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The Gender Dimension of Vulnerability to Climatic Shocks in Low Income Country

Gutu Tesso[1*]

[1]*World Vision International, Food Security and Climate Change Learning Center, East Africa Regional Office, Nairobi, Kenya.*

Author's contribution

This whole work was carried out by author GT. Author GT read and approved the final manuscript.

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ABSTRACT

Gender mainstreaming within policies and programs has remained a big priority among government and non-governmental organizations. In all societies, in all parts of the world, gender equality is not yet realized. Men and women have different roles, responsibilities and decision-making powers. Many people, however, find it difficult to understand in what way gender might be a factor in climate change (CC) or how it should be addressed. The prevailing gender power differences in terms of command over different capital endowments have significant impact on being disproportionately vulnerable to climate variability and its negative consequences. This article attempts to uncover the gender difference in vulnerability to the occurrences of climatic extremes with a survey of 452 households conducted in the central part of Ethiopia and time series data of climate variability and its impacts on livelihood. Trend analysis and statistical measurements were used to analyze the data. The study found out that there is a gendered vulnerability. Therefore, there is a need for gendered intervention in terms of policies and actions to reduce women's vulnerability and build their resilience.

Keywords: Climate change; variability; vulnerability; gender; low income country; Ethiopia.

**Corresponding author: E-mail: gutessoo@yahoo.com;*

1. INTRODUCTION

The wider body of literature presents climate variability as the variations in the mean state and other climate statistics (standard deviations, the occurrence of extremes, etc.) on all temporal and spatial scales beyond those of individual weather events. Variability may result from natural internal processes within the climate system (internal variability) or from variations in natural or anthropogenic external forces (external variability). Generally it is attributed to natural causes. However, because of changes in the earth's climate since the pre-industrial era, some of these changes are now considered attributable to human activities [1]. Whereas, climate change is largely understood as change in the statistical properties of the climate system when considered over long periods of time, regardless of cause. Accordingly, fluctuations in average temperature, average rainfall and others over periods of more than 20 years may represent climate [2]. Climate change induced shocks are then referred as the occurrence of extreme events like drought/moisture stress, flooding, disease outbreak, wind storms, and others that are the effects of climate variability and changes.

Climate change is a global phenomenon, with impacts that are already being experienced on a human level. It is recognized that those who are already the most vulnerable and marginalized experience the greatest impacts [3]. Among these are women that constitute the largest percentage of the world's poorest people, they are most affected by these changes. In this connection women's and men's differential access to social and physical goods or resources is one of the key dimensions of gender inequality that increases vulnerability. Especially in the developing world, women's social positioning in many situations means that the roles they are expected to take on are often supportive and reproductive, centered around home and local community rather than the public sphere. This does not mean that women do not play vital roles in agricultural production or other activities crucial to sustainable livelihoods and national economies. But the roles they play are generally less visible and attract less public recognition than the work men engage in [4].

Gender inequality is a major factor contributing to the increased vulnerability of women and girls in climate change induced disaster situations. According to WEDO's 2003 [5] report, women and children are 14 times more likely to die than men during disasters. Gender differential impacts are strikingly apparent in the aftermath of climate change induced disasters, where the largest numbers of victims are women [6]. Women's vulnerability is due to combination of factors, which include differences in socialization where women are not equipped with the same skills as their male counterparts to adapt to climate change impacts. With this background the objective of this research is to measure the level of differences between women and men in their vulnerability to climate change impacts in Ethiopia.

2. METHODOLOGY

2.1 The Study Location

The study area is the central part of Ethiopia, specifically YayaGullele, HidhaAbote and Derra districts of North Shewa Zone of Oromia regional state. The total population is 1,431,305 and the total land area is 10,323 km^2. The area is mountainous with plain only in the lowland areas. The altitude ranges between 1300-3000 meters above sea level. It is divided into three agro-ecologies, namely, 15% highland (>2500 meter above sea level), 40% midland (1500-2500 meter above sea level) and 45% lowland (500 -1500meter above

sea level) [7]. The area gets most of its rainfall during the *Belg* (February to April) and *Meher* (June to September) seasons." An even better statement would give the percentage of average annual rainfall that comes in these seasons. More precisely the area gets more than 92% of its rainfall during the Belg (February to April) and Meher (June to September) seasons[1]. The average annual rainfall of the area ranges from less than 840 mm to 1600 mm. Mean annual temperature varies between 15ºC and 19ºC.

The community practices mixed farming of crops and livestock. The average land holding is 1.1 hectare [7]. Due to the continuous reduction of farmland to degradation by frequent flooding and drought, farming has intruded into steep sloping areas, forest lands and expanded to marginal lands and communal lands. The crops, livestock and other livelihoods of the community are subjected to damage by climate change induced shocks [8]. This, coupled with the continually decreasing farm size, have serious impacts threatening farmers' adaptive capacity and livelihood improvements.

2.2 Data and Analysis

The data was obtained from survey of 452 households in 2012/2013. The specific study sites within the districts were selected based on a multi stage random sampling procedure. The sample households were selected randomly proportional to population size. A structured questionnaire was used to interview the farmers regarding household characteristics, landholding, crops and livestock production, climate variability/change induced shocks, climate change perception, coping mechanisms, adaptation strategies pursued, level of resilience, and other relevant information. Climate data relevant for this analysis was obtained from the National Meteorological Service Agency (NMSA) for a 31-year period. Climate change induced shocks, their impacts, and production data were obtained from the Central Statistical Authority (CSA) and agricultural offices for 10 years (2002–2012). The study was also supplemented with qualitative data collected through focused group discussion.

For the purpose of the gender disaggregated analysis of the physical, social, human and economic factors of vulnerability among female and male farmers during and after the occurrences of extreme climate events, trend analysis was applied to secondary data to see how climate variables and their impacts change over time. Statistical tools like percentage, average and tests of significance using t-test was used to analyze data collected from households to measure gendered vulnerability to climate variability. Figures and tables were used to present the analytical results.

3. RESULTS AND DISCUSSION

3.1 Gender and Livelihood

3.1.1 Resource endowments by gender

Women form a disproportionate share of the poor among the community of the study area and are highly dependent on local natural resources. Moreover, because of gender differences in property rights, access to information, participation in cultural, social and economic roles, the effects of climate change are likely to affect men and women differently.

[1] *Computed from the rainfall data received from the National Meteorological agency for the year 1971-2012*

Following the occurrence of droughts, landslides, epidemics and flood in the central part of Ethiopia, warning information are transmitted by men to men in public spaces, but rarely communicated to the rest of the family and as many women are not allowed to leave the house without a male relative. Moreover, as in many other Ethiopian communities, most women never had the opportunity to learn how to positively live with climate change induced shocks. Another clear illustration of the difference between women and men are in terms of crop and livestock production systems, educational level, social capital, and practice of environmental management. Table 1 presents differential asset ownership by gender and the gendered difference were found to be statistically significant.

Table 1. Socio-economic characteristics and resources endowment by gender

Types of resources	Female	Male
Illiterate (%)	90.30	67.20*
Wealth Status (% reported to be poor)	80.00	62.00
Institutional participation (≥3 institutions)	36.10	84.50*
Average farmland owned(ha)	0.86	1.15**
Average number of farm plots	2.50	3.80**
Average area under irrigation (ha)	0.00	0.06**
Average who do not own oxen (%)	0.98	1.56**
Average livestock ownership (TLU[2])	1.80	2.91**
Land conservation (% conserved)	25.00	50.00*

Sources: Own computation from 2012/13 household survey,, ** Significant at 5% and 10% probability levels respectively using t-test*

Lack of Education is one of the socio-economic characteristics of households that have detrimental impact on livelihood performance. Education guides decisions to take positive actions to adapt to climate change in many ways. The study area was characterized by very low literacy rate, despite being close to Africa's political capital. The survey results show that about 90.30% of the women who headed households and 67.20% of the men who headed households were illiterate. Both figures are large in absolute terms; however, the level of illiteracy is high for females as compared to males. The illiterate are always challenged to adopt improved technology, comprehend agricultural extension messages, generate relevant agricultural information from multiple sources, adopt improved production technics, etc. Therefore, women farmers are disproportionately negatively affected by illiteracy.

Participation in different social institutions is a measure of social capital and has significant impact in terms of reducing vulnerability and fostering adaptation to climate change shocks. Study conducted in developing countries including Ethiopia has reported a strong positive relationship between access to information and the adoption behaviors by farmers [9]. Moreover, Maddison [10] and Nhemachena and Hassan [11] showed that access to information through participation in local institutions, extension, etc. increase the chance of adapting to climate change through informed decision making. The local institutions in the study area include *Edir*[3], *Equb*[4], *Mehiber*[5], and *Senbete*[6]. Participation in such institutions

[2]*TLU refers to tropical livestock unit*
[3]*Idir is a local institution formed by neighbours to support each other especially after the death of a relative*
[4]*Equb is a saving and credit association formed by the local community to cover their critical financial needs for agricultural activities and social expenditure*
[5]*Mahiber is organized by community members of close relationship to make regular festivals at one's home on a revolving basis*

are high for the males as compared to the females (Table 1). Hence, in the study area male farmers do have better opportunities to get access to the necessary agricultural and climate information as they do have better level of involvement in many local institutions.

Ownership of basic assets and resources like land, livestock, perennial crops, access to irrigation and others are strong measures of wealth and hence has the ability to reduce vulnerability and increase adaptive capacity. In this regard, female headed households in the study are disproportionately affected by the ownership of such resources (Table 1). Thus, it is apparent that male farmers have better capacity to take adaptation and mitigation measures such as growing during non-rainy seasons, diversifying their enterprises, get access to credit through collateral guarantee, and try new improved technologies. This is because the male farmers do have bigger size of farm land in multiple locations and have a better access to irrigation as compared to the female counterparts. Ownership of more number of livestock ensures alternative means of survival outside the crop sub sector; ensure timely cultivation of land following the rainy seasons, serve as sources of manure, and more. When disaggregated by gender, livestock ownership and oxen ownership level is different in the study area, where male farmers own more livestock and oxen as compared to their female counterparts. Thus, one can easily see the better position the male farmers can resume from the livestock ownership and their bi-products.

Over the last few years, the central part of Ethiopia has been subjected to continuous degradation by water and wind erosion. The productivity of the farmlands has continually reduced to the extent that some of the farm plots cannot yield without more commercial fertilizer than is currently used [8]. To some extent some of the farm plots have been abandoned by households due to its loss of productivity even with extra fertilizer application. Thus conservation of available farmland is an important adaptation and mitigation mechanism to regain fertility and combat some of the climate change induced shocks. However, conservation of farmland depends on various factors such as the amount of land available, labor availability in a family, financial capacity and gender of the land owners. Especially, female headed households often fail to bring their farmlands under physical and biological conservation because they own small area of land, lack labor and financing. This is evidenced by the fact that they were able to build conservation structure. Hence, women farmers' land can experience a higher degree of vulnerability to erosion resulting from flooding as compared to that male's farm plots.

3.1.2 Access to institutional services

Access to institutional services within the agricultural system plays a great role in ensuring household adaptability to changing climate. Households that get required institutional facilities can easily cope with and bounce back in the aftermath of natural shocks. Literature evidences that households who are better endowed with social capital through the dense of their social network have a better capacity to immediately bounce back and reduce their vulnerability conditions [12]. The major institutional services available in the agricultural production system in the study area include agricultural extension services, early warning information, improved seed and inputs provisions, rural credit, and market information. The provisions of such services are not evenly distributed across farmers in a district or zone. The accesses to such services depend on the financial capacity of farmers, physical access,

[6]*Senbeteorganizes socialization activities conducted once in a month at the Coptic orthodox Christian churches on Sunday*

farm size, types of enterprises produced by farmers and more. More specifically, gender plays a key role in the pursuit to get access to institutional services.

According to Justina and Emily [4], the economically poor, and female headed households often lack the power to influence in getting access to basic agricultural services in developing countries. What is more worse is when the female farmers happen to be very poor, which hampers their privilege to enjoy institutional services to cope with climate change induced challenges. Male farmers by far have greater advantage in using the locally available services (Table 2). The figures in the tables were tested for level of significance and found that all of them are significant at probability level that ranges between 1% and 10%.

Table 2. Access to institutional services by gender

Types of service available	Female	Male
Access to extension services (%)	80.10	91.60**
Frequency of extension visit/month	0.34	0.80***
Access to agricultural credit (%)	31.90	57.90*
Areas under improved seed (ha)	0.00	0.20***
Areas under commercial fertilizer (ha)	0.10	0.60***
Access to market information (%)	36.00	62.90*
Access to early warning information (%)	38.60	60.60*

*Sources: Computed from household survey of 2012/13, *, **, *** significant at 1, 5, and 10% probability levels using t-test*

In all areas of agricultural and social services needed by farmers to adapt and mitigate climate change induced shocks, the male farmers outnumbered the female farmers in terms of getting access to the services in the central part of Ethiopia. Hence, the social power of women can be seen to be subordinate to the male farmers. Key information; like early warning, market information and extension services, which are important to save lives and livelihood of farmers during the ear of climate change is less accessible to women. This put the women farmers at greater level of vulnerability to climate change induced shocks as compared to their male counterparts.

3.1.3 Agricultural activities

In the central part of the country, the dominant crops produced for consumption as well as market are teff, maize, wheat, barley, sorghum, millet, wild oats, fababean and pea, which comprise more than 97% of the total production [13]. Other less dominant crops are beans, potatoes, cabbages, onions and carrots. The level of diversification of crop commodities depend on available land, agro ecology, labor availability in a family, access to irrigation, and access to key inputs. Gender disparity in terms of household head also determines the number of commodities produced per year and types of commodities selected. Study revealed that female headed households engage in the production of dozens of crops, some of which are comparatively disadvantageous to them. This is an indication of an agrarian mentality and opting to meet all subsistence need by producing at home. On average female farmers engage in the production of 7 more crops at a time while the male headed households produce around 4 types per year. Even though diversification is one of the mitigation strategies against unforeseen climate change induced shocks, there is always an optimal level, beyond which household tend to gain low return [14].

The types of crops commodities combination is also important to make advantage of changing climate or adapt to the changes. In the study area male farmers allocate more than 98% of their land to the cultivation of important cereals, while female headed households allocate only 50% of their land to the production of cereals.

3.1.4 Non-farm activities

In the studies of climate change, non-farm engagement is a measure of economic vulnerability that has meaningful impact in boasting adaptive capacity of farm households. Household who diversify their income sources to non-farm and make considerable percentage of their income from non-farm is relatively better in adapting to changes as opposed to those who do not engage in the non-farm sector [15]. In this central part of Ethiopia, where the study was conducted, about 17.50% of households have engaged in non-farm activities. About 12.70% and 3.80% were engaged in one type and two types of non-farm activities, respectively. In general female headed households have engaged in many number of non-farm enterprises as compared to the male headed once. More than 20% of the female headed households engage in non-farm, while it is less than 15% for the male headed households. The average annual earning per household is more than birr 420 (around 22 USD) for female headed and less than birr 270 (14 USD) for the male headed ones. Thus it is apparent that female headed households tend to diversify their income to non-farming as a mitigation strategy for the low income realized from the farming sector.

From this result, it can be deduced that the female farmers' position in terms of diversifying their income sources into non-farm as adaptive capacity is better than their male counterparts. As the female farmers lack land and other agricultural production resources, in the long run, one of the greatest areas of focus to improve their adaptive capacity will be by supporting them to improve the non-farm engagement further.

3.2 Gender and Differential Impact of Climate Change Induced Shocks

The community's disaster profile for the study area indicates that the major determinant factors that make a community vulnerable to shocks include economic, physical, social, and ecological factors. Gender, which is one of the social factors, is an important measure for the level of vulnerability to climatic shocks. The above findings show that, women are in general far more vulnerable than men. This is in relation to proportionally higher losses when climatic shocks strike as well as lower capacity to recover immediately. In relation to gender, inadequate access to health facilities by women as compared to men is found to increase people's loss when exposed to both livestock and human epidemic diseases. The effect of farmland locations and fertility also determines households' susceptibility to the risks. Women farmers who do not have access to large area of land and fertile plots are relatively more vulnerable to risks associated with climate change as compared to males. This basically emanates from the position given to women in a society and their capacity to access productive resources through inheritance from their parents. Such vulnerability also depends on the frequency of natural shocks, experience of people to adapt to climate variability and change, degradation of farmlands to erosion and more. Social factors like low level of literacy or lack of awareness of hazard related issues have been another bottleneck in the districts to easy recovery from disaster impacts (Table 3). The same argument is supported by Gutu et al. [12].

Table 3. Disaster history and trends in the last 15-20 years

Type of hazard/disaster (from recent to past)	Cause of hazard	Time during the year when hazards is most likely to occur	Resulting damage	Most affected group of people	Actions taken to cope
Flood	Heavy rain, deforestation	June-August	Death of animals, crop failures, injury and death of human	women, families with elders and disabled people	Food borrowing, consumption of alien crops, engage in daily labor
Drought	Deforestation, climate variability/ change and lack of rain	March-May	Shortage of food, Death of animals and human, crop failures, and migrate	women, families with elders and disabled people	Temporary migration, reduced food consumption, consume seeds
Landslide	Heavy rain, deforestation, building on slopes	June-August	Death of animals, crop failures, and migration	women, families with elders and disabled people	Food borrowing, consumption of alien crops, engage in daily labor

Sources: Adopted from World Vision Ethiopia community disaster preparedness Plan and Reports for the study area

Over a span of few decades, extreme meteorological events, such as spells of high temperature, heavy storms, droughts, and others have seriously disrupted the crop production systems of smallholder farmers. Recent evidences have shown possible changes in the variability as well as in the mean values of climatic variables [13]. Where certain varieties of crops are grown near their limits of maximum temperature tolerance, heat spells are becoming particularly detrimental. Similarly, frequent droughts, especially in the low-lying regions, not only reduced water supplies but also increased the amount of water needed for plant transpiration.

With regard to the number of people affected by climate change induced shocks for the past 10 years, more people became vulnerable. For instance in 2002, less than 130,000 people were seriously affected by the combination of the above natural shocks, while in 2011 more than 240,000 people were affected by the same. When this is disaggregated by gender, the percentage of female farmers affected surpasses the percentage of male farmers. Fig.1 reveals the differential impact of climate change on gender and the rate at which the impact is growing.

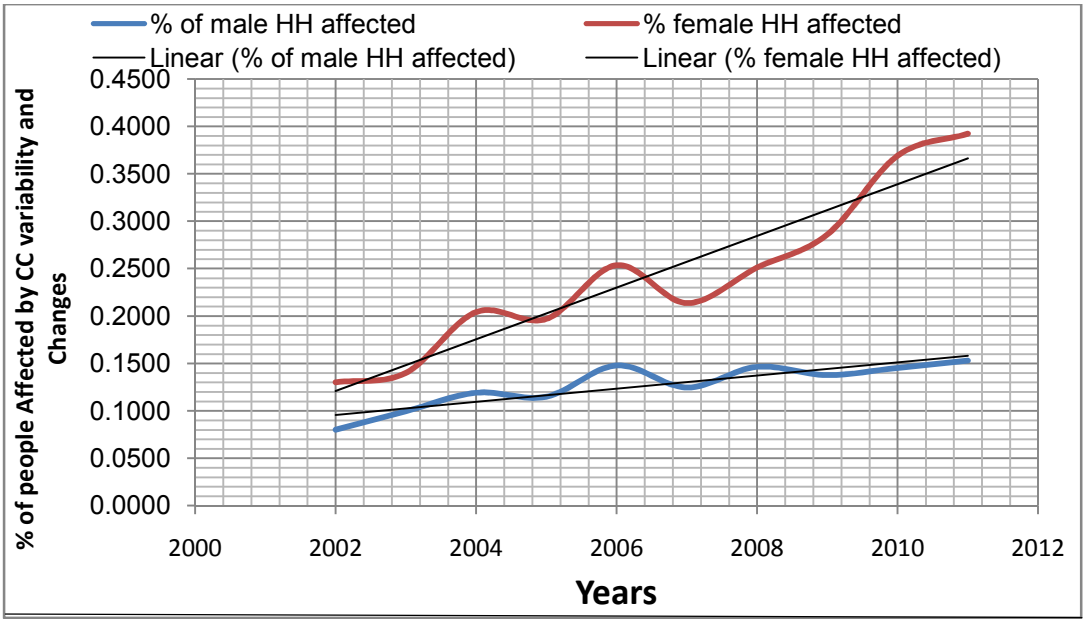

Fig. 1. Trends in the percentage of both male and female farmers affected by climate change induced hazards

Sources: Computed form the data obtained from CSA and agricultural office

Two things are apparent from Fig. 1, because the sensitivity and exposure of the household's lives and livelihood to climate change is increasing more than the rate of increase in household's adaptive capacity, the number of people affected has increased with every incidence of climatic shock. Secondly, the rate of increase in the magnitude of climatic shock is putting female households increasingly at more risk than their male counterparts as can be seen from the slope of Fig. 2. The slope of the trend line for female farmers is 0.27 and that of the male farmers is 0.06. The trend line is getting steeper for the female than the male. Using t-test, the difference in annual rate of increase of the number of people getting vulnerable by gender is statistically significant at 1% probability level. Some of the reason for

such is because of women's low position in accessing agricultural services, shortage of farmlands, less number of livestock, lack of access to institutional services, and others.

3.3 Gender and Vulnerability to Climate Change

Experience has shown that vulnerability to climate change differs within countries [16], within communities [12] and even within households [15]. Current approaches to assessing vulnerability for the purposes of designing specific adaptation strategies do not capture some of the minor differences among community members, and therefore the risk of excluding the very community member that interventions must benefit occurs often. To ensure that adaptation interventions reaches the most vulnerable people requires analysis and planning processes that capture these differences and that give the most vulnerable people a say in how the future should be approached.

In areas where gender inequalities highly prevail, climate changes threaten to reinforce gender inequalities and even erode progress that has been made towards gender equality in many developing countries. In such context, the poor women's limited access to resources, restricted rights, limited mobility and voice in community and household decision-making can make them much more vulnerable than men to the effects of climate variability and change. This can further lead to unfortunate consequences for all, as women play a unique role in the stewardship of natural resources and support to households and communities. With their knowledge, they can shape adaptive mechanisms in vulnerable areas. It is therefore vital that consideration of gender issues and differential vulnerability analysis in designing appropriate climate change intervention policies, as well as men's and women's different needs, perspectives and knowledge, be taken into account when planning community-based climate change adaptation activities.

A substantial body of literature on the gendered nature of vulnerability to past climate change induced hazards and disasters illuminates how women and men are differently affected. When climate change induced shocks occur, more women suffer than men, which reflects women's social exclusion: they are less able than men to relocate their livelihood, often have not learned to swim, and have behavioral restrictions that limit their mobility in the face of risk (not least of which is the fact that their voices often do not carry as much weight as men's in their households) [6,5]. On the other hand, some post-disaster analysis has shown that men suffer higher negative impacts because they take more risks trying to save themselves, their families and their key livelihood assets [17].

In the central part of Ethiopia, households are frequently affected by natural hazards, especially by droughts and moisture scarcity, flooding, and diseases outbreaks that are common from year to year. Since 2008, more than 85% of households have experienced severe drought, and 36.90% have lost significant proportion of their crop lands by flooding and excessive rain. Moreover, wind storms, crop and livestock diseases, hail storms and landslides have threatened the lives and livelihood of 36.50%, 63.50%, 64.80% and 19.90% of the households respectively. Hence, the area is remarkably vulnerable to climate change induced risks, and female headed households appear to be more vulnerable to these climate change induced shocks. The vulnerability level segregated by gender is presented below (Table 4).

Table 4. Vulnerability levels by gender

Vulnerability level	Male (%)	Female (%)
Highly Vulnerable	46%	65%
Vulnerable	37%	32%
Less Vulnerable	9%	3%
Not Vulnerable	9%	0%

Source: Computed from households survey of 2012/13

According to households' evaluation of their livelihood, 46% of the male farmers have indicated that their agricultural farm and their lives are highly vulnerable. Whereas in the same highly vulnerable category, the figure is higher for women farmers as more than 65% of them have indicated that they lose lives and livelihood to the hazards. Similarly, for male farmers 18% of them are either less vulnerable or not vulnerable at all, while the figure is only 3% for female farmers. It is apparent that in the study areas, females are more vulnerable to climatic risks as compare to their male counterparts as per the household's valuation of their vulnerability.

This gendered vulnerability level is manifested in various social, economic, physical and other characteristics. These are expressed by the difficulties that households face during and after the occurrences of climate change induced shocks. Many female farmers are forced to withdraw their children from schools earlier than their male counterparts. This is because the households no longer afford to support the food and non-food needs of their children in the school and the children are sent to alternatives to generate means of survival. Reduced level of food consumption in terms of quality and quantity is another manifestation of the gender difference of vulnerability. In line with prior results, the male farmers are better off in terms of meal frequency reduction, quantity of meals and diversity of meals. In here it is clear that the families of female farmers suffer more in accessing nutritionally sufficient food during and after the strike of climate change induced shocks.

Another vulnerability indicator for gendered difference is the frequency of family members suffering from disease and illness. As the capacity to obtain medication is low, the physical strength of family members deteriorates due to inadequacy of feeding. Hence the number of household members suffering from illness usually increases during and after the occurrences of disaster risks (Fig. 2). This shows a clear difference between female and male in terms of health condition in the aftermath of climatic risks. Fig. 2 presents the comparison of vulnerability level in terms of other key indicators of living conditions among both categories of households. Each figure for the different indicators was computed in percentage.

Furthermore, vulnerability difference between genders is expressed in the selection of negative or the so called extreme coping mechanisms that can destroy the potential for immediate recovery after the disastrous situation ends and create long consequences that can lead to long term and inter-generational vulnerability. These are coping mechanisms that divest household's assets like farm implements, household equipment, distress sell of land and perennial crops, etc. Such liquid and non-liquid asset divestments are indicators of the level of severity of the challenge and the failure in positive coping capacity. Among female farmers in the study, more than 45% of them have made a distress sell of farm equipment, while only 27.37% of the male category have sold the same items. Similarly, 33% of the females have sold out key household assets, while only 26.84% of the male counter parts have sold their similar assets as a means of survival during stressful periods. Beyond the

sale of these two categories of assets, considerable percentages of households have sold their oxen, perennial crops, and lastly their farmlands. These are the worst coping mechanisms that households used during years like 2008, when there was a severe drought that damaged livelihoods. In all such asset divestments, the females outnumbered their male counterparts. By implication, in the longer term rehabilitation and recovery phases after natural shocks, there will be also gendered differences. That is why women and girls are particularly vulnerable in post disaster situations, because they lack land and other assets that could help them cope, as it was devastated during the shock period. Therefore, they are more likely to face food shortages, sexual harassment, unwanted pregnancies, trafficking and vulnerability to diseases and could even be forced to engage in more disastrous situations that exacerbate the vicious circle of vulnerability.

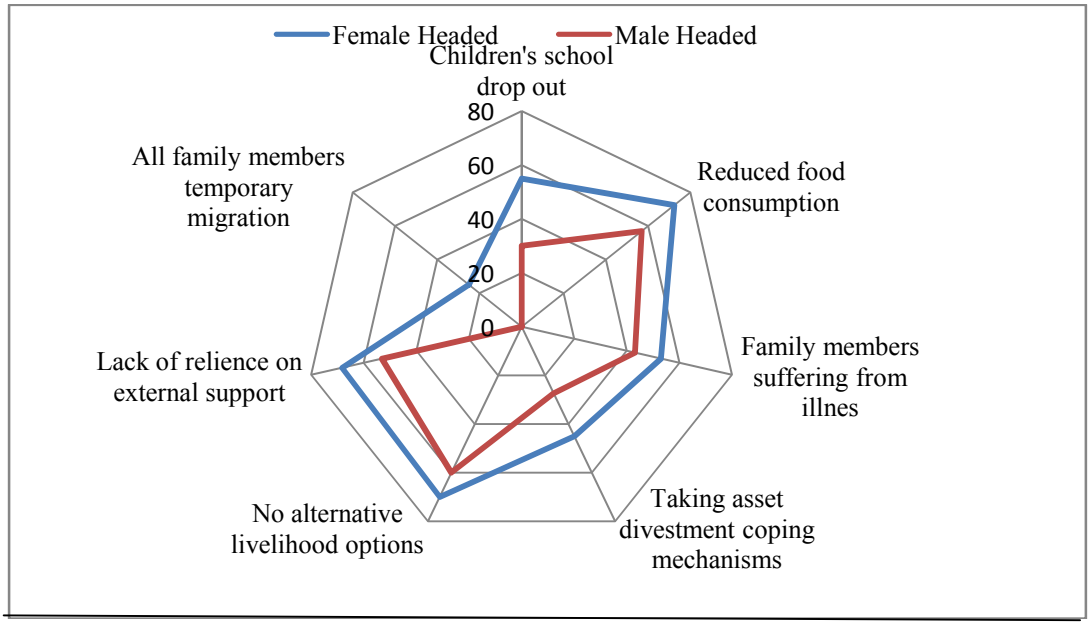

Fig. 2. Vulnerability level mapping by gender for selected climatic risks
Sources: Compiled from household survey of 2012/13

Reliance on external assistance is also one of the major coping mechanisms in the developing world. Whether at the national or local level, people in developing countries like that of the study area look for donations and sharing of resources to sustain living and livelihood. At the local level, the level of dependence on such assistance and the possibility of getting necessary supports during times of challenge are different among women and men. Contextually, even though females look for assistance, the number of females who get such assistance is low compared to their male counter parts. During the memory of the recent climate change induced shock that occurred in 2008, it was observed that only 31.74%, 40.28% and 30.56% of the female farmers were able to get supports from other people, government and local level development organizations, respectively. Whereas, during the same period 46.84%, 29.73% and 48.16% of the male farmers were able to obtain supports from other people, government and local level development organizations, respectively. Hence, it is only in terms of the support obtained from the government that female farmers were better off than their male counter parts. This can then be the measure of how low a female's social capital is in a community when compared to that of males.

Engagement in alternative livelihood options to cover the crop and livestock livelihood loss is normally taken as the best option to survive during times of climatic stresses. However, the possibility depends on a household's capacity to mobilize resources from savings, household's social capital, entrepreneurship skills, labor availability within a family and more. In rural areas, which are sometimes far away from market places and towns, the options available for such engagements are less diverse. In the study area around 33% of the households engage in alternative means of income generation like labor selling, non-farm enterprises (ex. petty trade), working in other business, etc. Still, there is a difference between genders in terms of having the potential to engage in alternative livelihood schemes that are viable. More than 70% of the female farmers do not usually get alternative livelihood engagements during times of crisis, while it is less than 60% for the males (Fig. 2).

When climatic stress periods are prolonged, families may take temporary migration as a final option to cover costs. They usually move to the capital city and other major towns of the country, where they hope to find temporary employment such as daily labor or where they can beg. This is evident by observing hundreds and thousands of migrant beggars lining up along the streets of Addis Ababa and other major towns during the years when the country encounters natural crises. The same is true of the community in the study area, where about 27.70% of them will have at least one household's member that migrates from the area to towns to raise funds to support family members left behind. In some cases, the whole family may even migrate. Whole family migration is 25% for the female headed and 0% for the male headed households (Fig.2). However, nearly 28% of the male headed households have one or two of family members who may move to town to raise funds for the whole family.

4. CONCLUSION

The major issues that emanated from the findings of the study is that, today in the twenty first century, female farmers are still by far less privileged in terms of economic, social, human and physical resources as compared to male farmers in the study area. When coupled with the consequences of climate variability and changes, women lack the knowledge, information, and the necessary capacity to react. Discussions with the females revealed that as much as they have experienced changes in the climate, the vast majority of them do not have the capacity to build their adaptive capacity that can in turn reduce their vulnerability. Hence, they are very much vulnerable and the level of lives and livelihood losses during and after climatic shock surpass that of their male counterparts and the rate of vulnerability as measured by key indicators has increased from year to year. The reactive measures taken by women farmers to climatic shock are often so negative and extreme that they destroy potential for immediate recovery and lead to long term inter-generational vulnerability.

Women's sustainable development demands recognition and value for the different ways in which their lives intertwine with environmental realities including climate variability and changes. Women's involvement must extend to the availability of simple and relevant climatic information, education, access to appropriate technological innovations (improved varieties, fertilizer improved animal's breeds and improved soil management); agricultural extension package (that includes climate variability issues), early warning information and resource management services. Women's right to equal access to natural resources, especially farmland, is essential to ensure all farmers position to feed their family members, access credit, and agricultural services during critical seasons of climate shocks. Therefore,

government and local development actors should focus on the following gender tailored actions:

- Awareness creation programs on climate change and its impacts on smallholders' livelihood, especially in the areas and sectors where women are more vulnerable than men.
- Women should be given equal educational opportunity right from their youth; hence such existing government's affirmative policy should be enacted. Adult women should be able to get access to adult education so that they can read, write, develop minimum numeracy skills to evaluate their budget/financial impacts, be able to comprehend extension messages, understand agricultural technologies and be able to utilize climate information.
- Governments should create means through which the female farmers can access financial services.
- Policies about women's right to natural resources like land should be enforced and governments should make deliberate efforts at the local level (district and peasant association) to put those policies into practice.
- Local specific adaptation mechanisms like climate smart agriculture should be developed and made available to both male and female farmers so as to reduce their vulnerability.

COMPETING INTERESTS

Author has declared than no competing interest exists

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