group is significant than the second group by 49.04% and no significant difference between second and third group. The fourth group has significant participation by 24.03%.

Table 8: Participation by age, education and livestock holding

Category		Quantity	Percent	%participation difference between groups
1	Age			
	0-15	-	-	-
	15-30	45	43.27%	43.27%
	30-45	39	37.50%	5.77%
	45-60	13	12.50%	25%
	Above 60	7	6.73%	5.77%
	Total	104	100.00%	-
2	Education			
	Literate	27	25.96%	48.08%
	Illiterate	77	74.04%	
	Total	104	100.00%	
3	Livestock holding			
	1-30	59	56.73%	
	30-50	8	7.69%	49.04%
	Above 50	6	5.77%	1.92%
	No livestock	31	29.80%	24.03%
	Total	104	100.00%	

Source; survey result, 2016

The result in the table above show, out of participant 43.27 percent households were young. The next category was also between 30 and 45 years old, which account for 37.50 percent. This participation indicate the diversification and attractiveness of young household by nonfarm employment in addition to their primary occupation. The percentage between 45- 60 and above 60 year account for 19.23 percent only. On the side of literacy, more than half percent households were illiterate. The literate households account for 26% and the household who have more livestock did not participate in nonfarm employment like that of poor household. The participation of rich household account only 13.46%. The medium plus poor households and destitute households participation account for 56.73% and 29.80% respectively. This result show, the poor household participation was greater than that of rich household. The poor and the destitute diversified their income for survival (subsistence) than wealth creation.

4.1.4 Ranking of reasons for participation in nonfarm employments

The household participation in nonfarm activity was generally for different reasons. Small number of households depend on this activities as their primary occupation for their livelihood, while others use as

additional or optional occupation.

Table 9: rank of main reasons for participation

Reasons	Ranks					
	1	2	3	4	5	Total
Insufficiency of income from primary occupation	27(25.96%)	24	17	16	16	100(96.15%)
Growth of family size	19(18.27%)	19	17	19	15	89(85.57%)
Possession of special skill	6(5.77%)	5	6	3	2	22(21.15%)
Decline in livestock productivities	21(20.19%)	19	17	18	15	90(86.54%)
Availability of credit	-					
Presence of road and market near to the villages	17(16.35%)	15	22	20	19	93(89.42%)
Favorable demand for goods and service	2(1.92%)	4	6	5	7	24(23.07%)
High return of nonfarm activities	5(4.8%)	5	5	4	7	26(25%)
Others(less cultivation of land...etc..)	7(6.73%)	11	13	17	30	78(75%)

Source ; survey result,2016

Majority of farmers are involved in nonfarm employments because they believe that farm income is not sufficient enough to stand households food security and livelihood. About 25.96 percent of the household participated in nonfarm employment told that insufficiency income from farming is the major push factor for such involvement. In addition to this about 20.19 percent mentioned that decline in livestock productivity was other major reason. Around 18.27 percent indicate growth of family size as the major reason. While 16.35 percent due to presence of road and market near to the village, about 6.73 percent, 5.77 percent, and 4.8 percent told because of less cultivation of land, possession of special skill and high return of nonfarm activities respectively. Only 1.92 percent involved due to favorable demand for goods and service. The study points, among others, the three main reasons that explain the extent and involvement in nonfarm employments are insufficiency of income from primary occupation or farming, decline in livestock productivity and growth of family size. From this, one can observe that farmers in the area participated basically due to push factor. 28.84% of households participate because of pull factor and 71.16% was due to major factor, which was push factor. However, from the study it is interesting to note that farmers, those who hold livestock undertake nonfarm activities during the dry season as other source of income except those who run out of livestock because of drought and disease, and have no livestock.

4.1.5 Perception of food habit and household food security after participation

Respondents were asked to state whether their food security status has improved after participated in nonfarm activities and accordingly, about 68.26 % of the respondents perceived that their food status improved as a result of nonfarm participation while 31.74 % of the respondents said that their food security status has not been improved even after participation. Hence, it is evident that nonfarm employments improve households' food security status. Respondents were also asked about perception of food habit change after participation in nonfarm activities. Accordingly, as shown in table 10 below about 49.03% of the respondents said that there has been an improvement in food habit. While 33.65% said there has been no change and about 17.3 % perceived as deteriorating.

Table 10: Perception of food habit after participation

Perception of food habit change after participation in nonfarm activities	Freq.	Percent
Improved	51	49.03
Unchanged	35	33.65
Deteriorated	18	17.3
Total	104	100.00

Source; survey result,2016

Out of 104 respondent who participate in nonfarm activities only 49.03% told the improvement of their food habit. More than half or 50.97% were unchanged and deteriorated. The reason behind their deterioration and unchanged food habit was drought and low productivities of livestock. The respondent told that they use the income from nonfarm activities to care for their livestock. Those who deteriorated totally loss their livestock by drought and couldn't feed their family by nonfarm income alone.

4.1.6 Nonfarm participation and livelihood change

From the respondents that are involved in the nonfarm activities, the result indicated that nonfarm employment improve farmers' livelihood. Farmers participated in nonfarm employments have shown improvements in daily food self-sufficiency, housing, schooling of children and other. Accordingly, about 41.5% of the respondents mentioned that their households' daily food sufficiency improved as a result of participation in nonfarm activities. 21 % improved housing and 16.25%, schooling of children. About 5.25 % and 4.75% reported that involvement in nonfarm resulted increase in confidence and independence, and reduced borrowing respectively, while 11.25% of the participants reported no change. An attempt has been made to see whether there is difference in total expenditures per year between the farmers participated in nonfarm employments and those that did not participate. As a result the average yearly total expenditure for households participated in nonfarm activities found to be as twice as non- participants. Households that participate in nonfarm activities are more likely to spend for education, food, closing and health care than those who do not participate at all. Statistically there is significant difference in total expenditure per year between the participants and the nonparticipants group. Nonfarm income contribution in total sample household income was 36.44% and its contribution in the income of participant was 55.83% alone. This greatest contribution of nonfarm income in household livelihood show the importance of nonfarm activities in rural area. The income from nonfarm activities positively collerate

with the household livelihood in rural area.

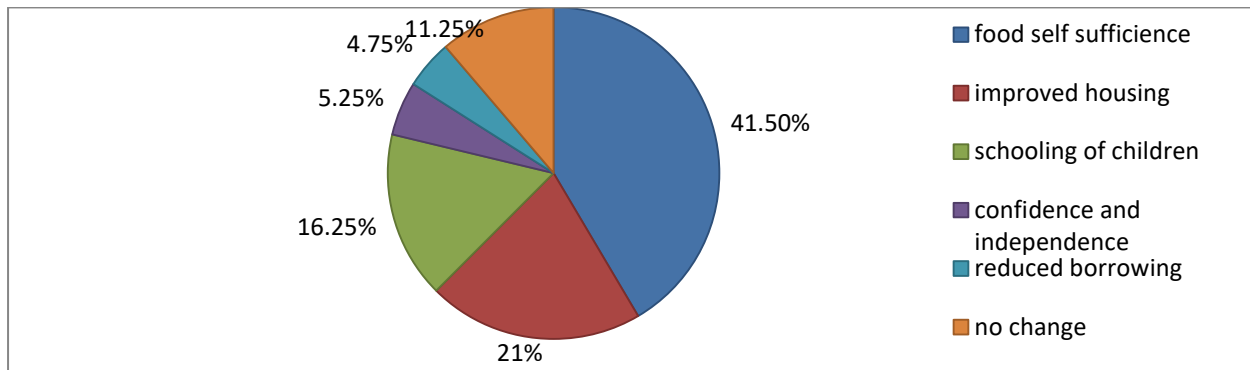


Figure 4: household participation and livelihood change

Source; survey result ,2016

4.1.8 Constraints to nonfarm employments and livelihood challenges

As the response of sample households there are a lot of livelihood challenges in the study area. These challenges include; increase in Population, Cross Border Trade Restriction, poor infrastructure facilities, Decline in Mutual Support and the like .Having this challenges out of 170 sample household 66 of them did not participate in nonfarm activities. This households told that they are willing to participate in nonfarm activities like petty trade, craft work ,transportation and other local trade which has high return. But there is constraint that make households to not participate. A frequently cited reason for the nonparticipation in nonfarm activities was lack of credit. As could be seen in Table above, 28.79 % of the nonparticipant mentioned that lack of credit is one and the major constraints in accessing nonfarm activities followed by, lack of skill 19.69 %,lack of employment opportunities 18.18%, low level of demand for labor 12.12%, low profitability of products and other 7.58% and Lack of nearby towns and transportation 6.06 %.

Table 11: rank of constraint to nonfarm employment

Constraints in accessing nonfarm activities	Freq. rank				Percent
	1 st	2 nd	3 rd	Total	
Lack of employment opportunities	12	9	7	28 (42.42%)	18.18%
Lack of skill	13	12	8	33 (50%)	19.69%
Lack of nearby towns and transportation	4	9	14	27(40.90%)	6.06%
Low level of demand for labor	8	9	7	24 36.36%)	12.12% 7
Lack of credit	19	14	14	47(71.21%)	28.79%
Low profitability of products	5	6	6	17(25.76%)	7.58%
Other (being aged, health problems and time constraints)	5	5	7	17(25.76%)	7.58%
Total	66				100.00%

Source; survey result,2016

4.2 Econometrics analysis

4.2.1 Probit estimates for participation in nonfarm employments

Regression results for participation in nonfarm activities and the corresponding marginal effects are presented in Tables 12 and 13 respectively below. As indicated in the Table 12 below, participation in nonfarm employments is influenced by variables age, family size, credit, livestock holding, education, marital status, distance to market and road. Except age and marital status, all the above mentioned variables are found in line with a priori expectations. The variable age has significantly negative effect on participation in nonfarm employments. This may indicate that younger headed households tend to participate in such activities. Family size is found to be significant positive influence in participation in nonfarm employments. This is in line with expectations, in the sense that having large family size in a limited livestock and crop production income alone could not meet food security and livelihood strategy and hence farmers might tend to involve in activities that bring additional income.

Table 12: Probit estimates for participation in nonfarm employments

Variables	Coefficient	Standard Error	P> z
Age	-.0246305	.0094619	0.009***
Sex	-.4546589	.2938429	0.122
Education	.039267	.2795315	0.08*
Special skill	.1860725	.3568473	0.602
Marital status	-.1646061	.3273484	0.061*
Family size	.0567971	.0480083	0.023**
Livestock holding	-.0075925	.0077617	0.032 **
Credit	.4053876	.336884	0.029**
Distance to nearest market	.9660557	.2260428	0.000***
Distance to main road	.4490882	.2243859	0.045***
Constant	.8030731	.5684387	0.158
Notes;*** 1% significance level,** 5% significance level,* 10% significance level			
LR chi2(10) = 50.48			
Prob> chi2 = 0.0000			
Log likelihood = -88.311095			
Pseudo R2 = 0.2223			

The result of the regression shows that marital status and livestock holding negatively influences participation in

farm employments. The household who hold large number of livestock has no priority to participate in nonfarm activities, because of they give more of their time to look after their livestock's and have enough livestock production and income from it to meet their livelihood strategy. Marital status expected to increase dependence in the study area. But because of lack of labor force in the new family it influence the participation in nonfarm activities negatively. Closeness to the nearest market and main road influence positively farmers participation in nonfarm employments. This seems reasonable because of the presence of opportunities for labor market in the town and being far away from the town increase the transaction costs of involving nonfarm activities.

Variables access to credit and education are turned out to be significant and positive as far as the decision to participate in nonfarm employments is concerned. This could be due to the fact that access to credit or source of finance and being literate enables and promote households to engage in nonfarm self-employment which has high return.

In terms of marginal effects, the regression results showed that the probability of non-farm employment participation positively increases with family size and is significant at 1 percent. As shown in table 13 the marginal effect of a unit change in family size, computed at mean of household size, enhances the probability of nonfarm participation by 0.017.

Table 13: Marginal Effects for Probit Estimates of nonfarm participation

Variable	dy /dx	Std. Err.	P> z
Age	-0.0072222***	.0026321	0.006
Sex	-.1333165	.0848538	0.116
Education	.011514 *	.0819724	0.08
Special skill	.0545607**	.1043808	0.06
Marital status	-.0482663	.0958205	0.614
Family size	.0166542***	.0139295	0.002
Livestock holding	-.0022263	.0022578	0.324
Credit	.118869**	.097329	0.022
Distance from market	.2832698***	.0552102	0.000
Distance from road	.131683**	.0638237	0.039
Notes ; *, **, *** represent significance at 10, 5 and 1 % levels, respectively.			

It implies that the probability of nonfarm participation increases by 1.7 percent for one person increase in family size. This might suggest that households with more family size (perhaps greater availability of labor for farming like looking after their livestock) may have the labor power to participate in the nonfarm activities as farm income is not sufficient to meet their needs. This is from the fact that higher family size in a low productivity of livestock and seasonal crop production leads to greater surplus of the labor resource and, hence farmers try to seek additional income from nonfarm activities. Age plays an important role as a determinant of nonfarm

employment participation. The result indicates that, age of the heads of the household negatively influences the possibility of involvement in nonfarm employment and is significant at 1 percent. This could be due to various reasons; firstly, majority of the nonfarm works in the area are daily labor, firewood collection and charcoal production which demand hard labor and hence it is obvious to observe younger households to participate more. Secondly, probably the continuity of decrease in livestock production did not attract younger household and hence, they tend to seek other employment alternatives than farming. Ownership of livestock was not significant in household decision making with regard to involvement in nonfarm employment but credit was found to be a strong influencing factor. Farm households who get financial source are more likely to participate in nonfarm employment than others. The marginal effect of a unit change in credit, computed at sample mean of credit size, on the probability of nonfarm participation is 0.118869. This means that the probability of nonfarm employment participation increases by 1.2 percent for a one percent increase in credit. This is plausible explanation. Because of the less productivity of farm that farmers own, and decline in land and livestock productivity, majority of the households do not generate enough yields/income for the year to meet livelihood strategy in unfavorable environment. And thus, in order to supplement the household income, farmers are forced to engage themselves in other activities apart from farming. Possession of special skill positively and significantly influences the nonfarm employment participation, i.e. it increases the probability of involvement in nonfarm activities and suggests that skilled households are likely to engage themselves in more paying self-employment activities. The possession of special skill increase participation in nonfarm employment by 5.45% and significant at 5 percent. As shown in table 13 above education influence participation in nonfarm activities positively and significant at 10%. The literate household has more chance than illiterate household to diversify their income source. Being literate increase probability of participation in nonfarm activities by 1.15%. Results of the regression model tell that distance to the nearest market and nearest main road has become the strong and major determinants of involvement in nonfarm employments. The significance and positive coefficient of the distance to the nearest market and road variable confirm that the concentration of the majority of the nonfarm activities to the town. The probability of nonfarm participation increases with proximity to town and road. Put differently, households residing in the nearby town/market and main road are more likely to participate in nonfarm employments. This is due the fact that the opportunities for labor market and less commuting cost. Being near to the market and main road increase the probability of participation in nonfarm activities by 2.83% and 1.32%, and significant at 1% and 5% respectively. Finally, variables like; sex, marital status, and livestock holding do not have a statistically significant relation with the probability of nonfarm employment participation.

4.2.2 Heckman estimations of nonfarm participation and household expenditure

The statistically significant parameter, mills lambda, confirms the superiority of Heckman selection model (two stage) above the ordinary least square alternative. The role of nonfarm participation in improving household livelihood is positive and significant. From the results, variables family size, special skill, livestock ownership, credit, marital status, education and distance to the market are found to be significant in explaining household yearly expenditure. Given that a household participated in nonfarm employments a one person increase in family size results in an increase in yearly expenditure by 507.9066 birr. Livestock ownership decrease yearly expenditure by 198.8982 birr. This is because livestock owners are less likely to spend for livestock production in comparing to those do not have livestock. In other words the households without livestock are basically

buyers of both crop and livestock outputs and one would expect for such households to spend more expenditures for food items. However, having special skill results in an increase in expenditure by birr 149.894. One possible reason for this is the income from own skill may result for generating high income and which might result higher expenditure for household basic needs. Provided that a household participated in nonfarm work, an access to credit decrease household yearly expenditure by 24.5 birr. Access to credit may results for more income which in turn results more expenditure. But, since household care for paying back the credit their yearly expenditure decrease. Distance to the nearest market also affects yearly households' expenditure. For a household close to the town and market, it results decrease in expenditure by 4836.669 birr. This is basically due to low transportation cost.

Table 14: Heckman estimation

Variable	Expenditure			Household nonfarm participation		
	Coefficient	Std. Err.	P> z	Coefficient	Std. Err.	P> z
Age	157.6236	172.0383	0.360	-.0246305	.0094619	0.009***
Sex	3022.381	3096.584	0.329	-.4546589	.2938429	0.122
Education	20.88282	2423.288	0.093*	.039267	.2795315	0.08*
Special skill	149.8938	3146.902	0.092*	.1860725	.3568473	0.602
Marital status	849.7041	3136.4	0.076*	-.1646061	.3273484	0.061**
Family size	507.9066	537.2796	0.034**	.0567971	.0480083	0.023** -
Livestock holding	-198.8982	75.56801	0.008***	-.0075925	.0077617	0.032**
Credit	-24.47778	4646.83	0.091*	-.4053876	.336884	0.029**
Distance to market	-4836.669	6740.974	0.043**	.9660557	.2260428	0.000***
Distance to road	-946.6746	3310.799	0.775	.4490882	.2243859	0.045**
Constant	8969.614	7227.615	0.215	.8030731	.5684387	0.158
Number of observation = 170 Censored observation = 66 Uncensored observation = 104 Wald chi2(10) = 10.60 Prob > chi2 = 0.3894 *, **, *** represent levels of significance at 10, 5 and 1 percent respectively						

5. Conclusions and Recommendation

5.1 Conclusion

From the above discussion, we have to conclude that the sample households classified as rich (13.53%), medium (46.47%), poor (21.76%) and destitute (18.24%). The result of the study shows that about 61.18% percent of the sampled households participated in nonfarm employments. But there was significance difference in the level of participation in nonfarm employments. Out of sample households which headed by females, 80.49% were participate in nonfarm activities and young households were also more attracted. Totally 25.29% sample households were full time worker in nonfarm activities and it is primary occupation for 4.7% households.

Apart from daily labour; charcoal production, firewood collection and petty trade are the major nonfarm employments undertaken in the study area. The major reason for income diversification of sample household was push factors {71.16%}. But it should be noted that 74.71% households undertake nonfarm activities during the dry or drought season. The statistical analysis confirms households that participate in nonfarm activities are more likely to spend for education, food, clothing and health care and have improved livelihood than those who do not participate. However, households have been constrained by various factors while accessing the nonfarm employments. A frequently cited constraint is lack of credit, followed by absence of employment opportunities and lack of skill. The variables age, family size, credit, livestock holding, education, marital status, distance to market and road are the most influencing variables in determining household's participation in nonfarm activities.

The total contribution of nonfarm income in sample household yearly income also show the powerfulness of nonfarm activities in the rural household life. It contribute 36.44% to the total household income. Because of participation in nonfarm activities 68.26% sample households told change in their food security and 31.74% did not see any change. On the other hand 49.03% told improvement of their livelihood after participation and the rest, 33.67% and 17.30% told no change and Deterioration of their livelihood because of income from nonfarm activities used for the care of their livestock health during drought and unfavorable condition. Generally both descriptive and econometrics results show positive relation of nonfarm income and household livelihood in the study area.

5.2 Recommendation

Depending on the above conclusion of effect of nonfarm income on rural household livelihood the researcher draw the following policy recommendations.

- **Integrated Rural Development Policy;** First of all, limited farm income, seasonality in farming activities, the existence of large family size and demand push factors are important factors for taking up nonfarm activities. Evidences also suggest that households use part of their nonfarm incomes for investment in farm and off farm activities, in addition to maintaining consumption.
- **Creating rural employment opportunities;** The descriptive result indicates that lack of employment opportunities is one of the main factors that derive households to diversify into activity choice participate for

income source strategy. measures need to be taken to create employment opportunities in rural area in order to absorb increasing rural labour forces due to high population pressure.

- **Increasing household access to credit and information;** The analysis indicates that the major constraint to participate in nonfarm activities and income diversification is lack of credit. The respondents also point out that lack of credit and high interest rate are the major problems in nonfarm employment. The supply of credit to rural households is not more satisfy nonfarm activities and it is difficult to know modern banking system to withdraw their money.
- **Rural Infrastructure development;** Another key ingredient for market development is the availability of infrastructure. Economic development in general and rural development in particular is dependent on the development of infrastructure and supportive services.
- **Continues training and skill development;** Lack of skill is the most and main reason for rural household to participate in high return nonfarm activities such as; carpentry, wool processing, trade and the like. To overcome and cover this problem continues training programme and skill development strategy for rural household must programmed whether by government or NGO
- **Expanding and specializing the existing opportunities in the study area;** lack of employment opportunity is one of the constraint in the area. since the study area has livestock potential there is the wide investment opportunities and specialization chance in livestock and their products. This opportunities were; Meat Processing, Milk and milk products processing ,Hide and skins processing ,Live animal export ,Trade with neighboring community like; Kenya .

Acknowledgement

First and foremost, my deepest gratitude is to my Advisor Dr. Demmelash Habte for his supportive advice, suggestions and constructive comments for this research paper by reviewing each and every point comprehensively. Next, I am also grateful to my friends and my family who made substantial contribution for this research Paper. Finally, my special thanks and appreciation goes to pastoralists family for their moral and support by share their personal information for me.

References

- [1] Reardon, T.(1992,1997, 1998). "Rural Nonfarm Income in Developing Countries," Special Chapter in The State of Food and Agriculture , Rome: Food and Agricultural Organization of the United Nations
- [2] FAO (1999)The State of Food and Agriculture. Part 3:Non-farmincome in developing countries'.www.fao.org/docrep/w9500e/w9500e12.htm
- [3] Mulat, D.(2001) Off-farm Income Generation in Ethiopia: Opportunities and Constraints in Food-insecure Woredas of Oromiya and Amhara Regional States. Ethiopian Development Forum: vol 2. No

- [4] Degefa, T. (2005). Rural livelihoods, poverty and food insecurity in Ethiopia: A case study at Erenssa and Garbi communities in Oromiya Zone, Amhara National Regional State, Norwegian University of Science and Technology, NTNU, Trondheim
- [5] Demissie, D. & Workneh, N. (2004). Determinants of rural livelihood diversification: Evidence from south Ethiopia. *Quarterly Journal of International Agriculture*, 43(3), 267–288.
- [6] Deressa, T. (2008). Measuring Ethiopian farmers' vulnerability to climate change across regional states. Washington, DC: International Food Policy Research Institute .
- [7] Barrett, C.B. (2001) Nonfarm Income Diversification and Household Livelihood Strategies in Rural Africa: Concepts, Dynamics, and Policy Implication'.
- [8] Tegegne G.E.(2000) Non-Farm Activities and Production Decisions of Farmers, the Case of Damotgale and Kachabira Woredas, in Southern Regions of Ethiopia, Social Science Research Report Series ,No.15 , Addis Ababa
- [9] Sosina B. (2012). Does the nonfarm economy offer pathways for upward mobility? Evidence from a panel data study in Ethiopia. *World Development*, 40(8).
- [10] Canagarajah, S. (2001). Non-farm Income, Gender, and Inequality: Evidence from Rural Ghana and Uganda. *Food Policy* 26:4. pp. 405-420.
- [11] World Bank (2008). Rural households and their pathways out of poverty. Available at: <http://worldbank.org/INTWDR2008/Resources/279>
- [12] Tassew W. (2000). Economic Analysis and Policy Implication of Farm and Off-farm employment: A case study in the Tigray Region of Northern Ethiopia. Wageningen University, Netherlands.
- [13] Zhu, N. and Luo, X. (2006). Non-farm Activity and Rural Income Inequality: A Case Study of Two Provinces in China, Policy Research Working Paper Series No.3811. World Bank
- [14] Davis, J.R. (2003) The Rural Non-Farm Economy, Livelihoods and their Diversification: Issues and Options. A report prepared for Natural Resources Institute, Department for International Development and World Bank.
- [15] Kejela G.(2005). Livelihood Diversification in Borana Pastoral Communities of Ethiopia- Challenges, electronic version 2005
- [16] Carswell, G. (2002) Livelihood Diversification: increasing in importance or increasingly recognized?, Evidence from Southern Ethiopia, *Journal of International Development* 14,no.6: pp 789-804

- [17] Sadoulet, E. and A. de Janvry (1995). *Agricultural Household Models Extensions, Applications and Policy* (pp.17-47).Baltimore: Johns Hopkins University Press
- [18] Tache B, Irwin B (2003).Traditional institution, multiple stakeholders and modern perspective common property accompanying change within Borana pastoral system. SOS sahel international, London ,United Kingdom.
- [19] Green HW (2005). *Econometric Analysis: Fifth Edition*. New York University Macmillan Publishing Company.
- [20] Heckman,J.J. (1979). Sample selection bias as a specification error. *Econometrics* 47(1):153-62