

Exploring climate service for food and nutritional security and health outcomes of socially differentiated smallholder farmers in moisture stress Weredas of Sidama National Regional State, Southern Ethiopia

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Abstract

Smallholder agriculture has historically dominated Ethiopia's agricultural production. To boost crop output and productivity, agrochemicals and agricultural equipment have proven indispensable. However, climatic information has received minimal consideration from agricultural interventions in food production and health development programmes. The heterogeneous qualities of smallholder farmers were likewise ignored by conventional agricultural extension services. The objective of this study is to assess the susceptibility of different groups of smallholders in the moist stress zones of Boricha and Bilate Zuria Woreda, Sidama National Regional State, to food and health risks associated with climate variability. To acquire data, a qualitative research design employing focus group discussions and interviews with key informants was utilised. The data indicate that climate variability affects the vulnerability of smallholder farmers differently. Climate information on spring rainfall (January to April) becomes a window period affecting food and nutrition and the health state of smallholder farmer categories. Rich and middle-class farmers were better able to obtain climate information from radio and television than the poor and women smallholders in order to lessen their climate susceptibility. In addition, the data indicate that women and the poor were disadvantaged in their ability to participate in communities where climate-related knowledge was shared due to their lack of economic resources and cultural factors. In the study areas, women and the impoverished are predisposed to health epidemics due to climate change, including scabies, marasmus, kawashiorkor, typhoid, typhus, and malaria. Establishing pro-poor and gender-responsive delivery of climate information services at the home level should be incorporated into agricultural and health extension programmes to improve food, nutrition, and health in moisture-stressed rural communities.

Key words: climate information service, socially different groups, vulnerability, food and nutrition and health, moisture stress

I. Background

Climate variability has been severely affecting all aspects of the life of most of African peoples, especially East African Countries. To reduce the impacts of climate variability and change, different institutions were established in Eastern Africa. One of which was Ethiopian Meteorological Services Agency. This Agency was established as an autonomous government organization in December 31, 1980 to achieve: provision of meteorological services, control

Air pollution and maintain the natural balance of the air, and discharge better, Ethiopia international obligations regarding meteorological activities (Kadi et al 2011). Regardless of the long history of establishment of the Agency, the intensity and magnitude of climate impacts has been increasing among farming communities. Climate information need, access, communication channel and utilization differently create vulnerability to food insecurity and health problems in social categories. Studies on smallholder farmers often assess the gender effects of climate information service. Ngigi et al. (2017) indicated that women in male headed households have different adoption strategies, information need, information trust and preferred channel of communication from their husbands. Similarly, Diouf et al. (2019) revealed that 95% of women requesting information relating to the onset date of rainy season against 90% for men, 46% of women prefer rural radios as a climate information service broadcast channel compared to 39% of men and women's native status and willingness to act against climate change affect their access to climate information services. Mingistu et al (2022) also mentioned household headship status percentage difference of 90% of male- and 74% of female-headed households perceived declining and erratic rainfall and rising temperature over time in their locality in the last three decades attributed to less access to climate information and lack awareness, which constrains their adaptation strategies. Similarly, Getachew (2015) pointed out that language problems, technical jargons, responsible institution to down scale weather information at local level and inconsistency in information provision hinder farmers' adaptation capacity in general and women in particular. McOmber et al. (2013) also showed that women farmers are overwhelmingly left out of many forms of climate service communication channels. However, Legesse et al. (2018) found out that there are nearly unified perceptions of climate variability and change among gender and social groups though adaptation strategies were determined by agro-ecological locations, sex, family size, plot size, off-farm income, livestock holding (TLU), frequency of extension contact and training.

Several socio-demographic and socio-economic characteristics of smallholder farmers have exhibited close association with use of climate service and adoption of coping strategies (Shiferaw (2014); Muema et. al.(2018); Mequannt et al. (2020); and Megersa et al. (2022)). By the same token, a comprehensive literature review on climate services by Kenea and Mebratu(2020) indicated that the majority of farmers in Ethiopia are aware of climate change and use of ranges of adoption like crop diversification, using improved varieties, changing planting and harvesting dates, irrigation, planting tree crops, water and soil conservation techniques, switching to non-farm income activities, marketing during forage shock, using

drought tolerant breed and fodder preservation though preference of adaptation strategies differs from place to place, farms to farms, and households capacity. They have also stated that at household level, most of the empirical evidence revealed Agro-ecological setting, sex, education level, landholding, farm income, non-farm income, livestock ownership, access to credit, extension visit, farmer-to-farmer extension, access to climate information and average distance from home to the farm have significant influence on the choice of climate adaptation strategies. Matewos (2019) mentioned that climate change and variability-induced impacts are widely available in Boricha, Loka Abaya and Hawassa Zuria Woreda of Sidama despite various adaptive strategies of the government and the households.

Aforementioned descriptive and inferential statistics tell us only half of the stories about the measurement of variables affecting climate services. These approaches assume women and smallholder farmers as if they are homogenous group who have similar sources, access and utilization of information. However, different groups have several ways of understandings about climate services and thereby take various course of actions. In this regard, Tall et al (2014) noted that patterns of unequal access to climate information and advisory services created uneven impacts of increasing climate risk within vulnerable farming communities resulting in differentiating between community sub-groups that can and cannot make use of incoming climate services to improve their management of climate risks and strengthen their resilience to a changing climate at farm-level. Tall et al. (2018) suggested that complementary evaluation efforts will need to draw on a combination of qualitative and quantitative approaches, be sensitive to the heterogeneity of user groups, and go beyond the focus on agricultural production to include other dimensions of the agricultural system so as to strengthen evidence on the actual value of climate information services.

Though Jost et al. (2016) stated that participatory tools' gives insights into women's adaptive constraints and capacity about climate-smart agriculture (CSA), potential climate analogue approaches and climate and weather forecasting production in Uganda, Ghana and Bangladesh villages, in-depth researches that go beyond the discourse of women as a homogeneously vulnerable group in CSA programmes become crucial. According to Perrels et al. (2018), MARCO project highlighted that end users 'poor level of understanding and inexplicit climate services, and incompatible delivery with users felt needs were two recurring challenges in the area. Here, there is dearth of qualitative information about the reasons behind for limited understanding and utilization of climate service in ranges of farming communities in moist stress areas. Hence, this study is going to answer the following three questions: (i) why do

climate information services remain less effective in moist stress areas? (ii) How do categories of social groups access climate information service in community (iii) why does vulnerability to climate variability and change differ across social groups in communities?

2. Method

2.1 Study setting and population

The study was carried out in Bilate Zuria and Boricha Woredas of western Sidama Region, south Ethiopia. They are located at about 315 km south of Addis Ababa, the national capital (Fig. 1). According to Ethiopian Metrological Agency, the main rainy season for the most parts of Sidama region Belg (spring), which ranges from February to May. Study population was smallholder farmers who have been practicing mixed farming. The fieldwork for the study was undertaken from November to December 2022.

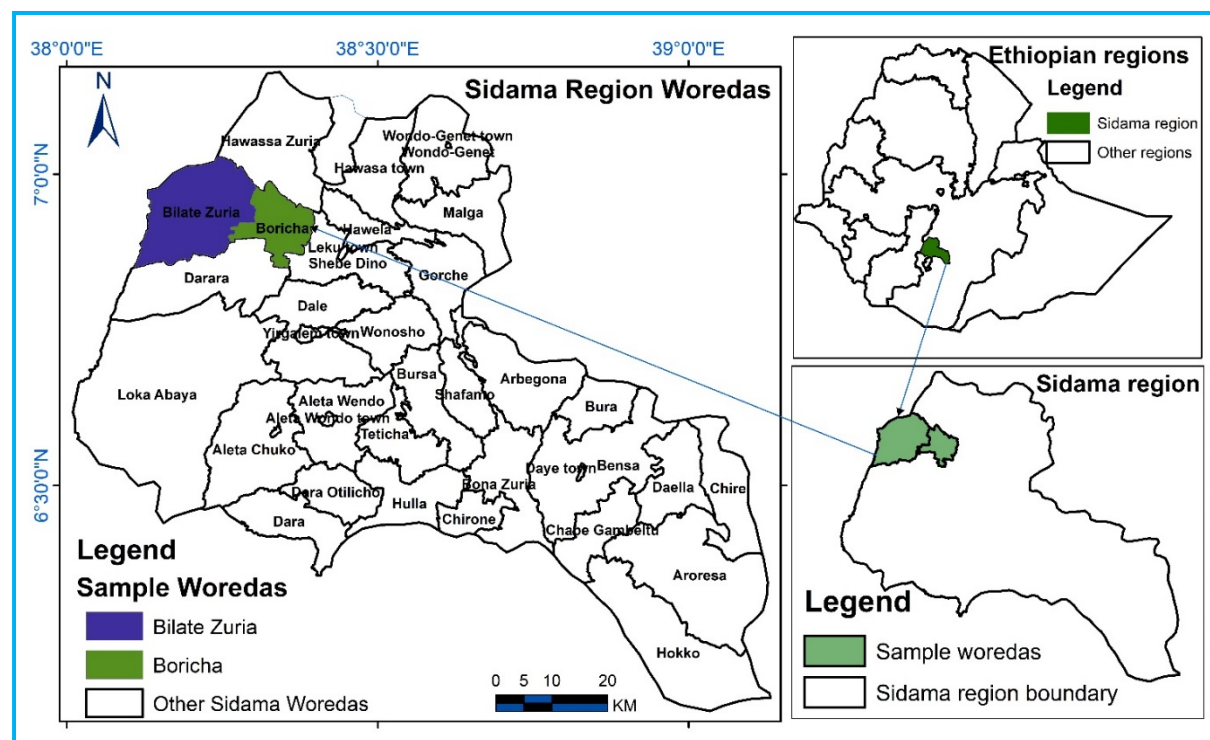


Figure 1. Map of the study areas

2.2 Study design

Since this study is focusing people experiences to the explore climate variability, the appropriate research design is qualitative method. FGD and Interview guiding questions were first prepared in English and translation were made into Sidama Affo and Amharic depending on participant's language ability. Field notes were taken during the interviews and focus group discussions. Besides, Smart Phone was employed for sound recordings.

2.3 Methods of data collection

2.3.1 FGD with smallholder farmers

Inclusion criteria to select participants in focus group discussion are age, household headship, land ownership and wealth status. On the basis of these criteria, health extension workers in each study Kebeles were assigned to recruited six types of focus group segments for the discussions. The first three focus group discussions held with women at Ala Worsiso and Aldada Dela Kebeles of Boricha Woreda and the remaining three conducted with men at Kindabe, Guano Bulanto and Hanja Goro kebeles of Bilate Zuria district. Each segment were composed of 4-7 participants. Men and women focus group segments were: male headed households in better economic stand as sufficient land used for non-perennial crops, age(above 40 years), better wealth(cattle, money, perennial crops; male headed households, sufficient land used for non-perennial crops, age belongs(25- 40 years), better wealth(cattle, cash, perennial crops, etc); male headed households holds land used for non-perennial crops, age ranges (25- 40 years), poor (Productive Safety Net Program Participants); women in male headed households who have sufficient land used for non-perennial crops, age composed of (25- 40 years), better wealth(cattle, money, perennial crops); female headed households who have land used for non-perennial crops, age included in(25- 40 years), self-sufficient(not Productive Safety Net Program Participants); and Poor female headed households who are in Productive Safety Net Program Participants.

2.3.2 Individual interviews

Key informant interviews were scheduled to get peoples' in-depth understandings about the issues. Rages of key informants were selected using snowballing sampling strategies who believe to have knowledge about climate information services. In-depth interviews were held with smallholder farmers, elders, development agents, health extension agents, district agriculture and health officials and metrology experts in the study sites.

2.3.3 Data analysis

Data analysis started concurrently with data collection. Besides, sound recording transcriptions were done to classify themes based on prior conceptual categories and further emergent concepts were derived from the data. The data were content-coded for thematic analysis. The collected data analysed into four themes for presentation and discussion.

3. Results and discussions

3.1 Socio- demographic characteristics of participants.

A total of thirty six men and women participated in six focus group discussions. Among them eighteens were women and the remaining ones were men. Besides, male government officials who have better knowledge about climate information were selected to get in-depth understanding of the food and nutrition security problems in the areas. In terms of education levels, participants have all sort of educational attainments from functional literacy to college diploma and degrees. However, female participants had less education attainment than male ones. Pertaining to landholding status, participants plot size ranges from 0.25 hectare to 3 hectares. All of them make use of their farmyards mainly for growing maize and haricot bean. Household headship, male and female headed smallholders as important category was taken into the research processes. Concerning religious affiliations, all of them are followers of Protestant Religion.

3.2 Status of Climate information services

Climate information services vary depending on the socio-economic development of the country. In Ethiopia, very limited climate information is given to users. Research participants identified that climate information sources are development agents, local elders, NGOs, market, social gathering and media. According to the SNNPR Meteorology agency expert, short weather forecast for air flight, and middle and seasonal forecasts for cultivation crops are provided for users. The types of climate information provided are: onset date, cessation date, cumulative rainfall, daily rain forecast, dry spells, and wet spells, off season's rain and temperature forecasts. Though the agency claims to provide the aforementioned services, all FGD and key informant interview participants mentioned that information service about off season rains, dry and wet spells were provided in the areas. SNNPR metrological agency also pointed out that information inaccessibility due to structural problems and lack of data to designate specific geography to disseminate at local levels are the major challenges. Besides, key informants at health and agriculture offices indicated that access and utilization of climate

information are limited for them. This finding agrees to that of Perrels et al. (2018) who reported that end users' poor level of understanding and inexplicit climate services, and incompatible delivery with users felt needs were two recurring challenges of MARCO project. There is mismatch between service provider and end users.

Since Boricha and Bilate Zuria Woreda are moisture stress areas of Sidama National Regional State, farmers critically need cumulative rainfall information for growing maize and haricot bean. All research participants preferred or identified critical period of getting climate information as of January to April. The amount of rainfall available during this season has several implications on crops cultivation, health conditions and domestic water use. On top of the crucial information needs, the information access is unevenly distributed across categories of farmers. FGD participants categorized as rich and middle are claiming that better information get from development agent and media sources. Similarly, development agents explained that they easily access information from their respective Woreda and deliverer to farmers. In contrast, poor smallholder farmers participated in the focus group discussion are saying that they do not get the information from development agents or other sources. It is not only the availability of information, but also the period of getting information substantially affect their agricultural activities. The available information, however, is not properly delivered to all categories of farmers in way to benefit agricultural production.

3.3 Climate information/advice trustworthiness

As focus group discussions and key informant in-depth interviews participants examined that available climate information sources can be considered as safe, trust or actionable if and only if the event occurs as predicted. Several categories of farmers identity their climate information trustworthiness into two groups. One group associates with local or indigenous knowledge system of the Sidama. Among Sidama, there is age-old calendric system that governs people's day to day life. An elder at Ala describes as, 'The Sidama have their own way of New Year Calendar System. During the celebration, elder or Ayabtos often predict weather, peace and stability conditions. So some people use this weather information for their subsequent agricultural practices as reliable source of information.' In line with this, all female headed households at Aldada Dela Kebele mentioned that elders are the main trusted sources of information though FM radio and development agents are also used for their farming activities. One of female headed households participated in the focus group discussion states the trustworthiness of climate information given by local elders as:

The elders are naturally gifted to know climate variability. They got the knowledge from God. FM radio tells us while looking at weather changes. However, like Gobena, elders tell us from their innate knowledge without seeing any weather changes in the area that is why we trust them. It happens as they predict. We accept the elders' information. When we want additional information, we listen FM radio and development agents.

Poor male FGD participants at Guwabe Kebele explained that traditional religious followers whose number reaches 70-150 peoples often follow traditional weather prediction as trust source information for their agricultural activities.

Another group links information trust with modern ICT. Most rich, middle and poor male headed smallholders expressed that weather forecasting by elders are unreliable, but media and development agents are their preferred information sources. Supporting male focus group participants, an elder at Ala Warsiso Kebele says, 'the new generation does not accept our knowledge. They mocked on us while they see us. They say as, 'the fortune teller is coming'.' This finding contrasts with that of Jost et al (2016) who found out that indigenous knowledge is the most available and considered the most reliable source of weather and climate information in smallholder farming communities of Uganda, Ghana and Bangladesh. The accessibility and trustworthiness of weather and climate information vary across household headship and socio-economic standings of smallholder farmers in the study areas.

3.4 Smallholder farmers' vulnerability categories

Moisture stress affects people at different socio-economic conditions. However, primary vulnerable group of people are poor and women headed households. Vulnerability is highly linked with economic capacity of households to get access and receive climate information services. This finding is supported by that of (McOmber, et al. 2013) who closely identified vulnerability with structural and group characteristics such as gender, caste, race, ethnicity, and age. However, this study has explicitly indicated that among structural and group characteristics, smallholder farmers' wealth and education status primarily provide capacity to cope the environmental shock produced by the climate variability. FGD participants of rich and middle smallholder farmers' categories have the ability to use different media sources to get advantage of weather predictions and climate variability. These findings are similar to the qualitative findings done by that of (Diouf, 2019) who reported that farmers who have more income may have more material assets like the radio and the television, which constitute important CIS dissemination channels. Farmers' economic foundation assists to have electronics media to access climate information at homes as well as market places. FGD

discussions with better off farmers stated that good education status able to listen required climate information and make use of available technological innovations towards their agricultural activities. On the contrary, women and poor people insufficiently access to climate information due to their restricted movements for economic reasons. One of the poor farmer participated in FGD under category of poor household head participants stated as:

In market days, several people come and chat in local drinking houses where TV and Radio are available. These places are mediums where people exchange any type information including climate variability. However, women often go to market places when they purchase food items used for household consumption. Similarly, poor men households could not travel to market places since they do not have money to pay for vehicles and drinks. Women and the poor are restricted to visit local tea and beverage houses. Hence, they do not get necessary information.

Although vulnerability levels vary across different farming groups in the study area, women and poor men fail to overcome the effects of climate variability during shortage and high rainfall periods. The less restricted mobility rural people have, the less climate information access.

In addition to economic factors, cultural norms interplay to restrict the poor and women from public participation where climate information is delivered. One of the development agents during an in-depth interview says, "When there is new introduction of agricultural innovations into the community, we first give the trainings for model farmers, and then for the middle ones." Indeed, there is no explicit rules that guide the development agents to deliver extension services to different categories of farmers rather the cultural influence that made them to exclude poor farmers and women from all walk of life. This finding is supported by Tall et al (2014) findings that skewed climate information and advisory services impacted vulnerability status and resilience mechanisms differently.

Little women representation in socio-cultural and economic situations affects climate information accesses. Age-old sexual division of labor in the area restricted women to household chores resulted in affecting accessing climate information. Women reproductive roles in the household restricted them from having information access and utilization and control of household economic resources. Regardless of the long history of development interventions in the area, women's information access and utilization remains blurred.

3.5 Climate variability effects on gender

Women are the most vulnerable social group affected by climate variability and changes. Health professionals' interviewed at Boricha and Bilate Zuria Woreda health offices mentioned that malnutrition, malaria, scabies, typhoid and typhus were prominent health treats occurred when there is shortage and excess rain in the areas. Such fluctuations affect people to keep personal hygiene and contaminant available water resources used for domestic purposes. Similarly, the major impacts of climate changes on the women in the area as mentioned by FGD and key-informants identified are malnutrition and associated diseases. This finding concurs with that of McOmber et al. (2013) who pointed that environmental shocks illuminate gendered social inequities within households, as women are often poorly positioned to adapt to these events and their consequences.

In rural areas, where women have little participation in agricultural activities, the source of information is very limited. Female headed research participants expressed that females in male headed households get better information from their husbands and better adapted to climate variability than the ones with female headed households. This finding upholds that of Ngigi et al. (2017) indicated that women in male headed households have different adoption strategies, information need, information trust and preferred channel of communication from their husbands. However, FGD group discussion with women in male headed household expressed that they rarely heard about the climate information services. This finding also contradicts with the qualitative interviews done by (Diouf, 2019) who stated that women often preferred ways of receiving CIS using producers' organizations or through social gatherings. No climate information exchange was not mentioned where women are members of different organizations in the study areas.

There are two reasons suggested by participants why women vulnerability to climate variability and changes. The first one is reproductive responsibility of women to care for children that limited women to move from place to place to search of additional income in time of climate hazard to cope malnutrition and other health related problems. The second one is the less productive roles of women that is associated to gender division of labor that exclusively assign women in domestic chores. This finding in line with that of Tall et al. (2014) who state as, "... different gender roles in the production process and in society largely explain the differential impacts of climate change, and gender differentiated capacities to cope with specific adaptation needs." The highest reproductive roles couples with the least control over productive assets at the household level predestined women to face of effects of climate

variability such as malnutrition, vector and water borne diseases, and poor hygienic conditions in the study areas.

5. Conclusion

Climate change and variability has been the major challenge for both the developed and developing countries. However, absorbing the shock of climate variability is difficult in many developing country, including the Ethiopia. The Ethiopian Great Rift Valley Region is the most moisture stressed areas of the country. Boricha and Bilate Zuria Woredas are found in the rift valley areas of the Sidama National Regional State. The findings indicated that smallholders in these Woredas highly depend on *Belg*(Spring rainfall) for cultivation of crops that ranges from January to April are critical periods or windows of the rainy season when maize and haricot bean grown. Climatic induced crop failures have been major characteristic features for the poor and middle smallholder farmers in the areas. The key climate related food and health problems are food shortages resulting in malnutrition and its associated diseases such as, *kiwashakor*, *marasmus*, scabies, typhoid and typhus, malaria.

Vulnerability status, however, varies across different categories of smallholder farmers. Wealth, education, house headship set conducive atmosphere for the opportunities to use ICT. Different smallholders' vulnerability to climate variability have been linked with access to information that have economic characters with the power to purchase communication channels. Smallholders categories as rich and middle have better economic and educational status are ability to purchase agricultural inputs from anywhere if during the sowing season if they have the capacity to absorb the shock that economic foundation give them to access ICT information from media and are also the target of the development agent to supply information.

Men get more climate information than the women in the study areas. However, women as heterogeneous groups, women in male headed households get limited information from their husbands compared with female headed household often got form local elders. This sets women for vulnerability context differently. The gender patriarchy operates social inequalities in the community gatherings and in food production processes to restrict women from information access. Irregular information communication and lack of formal structures at the Woredas and local levels for dissemination and monitoring the information increased people exposure to food and health diseases. Pro-poor and gender responsive climate information

services interventions are found to be crucial to reduce the prevalence and incidence of malnutrition among women and children and the poor in the research areas.

Conflict of interests

The authors declare there is not conflict of interest.

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