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Climate change, food insecurity and household adaptation mechanisms in Amaro Ward, Southern Region of Ethiopia

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Climate change poses an increasing risk to the agricultural sector and the dynamics that underpin food security. It is one of the main driving forces of the current food insecurity problem in Ethiopia and in Amaro ward in particular. The objectives of this study were to: Examine the current household food security situation in Amaro ward of Ethiopia; identify the adaptation mechanisms deployed by residents of the ward in response to the negative effects of climate change; and ascertain the coping strategies of the households in the study area with respect to food insecurity. A multistage sampling technique was used to select the study area and 100 sample respondents. Data was collected using structured interview and focus group discussions. Household Food Insecurity Access Scale (HFIAS) was used to examine the food security situation. Weighted Average Score (WAS) was used to analyze the adaptation mechanisms to climate change and the coping strategies to food insecurity. The results showed that majority (80%) of the households were food insecure. Majority (93%) of the respondents also utilized adaptation strategies contentedly. However, majority of households (71%) had great difficulty coping with food insecurity while 29% coped with relative ease. Hence, adaptation to climate change and coping with food insecurity are important factors that determine the welfare of households in Amaro ward. Therefore, common indigenous strategies adopted by farmers like replanting, annual crop rotation, regular weeding, change of meal preferences and reduction of the frequency of feeding in the area should be augmented with modern adaptation and coping practices to minimize food insecurity.

Key words: Climate change, food insecurity, adaptation mechanisms, Amaro ward, Ethiopia.

INTRODUCTION

The international community has espoused a set of ambitious goals which includes eradication of hunger, universalizing food security, improvement of nutrition and promotion of sustainable agriculture under the Sustainable Development Goals. However, the changing climate may affect all endeavours made towards achieving the goals (FAO and WB, 2017). In many parts of the world, climate change is presently exacerbating

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drought, conflict, poverty, chronic malnutrition, and weak governance. Although some people still deny the reality of climate change and question the wisdom of making attempts to combat it, others are struggling to adapt to the changing climate because its impact is worsening over time (OXFAM, 2017).

Africa, particularly sub-Saharan Africa (SSA), is the most vulnerable region to climate change because of its high poverty level, unequal distribution of wealth, reliance on rain-fed agriculture and very low adaptation capacity and these factors have severe implications for food security (IPCC, 2001; Kotir, 2011). Furthermore, the effect of climate change varies across the Sub-Saharan African region. East Africa suffers from certain extreme weather events such as flooding while West Africa experiences decline in oceanic productivity resulting in shortages in food and fish production.

As a result of the foregoing, it has been argued that adaptation is more of a necessity than an option for Africa (Thornton et al., 2006; Dim et al., 2016). In case of Ethiopia, both chronic and transient food insecurity situations are severe. Recurrent drought causes perennial food shortage and famine; hence, the prevalence of biting food insecurity in the country (African Development Bank, 2014). Ethiopia is overly susceptible to weather-related shocks because 80% of its population are dependent on climate change sensitive agriculture and rainfall in the country is characteristically unpredictable and varies by region (World Bank, 2010).

Previous empirical studies indicate that the major adaptation strategies used by farmers in response to the adverse effects of climate change include: mixed cropping, planting of different crop varieties, changing planting dates, use of soil and water conservation techniques, conservation agriculture practice, engagement in non-farm income activities, selling of assets and social protection programmes like the Productive Safety-Net Programme (PSNP) (Wondimagegn and Seifu, 2016; Weldegebriel and Prowse, 2013; Sorhaug, 2011). Coping strategies for drought and flood embraced by rural households in rural Ethiopia are minimizing the number and quantity of meals eaten in a day, diversification of livelihood income sources, migration, and wage labour (Sewnet, 2015).

Other researches on the food security status in the Upper Blue-Nile of Ethiopia found that 57.8% of the households were food secure, while the remaining 42.2% of the households were food insecure (Woldeamanuel and Simane, 2017). Similarly, Abi and Tolossa (2015) also used 2100 kcal as a benchmark to evaluate the household food security status. The study showed that households in the study area were prone to food insecurity and the available dietary energy of study households met only 45.3% of the minimum daily allowance during the study year, leaving a deficiency of 54.7%. Although these studies dealt with climate change but they failed to combine adaptation mechanisms to climate change and coping strategies to food insecurity at household level.

The Ethiopian government has significantly modified its existing food security program by scaling up its intervention allocation to food security problems. In 2003, the government launched a large scale consultation process called the New Coalition for Food Security (NCFS) alongside a large Productive Safety Net Program (PSNP) (MoARD, 2009). PSNP, a component of the government's Food Security Programme (FSP), was launched in 2005 with the aim of bettering the food security status of the chronically food insecure household's members through direct grants to the poor, elderly or incapacitated individuals, and payments to able-bodied members for participation in labour-intensive public work initiatives (MoARD, 2014). Despite the government's significant food security strategies, however, humanitarian needs in Ethiopia are mounting primarily in the southern and south-eastern pastoral areas due to failure of the 2016 dryer (October to December) rains and below-average and erratic 2017 rainfall. As of May 2017, 7.8 million Ethiopians were in need of emergency food aid, a 39% increase from mid-January. Malnutrition rates are also on the increase and extreme coping mechanisms are observed (FAO, 2017).

In view of the direness of the situation, a location specific study to assess the adaptation and coping strategies of the rural households to food insecurity was undertaken in Amaro ward, Ethiopia. The specific objectives of the study were to: (1) examine the current household food security situation; (2) identify their adaptation mechanisms to the negative effects of climate change; and (3) identify the coping strategies to food insecurity in the study area.

RESEARCH METHODS

Study area

The study was conducted during the year 2017/2018, in Amaro ward (otherwise woreda in Amharic language) of South Nation Nationality and People Region (SNNPR), Ethiopia which is located at about 468 km from Addis Ababa and 207 km south from regional city of Hawassa (FDRE, 2011). The ward has a total population of 167,379 of which 84,411 (50.4%) are males and 82,968 (49.6%) are females. There are 7,990 households in the sample villages and most of the population (75%) is engaged in mixed farming systems (CSA, 2010). Majority (94.2%) of the people are rural dwellers and their livelihoods revolve around small scale, rain-fed rural agriculture while about 5.8% of the people are engaged in non-agriculture related activities.

The area has different agro ecological zones, ranging from lowland to highland. These agro-ecological zones make it possible to grow different crop types but the changing climate threatens productivity in the area (AWADO, 2010). The ward receives an average annual rainfall ranging from 800 to 1000 mm and temperature ranging from 12.6 to 25°C. The ward has two main seasons (summer and winter) where different crops such as fruits, enset, vegetables, cereal crops, coffee, root crops, oil seeds and others are grown at low level of production due to erratic rainfall (Amaro Ward Agriculture and Rural Development Office, 2010).

Sampling and data collection

The study used a combination of purposive, stratified and systematic random sampling techniques to select the study area and sample respondents. Amaro ward was purposely selected from the five wards of Segen People Zone of Ethiopia because of its erratic rainfall, land degradation, scarcity of arable land, prevalence of food insecurity and dependence on food aid programmes (FDRE, 2011). Of the total 34 villages in Amaro ward, two villages were selected: Dayketa from the highland and Suluko from the lowland. Stratified sampling technique was used to identify male and female households in the area and systematic random sampling was used to select proportional respondents from lowland (Suluko village) and highland (Dayketa village) agroecological zones for making a total of 100 households (household head is a sample respondent).

Primary data were collected from the 100 households using structured interview triangulated with data collected from focus group discussions. Community leaders, head of the ward agricultural office, extension experts, elders and model farmers in the ward were part of the focus group discussion. On the other hand, the secondary data were retrieved from relevant publications such as journals, conference proceedings, theses and project reports.

Data analyses

Data were collected using structured interviews which were coded and processed using SPSS software version 24 for further analysis. To measure the household food insecurity access, Household Food Insecurity Access Scale (HFIAS) was used. It consists of 9 items specific to an experience of food insecurity occurring within the past one month. Each respondent indicated whether he/she had failed to access the items due to lack of resources to buy food in the last 30 days. Standard coding procedure was used with 1 point for occurrence and 0 for non-occurrence. The frequency scores ranged from 0 to 3: with 0 representing non-occurrence; 1, rarely (once or twice in the past 30 days); 2, sometimes (3 to 10 times in the past one month); and 3, often (more than 10 times in the past 4 weeks). Household food insecurity access category for each household was calculated according to the approach of Coates et al. (2007). Accordingly, household food insecurity access category was coded as follows: 1=Food Secure, 2=Mildly Food Insecure Access, 3=Moderately Food Insecure Access, 4=Severely Food Insecure Access. The criteria for categorizing the households under one of the aforementioned four major food insecurity category are the household's response to the 9 standard questions (Q1=not have enough food, Q2=not able to eat the kinds of foods you preferred, Q3=eat a limited variety of foods, Q4=eat some foods that you really did not want to eat, Q5=eat a smaller meal than you felt you needed, Q6=eat fewer meals in a day, Q7=no food to eat of any kind, Q8=any household member go to sleep at night hungry, Q9=any household member go a whole day and night without eating anything).

Based on these classifications, if household answers 1 or 0 for Q1 and 0 for the remaining 8 questions, then the household is food secured (category 1). On the other hand, responses for category 2 or mildly food insecure household could be: Q1a=2 or Q1a=3 or Q2a=1 or Q2a=2 or Q2a=3 or Q3a=1 or Q4a=1 and 0 response for the rest 5 questions. HFIA category 3 (Moderately Food Insecure) responses could be: Q3a=2 or 3 or Q4a=2 or 3 or Q5a=1or 2 or Q6a=1 or 2 and 0 for the remaining 3 questions. Finally, a household is severely food insecure (category 4) if his/her responses to Q5a or Q6a=3, Q7a=1, 2 or 3, Q8a=1, 2 or 3 or Q9a=1, 2, or 3 or at least one of the mentioned alternatives in the last 4 weeks.

Weighted Average Score (WAS) was used to identify the adaptation mechanism to climate change and the coping strategies to food insecurity. A weighted score is calculated by determining all the variables and their respective values by using frequencies. To arrive at a weighted score, values were assigned to each of the variables and multiplied by the corresponding numerals. The results were tallied and divided by the sum of all of the original values to yield the weighted average. It was used in this study to identify the degree of agreement of households in Amaro ward about their adaptation to climate change and coping strategies for food insecurity. A total of 21 and 13 statements were used in the questionnaire to ascertain how agreed households with their adaptation to the effects of climate change and coping strategies for food insecurity, respectively.

The responses to the statements were ranked on 5 point Likert Scale ranging from strongly agree to strongly disagree. Thus, the coding of Likert Scale was graded 5, 4, 3, 2 and 1, respectively. The data generated were subjected to WAS analysis. The threshold value to establish the agreement degree was derived by summing up the grades and dividing the total by the number of ranks possessed by the Likert Scale which is 5. Therefore, we have (5+4+3+2+1)/5=3. This implies that any statement with a WAS of less than <3 for adaptation strategies to climate change and coping strategies to food insecurity indicates low degree of perception and agreement, respectively while any statement ≥3 indicates high degree of agreement.

Descriptive statistics such as percentage, frequency and mean were used for further analysis. Narrative analysis was also used to analyse qualitative type of data collected from focus group discussion to enrich and illustrate qualitative conclusion.

RESULTS AND DISCUSSION

Current food security situation in Amaro Ward

Results from the answers to the 9 standard questions and the Household Food Insecurity Access Prevalence (HFIAP) status indicator show that 20% of the households were food secure; 13%, mildly insecure; 33%, moderately insecure; and 34%, severely food insecure (34%) (Table 1). According to Coates et al. (2007), a food secure household experiences none of the food insecurity issues, or just experiences worry, but rarely. A mildly food insecure household worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eats a more monotonous diet than desired. A moderately food insecure household sacrifices quality more frequently, by eating a monotonous diet or undesirable foods sometimes or often. But it does not experience any of the three most severe conditions. A severely food insecure household has advanced to cutting back on meal size or number of meals often, and/or experiences any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating), even as infrequently as rarely. In other words, any household that experiences one of these three conditions even once in the last four weeks (30 days) is considered severely food insecure.

Dayketa village is more food secured (28.2%) than Suluko village (14.8%). This is because Dayketa village is one of the villages in which the largest share of the total population consumes enset plant, a non-seasonal crop.

Table 1. Categories of food insecurity.

Category	Suluko (%)	Dayketa (%)	Amaro (%)
Secured	14.8	28.2	20
Mildly Insecured	11.5	15.4	13
Moderately Insecured	27.9	41.0	33
Severly Insecured	45.8	15.4	34
Total	100	100	100

Source: Authors' computations from the Field Survey (2018).

Enset is used for food, fiber and forage. It is also used in the manufacture of construction materials and medicines. It is a sure source of income and a veritable insurance against hunger (Asres and Omprakash, 2014). Most enset crop varieties grow in face of environmental stress better than other annual crops. The crop is drought resistant and climate resilient. Therefore, it is a suitable choice in adaptation to climate change and variability (Nurebo, 2017; Yematawet al., 2018).

Enset is an important staple crop in Amaro ward. It grows in all agroecological sections of the ward. However, it does far better in Dayketa village which is in the high altitudes of the ward. Few of the enset plants (*Enset ventricosum*) are found in the lowland area. Enset plant is considered as household's source of wealth and main source of food. Its possession in a household is perceived as an evidence of the family's food self-sufficiency. If the enset farm is thriving, the flow of household income will be guaranteed and the household will expend less money in purchasing food in the local market. Most families use indigenous knowledge in the management of the enset crop in order for it to yield high productivity.

From the focus group discussion (FGD), it was gathered that the community's idea of a food secure household is one with an impressive enset farm of at least 0.25 ha and two or more cattle. It is believed that a man with such belongings is qualified enough to get married. An average household typically consumes 10 to 20 big enset plants per year. The plant covers 61% of the total area allocated for perennial crops in the entire ward. The Enset plant is used as a raw material for several products in the ward. The proportion of these products is as follows: 4,200 tonnes of "kocho", 1,650 tonne of bulla, 410 tonne of fibre per year (Demekech, 2008).

Relationship of socio-economic characteristics with food security in the study area

Male headed households are more food secured than female headed households in the study area (Table 2). This is because the patriarchal culture allows a man to go out and work in the farm at will but somewhat restricts the woman from engaging in farming on her own terms. Man is also physically stronger than woman and so can work and endure long hours of strenuous labour more than the woman. Whereas female who heads a household cannot execute her plan for the seasonal or annual farming activates without soliciting help from male relatives. In addition, females in Amaro ward, like women in many parts of Africa, are socialized to be contented with their supposed gender-specific roles as wives, mothers and homemakers. During the FGDs, the women expressed the difficulties they face in trying to juggle the multiple tasks they are saddled with in the household.

With respect to the relationship between marital status of respondents and their level of food security, married households were the most food secured in the study area (Table 2). This is due to the ability of the household members to work together in order to achieve food security. For example, when it is time for weeding, all the household members go together until they finish the weeding of a particular farm land. Moreover, interactions from the FGDs revealed that married household members help each other during harvesting, storing and transportation time. Only 5% of widowed household is food secured. This is as a result of the assistance and contribution to the widowed household from the widows' daughters, sons and relatives.

The same Table 2 shows that households who have no formal education were more food secured than educated households. This is due to the fact that illiterate farmers tend to have more farmland than educated farmers. In this case, their high food security owes to abundance of the produce from their farms. Most of them remain food secured even in drought season because they reserve crops prodigiously after harvest. Information from the FGDs revealed that educated households (Certificate, Diploma or Degree holders) are highly dependent on constant salary from non-agricultural sectors. Hence, they gain access to food by purchase. And since the market price of crops fluctuates, they tend to be the food insecure. Table 2 also shows that households with 5 to 8 members are more food secure than small and large sized households. This is due to the fact that majority of the households with medium sized family have their children with the productive age bracket.

Adaptation mechanisms to climate change in the study area

Weighted average score (WAS) analysis was used to

Table 2. Cross tabulation of independent variables with food security.

Independent variable		Response, N=100		Frequency (%)
		Food secure (n=20; %)	Food insecure (n=80; %)	
Sex	Male	14.0	60.0	**74.0**
	Female	6.0	20.0	**26.0**
Marital status	Single	0	10.0	**10.0**
	Married	15.0	59.0	**74.0**
	Divorced/Separated	0	2.0	**2.0**
	Widowed	5.0	9.0	**14.0**
Educational status	No formal education	15	33.0	48.0
	Primary school dropout	1	19.0	20.0
	Primary education	4.0	14.0	18.0
	High school	0.0	5.0	5.0
	Preparatory	0.0	5.0	5.0
	Diploma	0.0	2.0	2.0
	University degree	0.0	2.0	2.0
Household size	2 to 4 members	1	16	17
	5 to 8 members	11	41	52
	9 to 13 members	8	23	31

Source: Field Survey (2018).

identify 21 statements to the degree of satisfaction/ agreement of the respondents with their choice of adaptation mechanisms to climate change in the study area. The results show that, on the whole, 93% of the respondents were able to adapt to or utilized adaptation strategies with ease (Table 3). This is attributable to good indigenous knowledge about climate change, good agricultural extension services, aimed to and the determination to increase farm production and thereby improve the household's access to food. Some of the respondents stated that "there is nothing anyone can do about climate change other than to adapt to it. One has to adapt in order to feed his household or suffer hunger and starvation''. On the other hand, 7% of the respondents were not able to adopt adaptation strategies because they carried on with their farming practices as usual. They did not cultivate or harvest early. Neither did they apply pesticides or inorganic fertilizers.

With respect to growing different crop varieties in Amaro ward, 56 and 22% of respondents agreed and strongly agreed, respectively. The WAS of 3.83 indicates a high degree of agreement to adaptation to this variable. In the case of diversifying into non-farming activities in Amaro ward, many of the respondents (44%) agreed and 17% strongly agreed. The WAS of 3.49 indicates a high degree of agreement to adaptation to this variable. These results have shown that farmers in Amaro ward were using growing different crop varieties and diversifying into non-farming activities as adaptation strategies to climate change. With the exemption of rainwater harvesting for irrigation with WAS of 2.63 and carrying on as usual with WAS of 2.47, the remaining statements have WAS ≥3; indicating their high degree of agreement to adaptability. Carrying on as usual and rainwater harvesting for irrigation had the lowest adaptability while regular weeding with WAS of 4.60 was the most popular adaptation strategy to climate change in Amaro ward. It is common knowledge that a crop land that is weeded regularly would produce higher quantity of crops even in dry season than unwedded farm.

Interactions during the FGDs indicated that households are adapting to climate change differently based on their knowledge and perception of climate change.

A farmer stated that:

"Decades ago, changes were not noticed due to high fertility of the land. But we have been using some common adaptation strategies to increase crop production in recent times. The drastic changes in climate seem to come from God as a punishment to the people because of their sin" (Uel, FGD on 23rd September, 2018).

Commonly adopted adaptation mechanisms identified by the households themselves during the FGDs and field observation include: growing different crop varieties, replanting, planting different fields at different times, annual crop rotation, regular weeding, application of

Table 3. Adaptation mechanisms to climate change.

Statement	1=SD	2=D	3=NS	4=A	5=SA	WAS	Frequency (%)
Growing different crop varieties	3	12	7	56	22	3.83	-
Diversifying into non-farming activities	6	17	16	44	17	3.49	-
Replanting	6	12	2	46	34	3.90	-
Different fields planted at different times	9	10	12	36	33	3.74	-
Annual crop rotation	1	5	2	34	58	4.43	-
Regular weeding	1	13	10	31	45	4.60	-
Use of organic manure	13	15	8	30	34	3.57	-
Fields are left fallowing	7	33	10	39	11	3.15	-
Tree planting alongside crops	8	26	20	32	14	3.18	-
Rainwater harvesting for irrigation	19	39	8	28	6	2.63	-
Praying for rain/asking for Gods intervention	0	4	2	28	66	4.56	-
Application of chemical fertilizers	3	9	8	37	43	4.08	-
Mixed farming	4	14	13	53	16	3.63	-
Early cultivation	1	27	8	39	25	3.60	-
Early harvesting	4	26	10	36	24	3.50	-
Farming intensification	5	20	16	48	11	3.40	-
Carrying on as usual	22	40	16	13	9	2.47	-
Lease your land	14	28	4	29	25	3.93	-
Spraying pesticides	2	22	10	30	36	3.76	-
Good spacing	1	8	8	44	39	4.12	-
Growing drought resistant crops	2	16	16	40	26	3.72	-
Overall adaptation							
Able to adapt comfortably	-	-	-	-	-	-	93
Not able to adapt comfortably	-	-	-	-	-	-	7

SD= Strongly Disagree, D= Disagree, NS= Not Sure, A= Agree, SA= Strongly Agree.
Source: Field Survey (2018).

inorganic fertilizers, praying for rain/asking for Gods intervention and spraying pesticides.

The households stated that when they observed the manifestations of climate change they resorted to application of inorganic fertilizers and pesticides, practices which were not common in the area decades ago in the area. When asked to divulge the sources of these strategies for climate change adaptation, some of them answered that they have learnt the practices from extension service workers but others are part of folk knowledge. From the aforementioned information, it is apparent that households in the Amaro ward have been practicing adaptation measures even before the concept of climate change became an item of government policy.

Any statements with WAS ≥3 is deemed as a good mechanism for adaptation to climate change.

Coping strategies to food insecurity

Table 4 shows that 29% of the respondents can cope with food insecurity comfortably. This is because they could reduce the quantity, number and types of meal they take; postpone the celebration of some festivals; and sell some of their ruminants like goats and sheep. On the other hand, 71% of respondents cannot cope comfortably. This is because some farmers harvest immature crops, sell charcoal and fuel wood, consume some of the seeds reserved for next planting season, sell their lands to purchase food, etc.

Any statement with WAS ≥3 is deemed as a good strategy for coping with food insecurity. The coping strategies used by the households can be seen as an expression of negotiated decisions to minimize the impact of food insecurity in the household. Hence, understanding these coping strategies could be a fertile ground to formulate household based coping strategies to improve food security at the household level by government.

Weighted average score (WAS) analysis was used to identify 13 statements related to the degree of agreement of the respondents about their coping strategies in the study area. All coping strategies in Table 4 with WAS <3 indicate low ability to cope (Table 4). With respect to reducing quantity of meals, 1, 64 and 17% of the respondents strongly disagreed, agreed and strongly

Table 4. Coping strategies to food insecurity.

Statement	1=SD	2=D	3=NS	4=A	5=SA	WAS	Frequency (%)
Reducing quantity of meals	1	10	8	64	17	3.86	-
Reducing numbers and types of meals	2	7	14	50	27	3.93	-
Postponing some festivals	2	24	18	41	15	3.43	-
Selling small ruminants like goats, etc.	1	31	11	38	19	3.43	-
Harvesting immature crops	15	40	10	22	13	2.78	-
Selling charcoal and fuel wood	59	27	6	5	3	1.44	-
Selling big livestock such as oxen, etc.	25	31	7	29	8	2.64	-
Consuming some of the seeds reserved for next planting season	17	19	11	41	12	2.32	-
Out-migration of family members	24	46	13	11	6	2.29	-
Going without food throughout the day	18	43	10	23	6	2.56	-
Selling land to purchase food	41	38	12	6	3	1.92	-
Consuming wild foods	49	23	3	22	3	2.07	-
Begging	52	33	3	6	6	1.81	-
Overall coping							
Can cope comfortably	-	-	-	-	-	-	29
Cannot cope comfortably	-	-	-	-	-	-	71

SD= Strongly Disagree, D= Disagree, NS= Not Sure, A= Agree, SA= Strongly Agree.
Source: Field Survey (2018).

agreed, respectively. The WAS of 3.86% indicates high degree of agreement on the use of this coping strategy. In the case of reducing numbers and types of meals, postponement of the celebration of some festivals and selling small ruminants, majority of the respondents (50, 41, and 38%) agreed, respectively. Reducing numbers and types of meals, with WAS of 3.93, is the best coping strategy to food insecurity in Amaro ward. This is because people in the community detest begging, starvation, migration and related coping strategies. Cultural norms exert a lot of influence on the selection of coping strategies in the community. For example, begging is considered as a reproachful practice in Amaro ward community.

In FGDs, it was discovered that households have been coping with food insecurity for decades but some new coping strategies have materialized over time. The view of households on the idea of food security differs from one another. Most of them stated that they are food secure as far as they eat 3 times a day regardless of the food's nutritional content. Others said that they are food secure as far as they could not feel hungry even if they eat once or twice a day. The households mentioned that none of the aforementioned food insecurity coping strategies is new as they are traditional coping strategies in the community. Therefore, it can be said that households in the Amaro ward have been practicing coping strategies for food insecurity even before climate change gained attention as a global concern. However, the government provides food aid to the citizens in times of food crises.

CONCLUSIONS AND RECOMMENDATIONS

This study concludes that indigenous adaptation measures and coping strategies were necessary to cope with the changing climate and improve food security of households in the study area. Though local or indigenous strategies adopted by farmers in the area over the years have helped them cope with the changing climate and food insecurity, it is also vital to integrate modern adaptation and coping practices for improved access to food to take place. This is because, with time, the efficiency of the indigenous methods and practices for adaptation and coping will begin to dwindle.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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