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DETERMINANTS OF FARMERS' ENGAGEMENT IN OFF-FARM (NON-FARM ACTIVITIES) AS COPPING STRATEGIES TO CLIMATE CHANGE: THE CASE OF MERTI, ARSI ZONE, OROMIYA REGIONAL STATE, ETHIOPIA

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ABSTRACT

Climate change is happening at a great speed becoming gradually perceived as most challenging impact of the world that life bearing organisms on earth ever sense. The study identified determinants of farmers' engagement in non-farm activities as copping strategies to climate change in Merti, Arsi zone, Oromiya Regional state, Ethiopia. The studies also carried out to investigated gender differences in perceiving climate change, assess non-farm activities practiced by farmers in response to climate change and describe the determinant factors that influence farmers' engagement in off-farm income source in the study area. The study followed a multi-stage sampling procedure. Both purposive and random sampling procedures were used to select sample Kebeles and households, respectively. Data collected from 191 sample households was used in this study. Descriptive statistics were performed to assess farmers perceptions and the types of coping strategies used were small-scale trade activities, handicrafts/craftsmanship and engagement in labor intensive salaried work, while the multinomial logit model (MNL) was used to identify factors influencing farmers coping strategies to climate change whereas age, sex, family size, agro-ecological locations (highland and midland), perception of climate change were the determinant factors favoring or inhibiting the decisions of farming households engagement in non-farm activities as climate change coping strategies.

Contribution/Originality: This study is one of very few studies which have investigated determinants of farmers' engagement in off-farm (non-farm activities) in Merti in undertaking possible climate change response mechanisms at the smallholder farming household level. The research will give baseline information for other researchers, practitioners, development actors, policy makers and research organizations by assessing and assembling existing information about the factors affecting farmers engagement in off-farm based activities as coping strategies in case of unexpected failure in agriculture produces.

1. INTRODUCTION

Climate change is happening at a great speed becoming gradually perceived as most challenging impact of the world that life bearing organisms on earth ever sense. According to the work of IPCC [1] the issue is now a-days being aggravating and impacting majority of development sectors like social, economic and environmental, and affecting various political issues of countries at global levels. The threat of climate change presents an immense devastating challenge on the rural poor communities' livelihood with low adaptive capacity in developing countries

relying primarily on climate sensitive natural resources [2]. Developing countries like for example African are highly vulnerable to the negative impacts of climate change [3]. Widespread climate based studies in Africa revealed that, Africa particularly those rain feed agricultural livelihoods were influenced negatively by the impacts of the change in climate [4]. Majority of these poor societies inhabiting areas supposed to be high risk drought affected parts of the continent experiencing the shortage of economic resources. Hence the impacts of climate change are more noticeable in dry land areas which are distinguished as lands of aridity having unreliable, unpredictable and insufficient amount of rainfall for full cropping season leading to elongated recurrent periods of drought [5].

Even though climate change is unequivocal world phenomena, the impact vary on society's adaptive capacity which may also be affected by factors like socioeconomic, institutional, environmental, technological, poverty and corruption factors.

Developing countries like Ethiopia, whose adaptive capacity is low, the impact is adversely rising up. Therefore; Ethiopia is the most seriously vulnerable country in Africa in terms of climate change impacts [6]. Several researches have been conducted to identify the impacts of climate change in Ethiopia. In line with this [7] has estimated the monetary impact of climate change on Ethiopian agriculture. The change in climate in the country induced the existence, frequency and severity of many climate related events. For instance the extent of drought and flood occurrence has increasing from time to time in the country [8]. The rise in annual temperature by about 0.2^0C for instance in the last 50 years and the unreliable rainfall pattern in amount and distributions occurring in every two years particularly in the lowland part of the country going to aggravating to cause its associate side effect, drought [9].

Various practices of coping mechanism with how societies counterbalance the variability and change in climate and unusual extreme events resulted in very important baseline information in bearing about long lasting adaptation strategies since it associated with the impacts of climate change. In coping with climate change farmers are seeking for solutions to cope which is indigenous opting mechanisms from adverse impacts. As an immediate response mechanism, smallholder farmers most of the time be able to use many different ways against adverse cases other than the decision they made on their farm which they enable themselves to assure their food security and money to pay school fees at the time of starvations due to bad harvesting occasions may be due to damage occasions that hinder their ability to market their produce.

In Ethiopia there are many immediate coping mechanisms to climate variability and change manifested in the form of drought, flood, excessive rainfall, and delay in the onset of short and long rainy seasons. Such coping strategies are considered as traditional contemporary response practices as for instance the way to practice small-scale petty trading, engagement in different labor intensive works including the need for employment, reducing home consumption, gathering food from elsewhere, charcoaling practice, the sale for fuel wood, borrowing credit from relatives/neighbors, sharing food from others, Non Governmental Organizations (NGO) and government provide aids, selling readily available assets like livestock, temporary or partial mobility in circumscribed manner, lad renting for debtors, shifting cultivations, changing crop and cropping seasons. According to the Food and Agriculture Organization FAO [10] state with regard to traditional copping mechanism inability in concerning with impacts lasting as medium to long-term. Therefore, technologies expected to be innovative that may supposed to bring change via introducing new modern strategies considered be more important in adaptation to climate change [11].

Farmers in Merti lead small-scale rain feed agricultural livelihood strategies and affected by the impacts of climate change. The local people's who have sensitive livelihoods dependent on climate and natural resources, perceiving the pain via such as unfavorable, unreliable, insufficient, erratic rainfall patterns, even a complete delay in some parts of the area causing occurrence of recurrent and frequent drought problems, feeling an increasing trends of temperatures which can be cause for the outbreaks of many heat sensitive constraints like crop and livestock

diseases, pests and insect existence, reduction in crop and livestock yield and production failures. Identifying how local farmers perceive climate change impacts and what coping strategies practiced and what determinant factors influenced the choice selection of coping strategies is important. Actually wider spread researches have been done on climate change perceptions and coping strategies. In Merti there is lack of such kind of researches. So this triggers attention to undertake this research in the area.

1.1. Objectives of the study

The overall objective of the study was to identify determinants of farmers' engagement in non-farm activities as copping strategies to climate change. The specific objectives were:

i. To evaluate gender differences in perceiving climate change
ii. To assess non-farm activities practiced by farmers in response to the threat from climate change
iii. To describe the determinant factors that influence engagement of farmers in off-farm income source in the study area

2. MATERIALS AND METHODS

2.1. Description of the Study Area

The study was conducted in Merti woreda Arsi Zone Oromia regional state, Ethiopia. Merti woreda is located 168kms south east of Addis Ababa, the capital of the Federal Democratic Republic of Ethiopia (Figure 1). Merti woreda is geographically found between at 08˚23' -08˚43'N latitude & 39˚50'-40˚0'E longitudes. The altitude of this Woreda ranges at 1780 meters above sea level. The normal mean annual rainfall ranges from 750 – 1500mm and the maximum and minimum temperature in most case found in the range 20 - 25 °C and 10 – 15 °C respectively. Rain-fed agriculture mainly cereal cropping along with livestock raring are the major sources of food and income for maintaining the livelihoods. Barley and Wheat are the main crops in the highlands and midlands (Dega and Weina Dega), and maize and millet or sorghum in the lowlands (kola) with restricted intercropping opportunities due to poor soil composition [12].

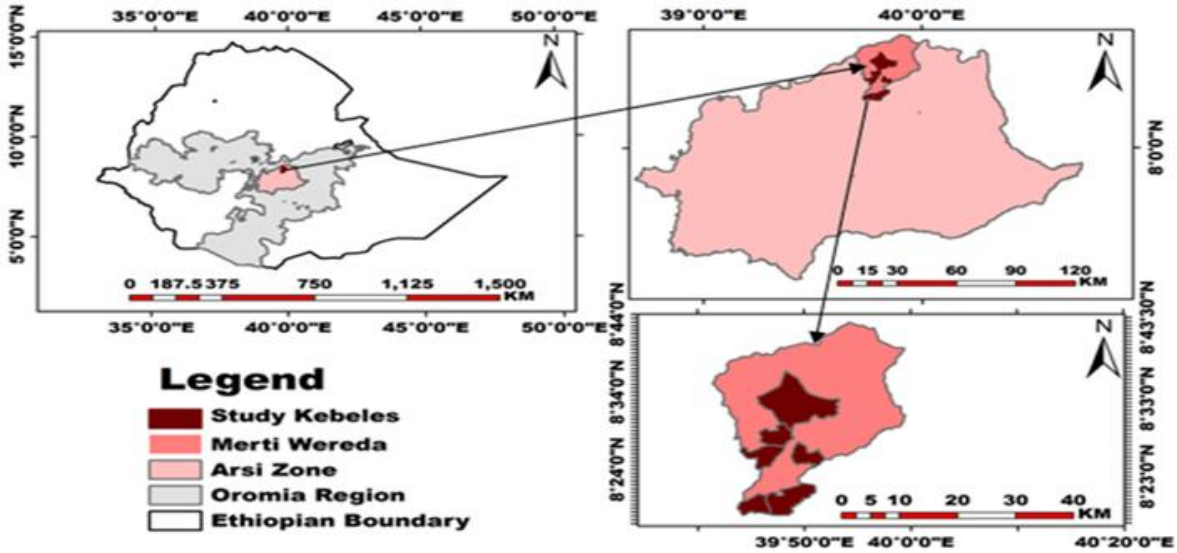

Figure-1. Map of Merti woreda showing the studied kebeles. Inset: Map of Ethiopia and Oromia Regional state showing Arsi Zone.
Source: Own computation from ARC-GIS (2016).

3. RESEARCH METHODS

3.1. Sampling Design and Sample Size Determination

The study followed a multi-stage sampling procedure. Both purposive and random sampling procedures were used to select sample Kebeles and households, respectively. At the first stage, , Merti woreda was purposively selected, out of the Woredas in Arsi zone as it comprises of highland, midland and lowland. A total of 6 Kebeles were selected from the 3 agro-ecologies in the next stage while two target kebeles selected purposively from each of the three agro ecologies representing purely one from the three locations. In the final stage, simple random sampling was performed to select sample households with probability proportional to total number of households in each Kebele. Simplified formula suggested by Green [13] was applied in deciding the minimum inclusion of sample households required for the study based the number of parameters (explanatory variables). Therefore, the rule-of-thumb for the sample size determination was:

$$N \geq 50 + 8K \quad \text{----------} \quad (1)$$

Where, N is sample size and K is number of Parameters

Considering the formula given by Green [13] that was clue to decide the lowest number of total sample size, extra number of sample households were included to accept for missing data due to various unexpected reasons. Accordingly, the sample size was increased to make it 10% of the total households in the sample kebeles. So, calculating 10% of the total households (1910) in the six kebeles under study gives 191 (Table 1). That is 10% * 1910= 191.
Accordingly, 191 sample households were selected for inclusion in the analysis. For each kebeles sample size computation was made as follow:

Table-1. Number of sample households in the study Kebeles

Agro-ecology	Kebeles	Total HHs/Kebele	Sample size/Kebele	Sub-total
Highland	Moleme kersa	250	25	68
	Moleme Arjo	430	43	
Midland	Getera kobre	250	25	55
	Ashe ejersa	300	30	
Lowland	Homba	280	28	68
	Dembeqa Iftu	400	40	
Total	6	1910	191	191

Source: Own Computation (2016)

3.2. Data Types and Data Sources

The data used for the study were collected in February, 2016. The research employed both qualitative and quantitative data types gathered from primary and secondary sources. The primary data were collected from the Key informant interviews, focus group discussions (FGDs) and from households by using structured questionnaire survey while secondary data were collected by reviewing documents of the various offices in Merti district.

3.3. Methods of Data Analysis

In this sub-section data analysis, model specification and variable description are included. The data collected was analysed by using Statistical Package for Social Science (SPSS, version 20). Both descriptive statistics and econometric (multinomial logit) model were used accordingly for analyzing the data that have been collected from primary and secondary sources.

3.4. Descriptive Analysis

Descriptive statistics (frequency distribution tables showing the number of households corresponding to their answers usually expressed in percentages, mean and standard deviation) were used to summarize and categorize the information gathered. Crosstab, chi-square test, F-test and analysis of variance (One way ANOVA) were employed to compare group means.

4. ECONOMETRIC ANALYSIS

4.1. Multinomial Logit Model

This study makes use of the multinomial logit (MNL) model since it is advantageous and being employed in many adoption decision studies [14]. In cases of mathematical computational simplicity in calculating the choice probabilities that are expressible in analytical form, the multinomial logit (MNL) model still remain preferable with superior ability to predict discrete choices [15, 16] and because of the computational draw backs of the multinomial probit (MNP).

To describe the MNL model, let Y denote random variable representing the adaptation measures chosen by any farming household taking on the values *j (j=01, 2, ..., J) for j ≥ 0 and j≤ 1* for choices j, and let ***x*** denote a set of (number) factors representing households demographic and socioeconomic characteristics as well as climate and environmental attributes.

We assume that each farmer faces a set of distinct or discrete alternatives, mutually exclusive choices of adaptation measures (that means that any farming household chooses exactly one of the adaptation options, not more and not less) and these adaptation measures are assumed to depend on factors of x. Therefore, how the response variable (dependent variable) in which case is the adaptation (adoption) options (p (y=j/x), j = 1, 2,….J-1) be affected when there is a unit change in the element of factor variable. Once we know the probabilities for j = 2…j-1 we can then determine the p(y = j/x). This is true since the summation of the whole response probabilities shall be equal to 1 or unity p (y=j/x).

Hence, the multinomial logit (MNL) model for adaptation choices can be specified as follows.

$$Yij = p(y = j/x) = \left[\frac{\exp Xi\,\beta j}{1 + \sum_{k=1}^{J-1}\exp(Xi\beta k), j = 1, \ldots, J}\right] = \frac{1}{1+\exp(-zi)} \ldots\ldots\ldots\ldots (2).$$

Where βj is k ×1, j = 1, 2 . . . J

Further computing equation (2) so as to just elaborate the actions of the explanatory variables on response variables or on the probabilities it's important to derive the marginal effects of the predictor on the dependent variable [17] and hence differentiating equ-5 partially with respect to the explanatory variables provides marginal effects of the explanatory variables. Therefore when the equation undergoes further derivation process, the solution will be given as:

$$\frac{\partial Pj}{\partial Xk} = Pj\left[\boldsymbol{\beta j} - \sum_{j=1}^{J-1}\right](Pj\boldsymbol{\beta j}) = Pj(\beta jk - \beta k) - - - - - - - - - - - - - - - - - - (3)$$

The marginal effects or marginal probabilities are functions of the probability itself and measure the expected change in probability of a particular choice being made with respect to a unit change in an independent variable from the mean [18].

4.2. Definition and Measurement of Independent Variables in the Analysis

There are different adaptation options described by different scientific communities in different literatures. The dependent variables in the multinomial logit (MNL) regression model parameter estimation are adaptation

strategies that are selected by the farming household. The choice of adaptation strategies are based on the ability households take to reduce the adverse impact of variability and change in climate.

Table-2. Description of independent variables and hypothesized to influence farmers decision to adaptations in Merti

Independent Variables	Variable type description & Measurement	Expected Sign in the model
1. Sex of household head	Dummy variable indicating the sex of the household head: 1= Male or 2 = Female.	-/+
2. Age of household head	Continuous variable measuring the number of years since household head was born.	-/+
3. Education level of household	Dummy variable measuring whether the household is literate or illiterate: 1= Yes or 2 = Other wise	+
4. Total family size of household	Continuous variable measuring the number of people living in the household	-/+
5. Total Landholding	Continuous variable measuring the area in hectares of agricultural land owned by household.	-/+
6. Total Livestock holding	Continuous variable measuring the number of livestock owned by household.	+
7. Engagement in off-farm income	Dummy variable to measure whether any member of household is engaged in off-farm activities: 1= Yes or 2 = Other wise	+
8. Access to climate information	Dummy variable measuring whether household head has any information on climate change: 1= Yes or 2 = Other wise	+
9. Agricultural extension service	Dummy variable measuring whether household head has any access to agricultural extension services: 1= Yes or 2 = Other wise	+
10. Perception of temperature increase	Dummy variable measuring whether household head perceive temperature increase: 1= Yes or 2 = Other	+
11. Perception of climate change	Dummy variable measuring whether household perceive climate change: 1= Yes or 2 = Other wise	+
12. Agro ecology-highland	Dummy variable measuring whether household head live in highland: 1 = Yes or 2 = Other wise	+
13. Agro ecology-midland	Dummy variable measuring whether household head live in midland: 1 = Yes or 2 = Other wise	+
14. Perception of rainfall decrease	Dummy variable measuring whether household perceive rainfall decrease: 1= Yes or 2 = Other wise	+

Source: Own data (2016)

5. RESULTS AND DISCUSSIONS

In this sub-section farming households' perception of climate change and appropriate strategies they consider to these changes briefly summarized. The surveyed sample farming households were asked questions about their observations in the patterns of temperature and rainfall over the past 15years.

The result indicate that over 96% of the surveyed respondent farmers have observed the increases in temperature change over the past 15 years while more than 95% perceived decrease in precipitation over the years. In line with this substantial proportion (97.1%) of the surveyed farmers perceived climate change in the locality. This conclude that climate change in the study area perceived by all social groups which indicate unified indiscriminate impact of climate change (Table 3) widespread existence presenting multiple damage with uniform perception and understanding throughout the local communities.

Table-3. Gender difference in perceiving climate variability and change

Perceptible variable	male	female	Pearson χ2 -value	P-value
Have you perceived increase in temperature over the last 15 years?	92.5	100	1.451	0.228
Have you perceived decrease in rainfall over the last 15 years?	91.3	100	1.694	0.193
Have you perceived climate change in last 15 years	94.2	100	1.098	0.295

Source: Computations from field survey (2016)

The result from Key informants (KIs) and Focus group discussion (FGD) in accordance with the household survey result. In view of the matters asked concerning differences in perceptions, crosstabs statistics and measures of association were computed to respond. The result reported in Table 3. The result confirmed that climate change in the locality perceived uniformly almost among all social groups. The Pearson chi-square test has revealed that the two groups differ insignificantly with respect to their perceptions on the trends of change in temperature, rainfall and climate change in the area over the last 15 years.

Farmers who have perceived changes in climate over the last 15 elapsed periods of years were asked as they have responded to the change through engagement in an off-farm based copping strategies to the adverse threats of climate change. Those reacted with the questions positively were copping through different non- farm activities listed very important amongst the many are engagement in small-scale trade activity, handicrafts or craftsmanship and engagement in different labor intensive work or salaried income (Table 4). The use of different small-scale trade activity and engagement in labor intensive salaried income source are the most commonly used method whereas practicing handicraft has got its least importance across the sample in Merti.

Table-4. Farmers copping strategies

Variable	Frequency	Percent
small-scale trade activity	24	12.6
labor intensive work or salaried income	22	11.5
handicraft or craftsmanship	13	6.8
non off-farm income	132	69.1
Total	191	100.0

Source: Computations from field survey

Respondents across agro ecology were able to exercise different practices of non-farm based coping strategies to counteract the impacts of climate change against their farm income (Figure 2). Accordingly, about 10.3% of the highland respondents practiced small-scale trade activities as coping while most trade activity being observed in the midland also handicraft is also become another importance coping here whereas labor intensive salary based income source has got dominance in the lowland.

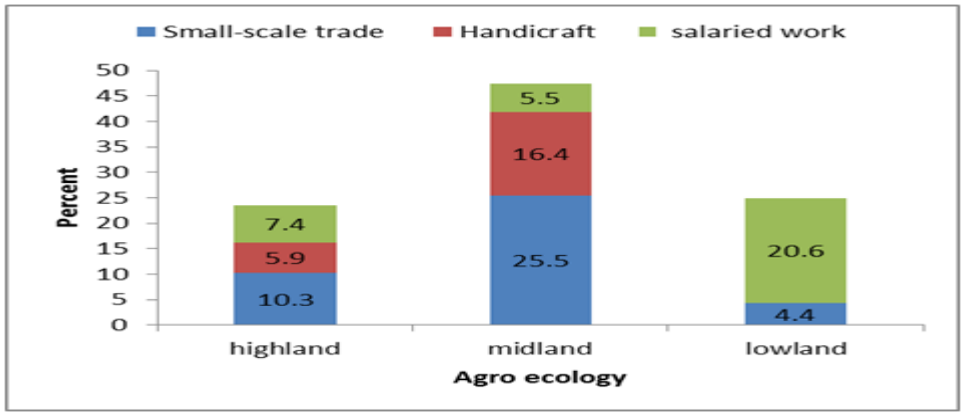

Figure-2. Engagement in an off-farm income source

Source: Computations from field survey (2016).

5.1. Off- Farm Based Copping Strategies

Off-farm activities are types of indigenous knowledge based coping strategies in the area (Table 5). Choice of farmers' off-farm as coping is influenced by age, family size, livestock number and farm size. However; even though the direction of the effect of the variable not known, only farm size and livestock number significantly influenced households' off-farm activities.

Table-5. Determinants of off-farm activities (for continuous variables)

Variable	Small-scale trade activity (n = 50)		Handicraft/ Craftsmanship (n = 45)		Salaried income (n = 70)		F_ value	P- value
	Mean	SD	Mean	SD	Mean	SD		
Age	1.48	0.504	1.36	0.483	1.39	0.493	0.942	0.536
Farm size	1.87	0.332	1.93	0.253	1.88	0.32	3.07	0.000***
Livestock TLU	1.59	0.496	1.8	401	1.61	0.493	1.048	0.50**
Family size	1.59	0.495	1.78	0.418	1.63	0.488	1.681	0.106

Source: Computation from field survey (2016). Note: *** & ** signifies level of significance at 1% and 5%.

Engagement in off-farm, in addition to the factors mentioned above, is influenced by factors other factors (Table 6). Hence; sex of household head, midland agro ecology, climate information, and extension service and perceive temperature increases were factors that bear significant difference on the decision of farmers' choice of off-farm activities.

Table-6. Descriptive analysis for dummy variables with respect to off-farm activities

Variable	Category	Trade activity (n = 24)	Craftsmanship (n = 13)	Salary based income (n=22)	χ^2	P
Sex	Male	20	12	17	7.831	.050**
	Female	4	1	5		
Education	Yes	7	4	7	0.674	0.879
	No	17	9	15		
AEZ - Highland	Yes	8	4	4	3.926	0.27
	No	16	9	18		
AEZ – Midland	Yes	14	9	3	26.044	.000***
	No	10	4	19		
Climate information	Yes	19	10	10	7.596	.055*
	No	5	3	12		
Extension service	Yes	18	9	9	8.254	.041**
	No	6	4	13		
Off-Income	Yes	21	13	19	94.615	.000***
	No	3	0	3		
Perceive Climate change	Yes	22	13	19	4.869	0.182
	No	2	0	3		
Perceive T° increase	Yes	21	11	17	15.804	.001***
	No	31	2	5		
Perceive RF. decrease	Yes	22	13	19	2.146	0.543
	No	2	0	3		

Source: Computation from field survey (2016). Note: ***, ** & * significant at 1%, 5% & 10%.

6. ECONOMETRIC ANALYSIS

6.1. Multinomial Model

The multinomial logit model concerning the determinants of climate change coping strategies practiced in the area such strategies are considered as indigenous strategies identified as off-farm activities such as small-scale trade activity, handicraft or craftsmanship and salaried labor work presented and discussed in this section. According to

the result from the multinomial model the decisions and the choices taken by smallholder farming households in the area to respond to the change and variability in climate is affected by different household, institutional and environmental factors.

As usual the marginal effects obtained from the multinomial model ascertain the likely influences of the explanatory variables on local farmer's choice for engagement in the off-farm activities. As a result age of household head negatively and significantly associated at 10 and 5% level of significance with engagement in trade and salaried income activities. Hence; with this study engagement in trade and salaried income found to dropdown by factors 0.976 and 0.922 respectively with a unit increase in age of the household as compared to the base case. This might be due to the fact that elders are not strong enough to activities demanding force and more likely the need to prefer for taking time doing on their farm. In line with this manner [19] had outlined that elder farmers have lesser extent of engagement in off-farm activities which most probably away from their residential area , in contrast they want to undertake on-farm activities found around homestead areas. On the other hand sex found to have positive relation with all mutually exclusive types of off-farm based copings to climate change stated in this study even though it has significant effect at P<10% and P<5%, and odd ratio of 2.193 and 0.149 respectively on the choice of farmers to engage in trade activity and salaried income sources. Odd ratio of 0.601, 1.011 and 1.199, and at 1%, 10% and 5% level of significance respectively for the three off-farm activities (Table 7) revealed that when the size of the family of a household increased, the likelihood of searching for an off-farm based income source would likely increased by these much factors. This might be because; larger family is the source for large human power thereby diversifying household income and likely to open a room for the family to increase income source so as to better cop with the change in climate [20]. Making a living in highland and midland agro ecological zones affect small-scale trade activities and handicraft or craftsmanship positively in both cases and negatively engagements in salaried income or labor work. As there is increase in the agro ecological zones that is as we go from lowland to midland and highland, there was an increase in doing off-farm activities particularly small-scale trade activities and handicraft or craftsmanship. In case of the highland trade activity was increased by factors 7.393 times at P<5% and a decrease was observed with respect to salaried income by factors 0.078 times at 5% level of significance as we compare to base category while we look at the midland agro ecological zone, engagement in trade activities was increased by factors of 23.227 times. So that according to this study, making a living in the highland and midland is beneficial in performing trade activities and also craftsmanship activities although not significantly distributed. Households perceiving climate change were able to further design a plan for off-farm activities to cope to climate change. For this reason, perceiving climate change positively influence all types of off-farm activities in this study at P<1% and P<5% level of significance. Accordingly; as tendency of perceiving climate change by farming households increased, the likely probability of engagement in trade, craftsmanship and salaried income would be affected positively by factors of 2.374, 192.8 and 0.976 times respectively compared to the base case.

Table-7. Parameter estimates of the multinomial logit (MNL) model for off-farm activities.

Variable	Trade activity		Craftsmanship		Salary based income	
	Coefficient	Exp(B)	Coefficient	Exp(B)	Coefficient	Exp(B)
Age	-0.024**	0.976	0.022	1.022	-0.081*	0.922
Sex	3.647*	2.193	0.962	0.382	1.902**	0.149
Family size	0.509***	0.601	0.011*	1.011	0.181**	1.199
Education	0.254	1.289	0.3	1.35	-0.417	0.659
AEZ- highland	2.000**	7.393	27.68	1.05E+12	-2.547**	0.078
AEZ-midland	3.145***	23.227	29.035	4.071e+12	-1.024**	0.359
Total landholding	-1.52***	0.572	-5.61	0.166	-1.865***	6.457
Total livestock unit	0.008*	1.008	0.189	1.022	-0.589*	0.555
A. Extension service	-1.382	0.251	-15.562	1.74E-07	-0.776	0.46
P. rainfall decrease	1.634	5.124	19.885	432643481.1	0.212	1.237
P. temperature increase	-1.96	0.141	-3.638	0.026	-2.301	0.1
P. climate change	0.865***	2.374	19.077***	192.8	0.024***	0.976
Off-farm income	238.989	6.19E+103	239.661	1.21E+104	179.477	8.83E+77
Climate information	2.693	14.775	18.347	92856932.17	0.589	1.801

Source: Computations from field survey (2016). Note: ***, ** and * signifies level of significance at 1%, 5% and 10%.

Base category = not undertake adaptation Exp (B) = Odd ratio Observation = 191
Likelihood ratio = 229.181 Prob >Chi-square = .000

7. CONCLUSION

Based on the findings of the study, we conclude that climate change in the study area perceived by all social groups which indicate unified indiscriminate impacts of climate change. From this one can suggest that there are no different opinions or different insights among farming households in terms of the subject matter under study. This might be probably due to the wider prevalence and impact of climate change. Several coping strategies are chosen by farming households to cope with impacts of climate change. Among the many different non-farm or off-farm based coping strategies small-scale trade activity, handicraft or craftsmanship and labor work or salaried work are some the activities that were used in this study. It is possible to decide these are not the only types of coping strategies in the face of climate change in the area. Result from the multinomial model revealed that out of 14 explanatory variables, 6 were found to be significant at 1%, 5% and 105% probability level. Accordingly, age (negatively) and sex (positively) found to have inhibit and favor significantly with engagement in trade and salaried income activities. Family size and perception of climate change both favors the farmers' engagement in small-scale trade, handicraft and labor work or salaried income whereas highland and midland agro ecology also favors coping by engagement in small-scale trade activities while inhibiting engagement in labor work or salaried income.

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