

# Schematizing vulnerability perceptions and understanding of drought-prone Gamo lowland communities: an evidence from Southwest Ethiopia

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## Abstract

**Purpose** – The conceptual root of vulnerability dates back to the 1970s in the social science spheres. Vulnerability is a multi-dimensional and determinant precondition for disaster occurrence. The Gamo lowlands are exposed to a wide range of vulnerabilities. Therefore, this study aims to schematize community perceptions and understanding of vulnerability in drought-affected rural Gamo lowlands.

**Design/methodology/approach** – A community-based cross-sectional survey design and the mixed-methods research approach were executed. A four-staged multistage sampling was used to identify the respondent households. Into the four study sites, sample households were allocated proportionally by the lottery method. The survey data were gathered from 285 lowland households. The structured survey questionnaire, key informant interview, focus group discussion, and field observations, and transect walks were the tools used to collect the primary data. Data were analyzed deploying both qualitative and quantitative techniques. The Likert scale is used to analyze households' vulnerability perceptions in which the item analysis approach was used for detailed analysis of the Likert-type items.

**Findings** – Locally, people perceive and understand vulnerability as exposure to drought hazard, rainfall inconsistency, the prevalence of human and animal diseases, livelihood insecurity, food shortfalls, poor income, lack of access to market, landholding and livestock ownership which are schematized by vulnerability perception



pathways that delineate its extent. The findings also showed that the Gamo lowland inhabitants are unequally vulnerable as 96.5% of the studied households stated the differential idiosyncrasy of vulnerability. Old-aged, small-sized and female-headed households with no supportive force were found to be more vulnerable.

**Practical implications** – For better resilience, enhancing communities' perceptions and understanding of vulnerability via continuous awareness creation by all the concerned stakeholders is recommended as the majority was lowly educated. It also yields input for policy debates and decision-making in the drought-prone lowland setup for building a resilient community.

**Originality/value** – To the best of the authors' knowledge, this is an original work pursued by using a household survey with empirical data sourced from drought-prone rural lowland communities.

**Keywords** Community, Drought, Gamo lowlands, Perceptions and understanding, Vulnerability, Drought hazard

**Paper type** Research paper

## 1. Introduction

Vulnerability is originated from the Latin term “vulnus (vulner)” meaning wound (Slater, 2016; Wisner, 2016). Conceptually, the root of vulnerability dates to the 1970s in the social sciences. The scenario was to respond against the absolute hazard-based perception of disaster risk (Birkmann, 2006). Since the 1980s, such a hazard-oriented understanding is shifted to a vulnerability-focused paradigm. Alternatively, the shift followed the technically intervening challenges against the hazard-oriented views (Schneiderbauer and Ehrlich, 2004). This new paradigm in emergency management is advanced by the proponents as a core theme in the introduction of vulnerability connotation. This is found helpful in better capturing and perception of disasters' social construction (McEntire *et al.*, 2010). Regarding this, others also acknowledged that vulnerability is a word accredited by multiple denotations across disciplines Ciurean *et al.* (2013) with a defied consent on the meaning (Sterlacchini, 2011).

Community perception of climate-induced risks is manifested in diverse ways and attributes. Politically, culturally and in terms of the physical environment, the issue has been elaborated. Such climate-related circumstances pose susceptible sections of the society to perceive themselves exposed to climate emanated risks as indicative of social vulnerability (Akerlof *et al.*, 2015). Understanding the vulnerability of rural areas is vital from multiple perspectives. Among, its role in the development of proper risk aversion mechanisms is duly addressed. Accordingly, the consequence of smallholders' cognitive insight is explored with the knowledge they developed to climate-induced hazards like droughts. In such rural geographies, the farming communities are idiosyncratically found differential in terms of the social vulnerability (Jamshed *et al.*, 2020; Tagel and van der Veen, 2020; Kuchimanchi *et al.*, 2019).

Risk perception, as scientifically evidenced, is among the factors that strongly affect household-level adaptation strategies against natural hazards. In Africa, the flood-prone city dwellers are reported as well-cognizant of vulnerabilities with such attributes (Okaka and Odhiambo, 2019). Moreover, perception of risk is claimed to be changeable through time per the occurring natural hazards manifested with the differential magnitude of vulnerability (Balteanu *et al.*, 2014). Also, Ghana's women farmers in the context of climate change express their perceptions of decrement in rainfall trend as a commonly stirring norm (Lawson *et al.*, 2020). Likewise, people, their perceptions as well as knowledge are in the middle of crucial vulnerability concerns for social vulnerability construct (Singh *et al.*, 2014).

In Southern Ethiopian lowlands, the households differentially expressed their perceptions for a local climate variability related interrogation. The perceptions are stated as

good times only remained as history, rainfall both in its amount and frequency has been observed with decreasing tendency and bad weathers are the implications of God's punishment. Such insights of drought-prone smallholders on vulnerability are the vital inputs collected scholastically (Aklilu and Alebachew, 2009). Apart from this, the smallholder farming households perceive climate change and its results with varieties of manifestations in Ethiopia. Low amount of rain, natural hazards such as drought and flood, high disease onsets and declined crop yields are among such resultants. The perceptions are characterized by differential levels. Farmers' profiles such as the lowland residential areas, education and the strength of social ties determine their perception of changing and varying climate states with negating impacts on the local agricultural activities and livelihoods. The pitfalls are disproportionately severe in the arid, partially arid and sub-humid dry lowlands of the country. To tackle these adversities in the entirety, beyond awareness creation, customized endeavours targeting capital assets, population migration and resettlement and livelihood source diversifications as adaptive strategies are demanding (Thomas *et al.*, 2021; Mekonnen, 2018; Nega *et al.*, 2015; Yoseph *et al.*, 2015; Assefa *et al.*, 2008).

The Gamo area lowlands have been exposed to diverse vulnerabilities such as drought hazard, animal and human maladies, livelihood security challenges and food insecurity (National Disaster Risk Management Commission (NDRMC), 2019; Food and Agricultural Organization, FAO Ethiopia, 2017; Disaster Risk Management, Environmental and Social Management Framework, 2011; NURU International, 2015; Lomboll and Pound, 2014). These are among the existing conditions that necessitated this study to contribute to relieving the vulnerabilities and build community resilience, i.e. congruent to the third priority of the Sendai framework.

The assessment of vulnerability poses five important questions with expected replies in the end. Three of these questions, namely, "What is the extent of vulnerability? What are the sources of vulnerability? and Who is vulnerable?" (Moret, 2017, p. 7) are duly considered in this work. Further studies on the perception of cattle farming households on risk and its management strategies in the context of Ethiopia are recommended in the literature. This is because only a little is known about farmers' perception without recent empirical investigations (Kinfe *et al.*, 2018; Kinfe and Tewodros, 2014). For that reason, this study was conducted to schematically assess the community vulnerability perceptions and understanding based on the timely collected survey data of households' socio-economic characteristics subsuming livestock.

A lot of scholars in different fields have contributed to knowledge generation on the Gamo highlands. Nevertheless, drought susceptible Gamo lowlands receive little scientific investigation. This study tried to give more attention to these areas to fill the lacuna of scientific literature concerning the body of knowledge generation. The main objective of the study was to schematize community perceptions and understanding of vulnerability in drought-affected Gamo lowlands. The intent was to investigate how and to what extent the Gamo lowland communities perceive and understand the existing vulnerabilities. Hence, the extent of households' perceptions and understanding of rural vulnerability was illustrated in two perception pathways of vulnerability. The basic focus of this paper is on the perceptions of vulnerability in the drought-affected community setup. The topic is believed to be important to help resilience building of vulnerable communities through continuous awareness enhancement and effective coping strategies. The policy and decision-makers would revisit their interventions across the vulnerable geographies. Additionally, it is believed that the findings are thought of influencing public attitudes and affecting the quality of life via building a resilient community.

## 2. Lowland vulnerability assessment and the theoretical outlines

Per the concerning issues under scrutiny, a lot of theories have been deployed in vulnerability investigations. In this study too, particularly relevant theories that advocate the socio-economic version of vulnerability are prioritized. Building resilience of the communities is highly narrated in this work. This is an imperative implication of the Sendai framework of 2015–2030. The framework advocates resilience-building by appropriately intervening in the reduction of disaster risk among its primacies (United Nations, 2015). Hence, due attention is given to the disaster crunch model, the Bogardi, Birkmann, and Cardona (BBC) framework and the protection motivation theory (PMT). The reason for focusing on these theoretical perspectives is basically to strengthen the study via the existing relevant theories. Furthermore, driving the implications and accordingly interpreting the study findings in the drought-prone lowland communities' setup is the other intent of the germane theoretical inclusions.

The disaster crunch model reveals the mandatorily preceding occurrence of hazards affecting the vulnerable people for the disasters to occur (Hai and Smyth, 2012). This idea was scholastically avowed as it is vulnerabilities, not hazards that cause disaster for disasters are firmly induced by vulnerabilities where hazards are combined with vulnerabilities (Kelman, 2007; Lewis, 1999; Kelman *et al.*, 2016). In this model, vulnerability is connected with inopportune settings and peculiarly identified risks in the thought of the political economy, resources and alterations of risks from the local to national and universal levels (Birkmann *et al.*, 2013). Recently, new elements are announced into the crunch model wherein the vulnerability of women and men is perused gender-wise. This shows that they experience different levels and types of vulnerability to disasters and the adverse effects for what the model is henceforth the gendered crunch model (Hai and Smyth, 2012) implying the differential idiosyncrasy of vulnerability.

The BBC framework is the other relevant framework to have insights on the rural community susceptibility. The nomenclature of the BBC model is linked with its developers, namely, Bogardi, Birkmann and Cardona for contributing a lot between 1999 and 2004. In the BBC model, it is deemed that vulnerabilities are dynamic and happen within the adaptive response loops. Disastrous events in this model are framed as extremely circumstantial happenings where the effects of a calamity are well-defined by its unique aspects and the context they befall. The BBC model similarly integrates an examination of the accountable fundamentals and managing capabilities of a system. This is accounted as an opportunity to lower the adverse effect of a disaster incidence on that specific structure. Besides, it is advocated that corrective measures can be pursued both before and after the adverse incidents to relieve the possible hardships in the light of the model (Birkmann, 2006). The dynamic nature of vulnerabilities divulged by the BBC model is found indicative of the households' differential nature of vulnerabilities across the Gamo lowlands.

The PMT is a theory suitably used to explore drought risk and for insights and adaptation behaviours during climate vagaries. In the commencement, the theory was practically used to health-related concerns and later used in the missions of studying environmental issues. PMT seems to be the utmost implemented model concerning the conduct linked to a changing climate. It comprises the major attributes such as perceived adversity and susceptibility, self-effectiveness and expenses of counteractions as determinants for climate-related investigations and interventions as indicated in diverse literature (Floyd *et al.*, 2000; Rogers, 1975; Cismaru *et al.*, 2011; Patchen, 2010 as cited in Tagel and van der Veen, 2020). The PMT is also a fitting theory to the Gamo lowland setup where droughts along with their corollaries recur threatening the household level food security among the other implications (Thomas *et al.*, 2021). In general, the aforementioned

theories are of crucial importance in the study areas' context. Mainly to help the vulnerable communities build the capacity (resilience) against the facing shocks is significantly weighted. It is a signal to decision-makers, intervening actors on the rural development, as well as the other concerned stakeholders, to revisit their interventions among the at-risk communities. This is found to be imperative in the face of the changing climate that widely tests people's socio-economic systems in the entirety and the rural livelihoods in particular.

### 3. Materials and methods

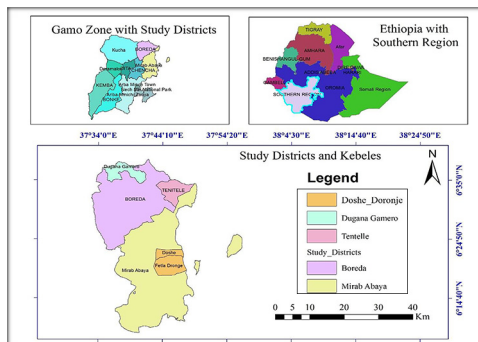
#### 3.1 Study sites and location

The study was conducted in the Gamo lowlands of the recently structured Gamo Zone, located in the Southwestern part of Ethiopia in Southern Nations Nationalities and Peoples Regional State (Figure 1). The Gamo zone has its zonal capital at Arba Minch which is located at 505 and 275 km away from Addis Ababa and Hawassa, the national and regional centres, respectively. The total population of the Gamo zone is 1,668,744 of which 826,020 were males and 842,724 were female counterparts (United Nations Office for the Coordination of Humanitarian Affairs, OCHA Ethiopia, 2020 as cited in Thomas *et al.*, 2021).

The areas that the Gamo lowlands (below 1,500 m) include are found in nine of the 14 rural Gamo zone districts, namely, Boreda, Kucha, Kucha Alpha, Mirab Abaya, Dera Malo, Arba Minch Zuria, Geressie, Kamba and Martha Garda, with an altitudinal range of 638–1,500 m. The study districts, Mirab Abaya and Boreda, are vicinal to each other and share common borders with other districts. Accordingly, the Mirab Abaya district is bordered in the East and South by Lake Abaya, which naturally separates the district from the Oromia region. Additionally, Arba Minch Zuria district in the South, Chencha district in the West, in the Northwest by Boreda district and by Wolayita zone in the North. Boreda district on the other side is bounded by the Wolayita zone in the North and Northwest, Kucha district in the West, Mirab Abaya district in the East and Southeast and Kogota district in the South.

#### 3.2 Study design, approach and sampling technique

A community-based cross-sectional survey research design was used in the study. The research approached considered was mixed methods research approach that is used to understand how and what the local communities perceive as risk and hazard that impacts their everyday life concerning disaster risk reduction (Iloka, 2017). Among the strategies of mixed research, concurrent triangulation was used to collect and analyze both qualitative



**Figure 1.**  
Study sites' location  
map

Source: Modified from Thomas *et al.* (2021)

and quantitative data concurrently in terms of interactions (Creswell, 2014). The study sites were purposively selected. In *Woreda* Disaster Risk Profile (WDRP), a comprehensively used disaster reduction program with data used as research baseline, Mirab Abaya and Boreda districts are among the districts prone to drought and other hazards where most households are vulnerable to drought corollaries (NDRMC, 2019). These districts were also among the prioritized intervention areas in the former Gamo Gofa zone for disaster prevention and coping strategies such as school feeding programs (Gamo Zone Education Department, 2019). These districts have many drought-vulnerable lowland *kebeles*. 62.5% of Mirab Abaya district and 53% of Boreda district is agro-ecologically lowland where many rural *kebeles* are exposed to a plethora of vulnerabilities.

Multi-stage sampling was used to identify the targeted participants stagewise. The sample frame used was the list of the study population households accessed from the documents available in the *Kebele* administrative offices. A four-staged sampling procedure was used. The first stage was identifying districts with vulnerable *kebeles* from the Gamo lowland areas. In the newly structured Gamo zone since January 9, 2019, there are nine rural administrative districts, namely, Arba Minch Zuria, Kucha, Kucha Alpha, Dera Malo, Boreda, Mirab Abaya, Geressie, Kamba and Martha Garda which are comprised of the lowland *kebeles* with varying extent of drought vulnerability among the 14 rural districts. Secondly, the vulnerable rural *kebeles* were identified. In the Mirab Abaya district, 15 of the 23 rural *kebeles* are found in low-lying areas. Even though, some of these *kebeles* practice small-scale traditional irrigation schemes that help them relatively to cope with vulnerability and livelihood security-related constraints. Recurrently drought-prone *kebeles* in the district include Fetele Doronje, Doshe, Korga Geramo, Yayike and Kolla Barana among which the prioritized ones were Fetele Doronje and Doshe based on the severity of the vulnerability. Since the 1960s, drought with increasing trends of effects has been presented in the WDRP in Doshe and Fetele Doronje *kebeles* (NDRMC, 2019).

In the Boreda district, 13 of the 28 rural *kebeles* are agro-ecologically found in drought-prone lowland areas. More vulnerable *kebeles* to drought and the related impacts are Tentelle, Dugana Gamero, Gumgumuta and Dubana Bulu wherein the first two were taken as sample *kebeles*. In the database of NDRMC (2019), these *kebeles* are delineated with drought and human and livestock diseases since 2008 with the worst 2015. Fetele Doronje, Doshe, Tentelle and Dugana Gamero were purposively prioritized as samples of vulnerable lowland *kebeles* from both districts per the population homogeneity. Thirdly, the targeted population was identified. From both Mirab Abaya and Boreda districts, the study population from the top vulnerable rural lowland *kebeles* was selected, and lastly, sample size determination was conducted. A commonly recommended technique of sample size determination, applying a formula, is used to decide the sample size. Accordingly, a simple and easy formula illustrated for determining the sample size by Israel (2013) and suitably used for the finite population, namely,

$$n = \frac{N}{1 + N(e^2)} \quad (1)$$

was used in which  $n$  is the response/sample size, and  $N$  is the total household population size.  $e^2$  is the level of precision (0.5%) signifying the maximum variability and 1 is the probability of an event that occurs. To nominate the calculated and proportionally allocated household survey respondents, the lottery method was used. In the proportional allocation, the number of female-headed households was found to be around 10%. This was because of the availability and the respective share of the female-headed households in the sample

framework. Consequently, the calculated 285 respondents were allocated proportionally into the study *kebeles* (Table 1).

### 3.3 Data collection and analysis methods

From various sources, both primary and secondary data were obtained. Primary data were procured from 285 survey respondents, agriculture experts with disaster risk management and food security backgrounds as well as the available development agents in the *kebeles*, key informants comprised of local elders not included in the household survey, model farmers, *kebele* administrators, district headmasters of the Farming and Natural Resource Development Offices, focus group attendees and field observations and transect walks. Four focus group discussion (FGDs) were conducted in the study sites. The participants were the non-sampled households who did not take part in the household survey. The selection was done with the considered gatekeepers. A total of 6–8 gender-inclusive members have participated in each FGD. As the selection criteria of the FGD and key informant interview (KII) participants, their familiarity with the study concerns was stressed. The questions of these tools were mainly comprised of households' demographic and socio-economic attributes, survival sources and vulnerabilities, how they perceive and understand vulnerability with its extent among others. To authenticate the survey data findings, the obtained inputs were used (Thomas *et al.*, 2021).

Secondary data were acquired from the relevant published and unpublished materials such as books, journal articles, websites, namely, the WDRP, documents and official reports. Diverse tools of data collection such as the structured survey questionnaire, structured questionnaire, KII, FGD and field observations and transect walks were used. In advance of the enumeration and enumerators' training, the survey questionnaires were pilot-tested by the first author in another non-sample site at the Mirab Abaya district (Fura *Kebele*) with a related setup to the study areas. The research questions that led to the attainment of the intended objective included: How do the Gamo lowland communities perceive and understand vulnerability? To what extent do the local people perceive and understand vulnerability? and What are the sources and characteristics of community vulnerability in the Gamo lowlands? These questions were used to structure the contents of the survey questionnaires and the other tools prepared for the concerned data sources. The door-to-door survey enumeration in the field was done by the five trained male enumerators with close supervision of the first author. The enumerators were comprised of qualified professionals, namely, the development agent/s, teachers, directors and cluster supervisors living and working with the study communities.

Quantitative and qualitative data analysis approaches were used. Qualitatively, interpretive analysis was widely conducted. Verbal descriptions and discussions were done to link the statistical findings of the survey questionnaire. Quantitative data were analyzed first generating the descriptive statistics and triangulated by qualitative data. Descriptively, respondents' demographic and socio-economic characteristics were generated by the SPSS software. SPSS software version 23 is used for the descriptive statistics, wherein editing, numerically anchoring, categorizing and cleansing survey questionnaire data were conducted before the analysis. Microsoft Excel is also used to recode the numerical weighting of the Likert scale in a way that the most (5) and least (1) favourable responses of households for each Likert-type item were assigned showing the intensities of responses. The item analysis approach (IAA) was used to analyze the Likert-type items. The considered Likert items were the 11 vulnerability perceptions and understanding parameters provided to the survey respondents to express their attitudes. Also, an effort is exerted to incorporate and link the theoretical underpinnings of the study with the results

District	Kebele	Total population			Household heads			Proportional allocation (%)			Selected sample		
		M	F	T	M	F	T	M	F	T	M	F	T
Mirab Abaya	Fetele Doronje	561	563	1,124	138	20	158			28.81	39	6	45
	Doshe	809	779	1,588	201	36	237				58	10	68
Boreda	Tentelle	500	601	1,101	102	11	113				30	3	33
	Dugana Gamero	1,423	1,482	2,905	454	27	481				131	8	139
Total		3,293	3,425	6,718	895	94	989				258	27	285

Source: Authors (2020)

**Table 1.**  
Population  
identification and  
proportional  
allocation



section. This was required to associate the findings with the issues outlined by the relevantly addressed theoretical perspectives in the study.

#### 4. Results and discussion

##### 4.1 Key characteristics of sample households

The age of sample respondents was found among the vital attributes of the household survey. The finding showed that the minimum and maximum ages of respondents were 20 and 90, respectively, while the mean was 46. Nearly, this converges with what [Alemayehu et al. \(2020\)](#) found out wherein the lowest and average ages were 20 and 46.8 for the households, respectively. Family size is an important variable to explain household vulnerability. The mean and standard deviation of family size were 6.76 and 2.375, respectively. This average family size was higher than both the rural national (5.1%) and Southern Ethiopian regional (5.5%) average household figures ([Central Statistical Agency \(CSA\) and World Bank, 2013](#)). Besides, the generated survey data of this predictor showed that above 54% of the households were large-sized with 7–17 family members as indicative of rural vulnerability.

In the study areas, 68.1% of the households were at low educational status (illiterate, functional adult literate and grade 1–4) which is relatively consistent with the finding of [Amare et al. \(2020\)](#) that showed above 50% of respondents' illiteracy indicating the strong commitment of enhancing people's awareness for better coping-capacity against vulnerabilities. Contrarywise, respondents' educational level was inconsistent with the report of [Okaka and Odhiambo \(2019\)](#) that discloses the secondary level of education for above 50% of the households. Farmland is also among the basic characteristics of the households. Its size varied from the lowest 0.125 ha to the highest 19 ha. On average, the households possessed 3.43 ha of landholding which is much greater than the estimated national average of 0.93 ha (CSA and WFP, 2014 as cited in [Dereje, 2019](#)). The survey findings implied that farmland possession was not a critical problem for most households. This statement is because there was no landless respondent and even above 85% of the households owned above 2.5 to 19 ha of farmland ([Table 2](#)).

As a survival strategy, seasonal migration was pursued by either the households or their family members. Informal informants like school directors and supervisors strengthened the odds of such migration. Most students of the Tentelle *kebele* follow their families and go to the lake Abaya area which makes absenteeism and dropout rates among the highest in the Boreda district. As observed in the field, the misery of water paucity is much severe in the *kebele* hit hardest from all the study sites. The situation is too hard for disproportionately vulnerable and thirsty school children around empty water pipes and pregnant women who struggle for tentatively available under-sand impure water that solely exists at rainy times ([Plate 1](#)).

All the study sites are occupied by both the early and recent relocates with differential arrival times. Most of them were resettlers who came from different origins. Households with the earlier arrival characteristics since 1948 have more landholding size that also was among the drivers of differential vulnerability. That is because population size, minimum with abundant land at their first arrival, was not like the study time with large family size (around 7 on average). Hence, this condition is imperatively quoted as "First came, the more served." This by itself is an implication of differential vulnerability and inequitable access to assets like landholding and the advanced pressure of rapid population growth. Scholars convergently revealed the instance of decrement in the average size of farmland in Ethiopia because of the combined effect of determinants. The increasing countryside population, the narrowing expansion scope of extra land and sluggish movement to be released from

Characteristic	Category	Frequency	(%)	Mean
Age	20–24	3	1.1	46
	25–29	12	4.2	
	30–34	16	5.6	
	35–39	38	13.3	
	40–44	66	23.3	
	45–49	47	16.5	
	50–54	46	16.1	
	55–59	17	6	
	60–64	23	8.1	
	≥65	17	6	
	Total	285	100	
Family size	1–3 members	24	8.4	6.76
	4–6 members	109	38.2	
	7–17 members	152	53.3	
	Total	285	100	
Farmland size in hectare	0.125–1.00	3	1.1	3.43
	1.01–2.00	132	46.3	
	2.01–5.00	109	38.2	
	5.01–10.00	34	11.9	
	>10	7	2.5	
	Total	285	100	
Educational status in grade level	Illiterate	94	33	
	FAL	29	10.2	
	Grade 1–4	71	24.9	
	Grade 5–8	59	20.7	
	Grade 9–10/12	28	9.8	
	Certificate/TVET	1	0.4	
	Diploma	3	1.1	
	Total	285	100	
Current marital status	Married	254	89.1	
	Unmarried	1	0.4	
	Widowed	22	7.7	
	Divorced	8	2.8	
	Total	285	100	
Sex	Male	258	90.5	
	Female	27	9.5	
	Total	285	100	
Presence of migrant family members	Yes	58	20.4	
	No	227	79.6	
	Total	285	100	

Schematizing  
vulnerability  
perceptions

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**Table 2.**  
Basic characteristics  
of survey  
respondents

**Source:** Modified from [Thomas \*et al.\* \(2021\)](#)

agriculture are the determinants acknowledged ([Kibrewossen \*et al.\*, 2017](#)). Most of the land acquiring ways in Ethiopia are pursued by the Gamo lowland households except donation and lease. The identified land accessing ways embrace official distribution, from the government during the resettlement scheme, taking one's share from the family, inheritance from parents and renting either from relatives or neighbours. The leading acquisition strategies in rank were resettlement, official distribution and taking shares from families with 36.8%, 29.5% and 16.1%, respectively, among others.

For survival, the households have been engaged in diverse livelihood activities. The lion's share goes to farming where both crops and animals were being farmed in a

**Plate 1.**  
Field observations on  
water tragedy in  
Tentelle Kebele

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**Source:** Field photo (2020)

subsistence mixed modality by the respondents exceeding 97%. Coincidentally, the investigation of [Kidane et al. \(2019\)](#) shows such agricultural activities as basic livelihood sources. Above 90% of the respondents rear various domestic animals with differential ownership sizes. This subsector helps to build community resilience in the study *kebeles* as animals are the mainstay of people. On average, the Gamo lowland households owned slightly above two oxen and cows while their possession was below two for the heads of bulls, heifers, and calves as components of bovine families. Livestock farming in the areas also comprises smaller ruminants whose value is highly weighed to stand against vulnerabilities to food and livelihood insecurity. During hard times that enforce people to sell their animals, the people mostly prioritize selling these animals before the big ones (cattle). Goats and sheep are dominant under such cases.

#### *4.2 Community perceptions and understanding of vulnerability in the Gamo lowlands*

In the setting of the investigated Gamo lowlands, the local communities had diverse perceptions and understanding of vulnerability. The existing environmental and socio-economic conditions dictate households' vulnerability expressions. Communities' perceptions and understandings of vulnerability were varyingly described. In the study households' context, vulnerability was perceived and understood as exposure to drought, rainfall inconsistency, the prevalence of animal diseases, livelihood and food insecurity, as well as poor income, were commonly described with higher frequencies among the others. People's vulnerability expressions varied per their differences in the living standard and resource possessions. For instance, those who owned ample farmland size did not recognize landholding-related problems as part of their vulnerability.

Perceiving exposure to drought hazard as rural vulnerability is identified by the vast majority (98.9%) of the households. In addition to examining the perceptions and understanding of households' lowland vulnerability, the survey incorporated investigating what the households were vulnerable to. In the study sites' setup, 11 sorts of vulnerabilities to what households have been predisposed were provided to respond. Namely, exposure to drought, flood, landslide, human diseases, animal disease prevalence, animal death, crop failure, livelihood insecurity, food insecurity, environmental degradation and crop pest were the basic items for which the households expressed their vulnerability attitudes. Likert scale, "the summated scale" alternatively ([Kothari, 2004](#), p. 84), was used to analyze households' attitudes on the provided multiple vulnerability perceptions and understanding

alternatives. The considered Likert items are presented in [Table 3](#) with the overall scores generated by SPSS. The figures in the table show the different numbers of responses to different scales. Reliability analysis was conducted to check the similarity of average scores for the items via which the survey questionnaire reliability is ascertained. The item statistics of the generated Cronbach's alpha showed fairly similar average scores without a lot of high or low value that demanded no removal of any item. The other data collection tools were used to validate the survey.

To reach the overall scores of respondents' vulnerability perceptions and understanding tabulated above, the IAA was used. To show the extent of households' vulnerability expressions, the average value for each Likert item was considered. As indicated in [Kothari \(2004\)](#), the favourability and unfavourability of respondents' vulnerability expressions are determined based on their overall score of responses for each item. Accordingly, those households whose overall score was above 33 were in a position of expressing vulnerability favourably. This indicates that 276 or 96.84% of the households were found in this position. The others were identified with low scores below 33 (seven households) whose vulnerability expression intensity was discriminated as low, and the remaining two households were found at the neutral status per their score of 33. This was indicative of their undecided position to show their opinions on vulnerability perceptions and understanding. The decided positions of households' vulnerability expressions and understanding were based on the sum of scores for the 11 items with the highest expected score of 55 per the Likert scale with five-point options assigning 5 for the high score to represent the high intensity, and 1 for the low score for the low intensity of vulnerability perceptions and understanding. The cut-off value was 33 per the number of the accounted Likert statements ([Table 4](#)).

#### 4.3 Addressing the gaps of vulnerability assessment

Descriptively, the frequencies of responses for the provided alternatives of households' vulnerability perception and understanding are summarized and schematized in two vulnerability perception pathways (VPP). This was found important for investigating the

S. no.	Likert items (Vulnerabilities people were exposed to)	Likert scale					Total score
		Strongly agree (5)	Agree (4)	Undecided (3)	Disagree (2)	Strongly disagree (1)	
1	Drought hazard	56.5%	43.1%	0.4%	0%	0%	100
2	Flood	11.2%	20%	16.1%	29.9%	22.8%	100
3	Landslide	13.3%	11.6%	18.9%	31.6%	24.6%	100
4	Human diseases	30.5%	45.3%	22.8%	0.4%	1%	100
5	Animal disease prevalence	42.1%	50.5%	3.5%	2.5%	1.4%	100
6	Animal death	32.4%	38.2%	9.1%	17.5%	2.8%	100
7	Crop failure	55.4%	34%	6%	3.5%	1.1%	100
8	Livelihood insecurity	43.5%	43.5%	6.3%	4.9%	1.8%	100
9	Food insecurity	52.4%	40.7%	2%	4.2%	0.7%	100
10	Environmental degradation	6.7%	55.4%	15.1%	13%	9.8%	100
11	Crop pest	31.9%	38.9%	10.9%	17.2%	1.1%	100
Average score		35	38	10	11	6	100

Source: Survey data, 2020

**Table 3.**  
Descriptive statistics  
of households'  
vulnerability types  
considered as the  
Likert items and their  
scales

weight of severity for the existing conditions. With varying degrees and frequencies, eleven vulnerability parameters were commonly expressed by the households. The schema in Figure 2 shows the summary of people’s vulnerability extents for the identified predispositions. In the schema, responding to some of the basic vulnerability assessment questions as the considered gaps to be filled were taken into account. Three of these five questions were treated based on the survey responses of drought-vulnerable lowland households and additional inputs from the key informants.

4.3.1 *What is the extent of vulnerability?* Drought-vulnerable lowland community-based response is outlined in the schematized pathway. This is an attempt made to address the practical question in the literature looking for an answer, namely, “what is the extent of vulnerability?” (Moret, 2017, p. 7). An effort has been exerted to systematize the results of the survey questionnaires provided to the households. The findings on households’ vulnerability perceptions and understanding are collected from the SPSS outputs and presented schematically by the illustrated two pathways. To understand the communities’ vulnerability perceptions and extents, it is demanding to follow the respective arrows that have differentially contradicting origins and implications.

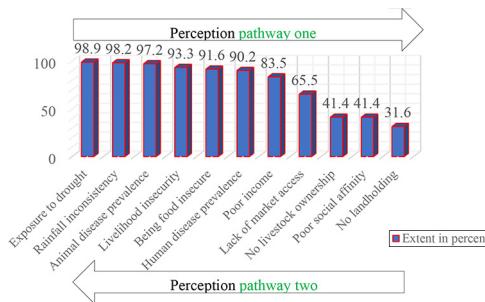
The first pathway indicates how the vulnerability is perceived in the context of drought-affected lowland people. Throughout the pathway, the perceptions and understanding of households towards vulnerability are stemmed basically from susceptibility to drought hazard and its corollaries. Except for a few of the respondents, most others prioritized and iterated drought hazard along with its recurrence in their expressions about vulnerability perceptions and understanding. This finding agrees with the local Zimbabwean farmers’ understandings wherein vast majorities (91.9%) prioritized the drought hazard while expressing their perceptions of the changing climate (Mashizha *et al.*, 2017). Besides, rainfall

**Table 4.**  
Households’ vulnerability perceptions and understanding positions discriminated by item analysis approach

N	Overall score of the Likert items	Decided positions of vulnerability expression	(%)
276	>33	Favourable	96.84
7	<33	Unfavourable	2.46
2	=33	Neutral	0.7
Total 285			100

Source: Survey result, 2020

**Figure 2.**  
Schematic pathways of vulnerability perceptions and extent7

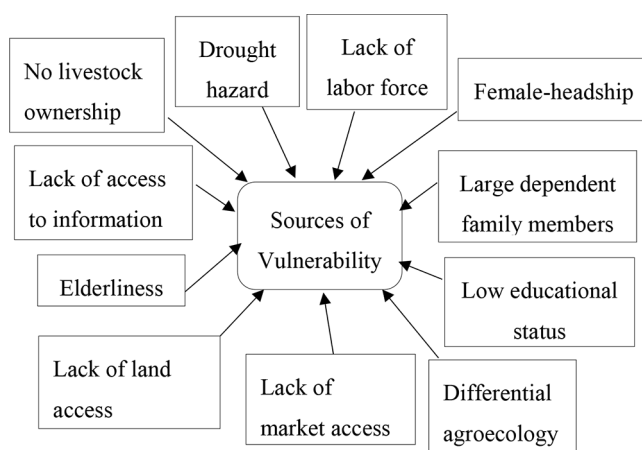


Source: Survey result (2020)

inconsistency, the prevalence of animal diseases, insecure livelihoods, exposure to food insecurity and human disease prevalence were among the common indicators of communities' consciousness about vulnerability showing the degree of exposure. Across the pathway, the magnitude becomes lessened, for instance, poor sociality and landlessness were not severe problems in the study areas for the majority of the households.

Pathway two delineates the fact that from its initial areas toward its course, the extent of existing problems people perceive as vulnerability becomes worse and worse. Generally, the VPP imply differential extent of vulnerability perceptions based on the existing socio-economic characteristics from the lesser restraint of landholding to the severe drought exposure. This is easily understood by contouring across the contradicting courses of the pathways indicated by the arrows. The arrows indicate the degree of increment or decrement of the constraints and what actions to prioritize for tackling the problems by all the concerned bodies including the victimized households.

4.3.2 *What are the sources of vulnerability? "First came, the more served" notion.* In the study areas, the land is the crucial physical asset that dictates households' vulnerability extent. As elaborated earlier, almost all of the study population were resettled communities with varying origins and arrival periods. During these arrival variations, the dynamics of the human population with incremental indicators at destinations was another determinant of access to landholding size. The notion "First came, the more served" is found to be a fitting instance and expression of the condition in terms of land ownership. The earlier occupants who began holding in the modality of *mootta* (land owned/later inherited by highland households/family members at lowlands before the current permanent settlement), for instance, in Mirab Abaya district *kebeles* enabled the households to own ample landholding size up to 19 ha. Additionally, most earlier occupants have large farmland possessions in Dugana Gamero and Tentelle rural *kebeles* of the Boreda district. When examined watchfully, most of the sources (Figure 3) incline to multiple classes of livelihood resources that are not equally accessed by the sampled respondents. Such unequal access to resources among societies is asserted as a factor of differential vulnerability in line with examining climate change impacts (Thomas *et al.*, 2019).



Source: Survey result (2020)

**Figure 3.**  
Sources of  
community  
vulnerability in the  
Gamo lowlands

Consistently, the poor markets and shortage of fertile land are among the concluded dynamic pressure factors that drive people's vulnerability to drought hazards in the light of the recently modified pressure and release model (Hamis, 2018). These findings are among the theoretical association indicators of the disaster crunch model used in this study. Gender, which mainly focused on female-headship and age on elderly people and their especial predisposition in this study, was also incorporated in the dissemination of HelpAge International (2013). These are identified among the culprits of vulnerability that agree with the Gamo lowland context.

*4.3.3 Who is vulnerable?* The people resettled at the study areas originating from differential agroecology were found vulnerable to varied socio-economic problems and the drought hazard. This condition is accounted as an answer for the question commonly posed in the vulnerability assessment seeking a response. The question is "who (or what) is vulnerable to what?" (Food and Agriculture Organization of the United Nations Rome, 2015, p. 1). Such a happenstance was widely observed at the Dugana Gamero *kebele* where many highlanders from the cold climatic conditions of Chench, Kogota and Dita districts were resettled and became vulnerable to the contradicting lowland climate and its resultants like malaria prevalence. Consequently, many households returned to their original abodes within few weeks of the 2003/2004 resettlement scheme not achieving the intended food security assurance (Asrat, 2009).

Besides, key informants and informally contacted community members added that especially for the old-aged and female-headed households with no relatives and responsible supporters, vulnerability with multiple modalities was severe. Across the study areas, such vulnerable sorts of people depend on the supports of others, churches and governmental social protection strategies like the productive safety net program as direct beneficiaries. For these sections of the community, the capacity is weak to stand against the facing challenges like food shortfalls, human and animal diseases, recurrence of drought hazard and its impacts and others. This finding coincides with what Hamis (2019) claims on the decisiveness of people's shock withstanding capacity for economic vulnerability in Tanzania among other things. The other scholars Dasgupta and Badola (2020) also concluded the necessity of vitally investigating the issues of who is vulnerable and the extent of vulnerability for what the aforementioned endeavours are the responses considered.

#### *4.4 Investigating the characteristics of vulnerability: is vulnerability differential or uniform?*

The ontological characteristics of vulnerability are found pivotal in the current debates on disaster management. The intention is to explicitly investigate the contradicting attributes of vulnerability in static features and dynamicity in terms of the referential targets (Orru *et al.*, 2021). In this study, furtherly to explore the characteristics of vulnerability, that is the uniform or differential idiosyncrasy of vulnerability, the question "Are all households equally vulnerable to hazards and the related adversities?" was forwarded to all survey respondents. Consequently, the idiosyncrasy of community vulnerability in the Gamo lowlands is identified with two characteristics, namely, differential and uniform. In the survey result, 96.5% of the respondents stated the fact that rural vulnerability is differential as all households were not equally susceptible to the existing socio-economic shackles. The identified causes for this status were investigated in detail and presented in consideration of the profile of drought-prone lowland communities. Accordingly, the leading six factors of households' differential vulnerability were the strong capacity to resist hazards (77.9%), better/diversified income (71.7%), large livestock ownership (45.7%), large landholding (35.9%), large family size (33.2%) and strong social institutions (32.2%). This finding is

cognate to the claims of [Muttarak and Lutz \(2014\)](#) and [Diderichsen \*et al.\* \(2019\)](#) which state the unequal vulnerability of all humans to climate change impacts and health-related risks, respectively.

Though with decreasing degrees, other drivers also contribute to varying vulnerability. The low dependency ratio (28.7%), small family size (23.9%), male-headship (15.6%), no marginalization (15.6%), better access to water (13.8%) and no problem of good governance (6.2%) in this regard have the additional weight for unequal community predisposition. Participants of key interviews and FGD also strengthened this scenario as the households were unequally vulnerable. They differed in their capacity (asset ownerships) that helps them better withstand or make them easily exposed to the facing vulnerabilities. On the other side, some respondents expressed uniformity of vulnerability ([Table 5](#)). Each of the response categories and sub-contents specifically accounts for the combination of agreements expressed by the households. The summed values of the response categories in percent are 90, 80 and 50–70, respectively. These categories are outlined based on the summarized responses of the households. The priority was given to the higher iterations for the provided multiple responses.

Generally, the households' vulnerability characteristics are found cognate to the concerns of the theoretical perspectives embraced in the study. For instance, the disaster crunch and the BBC models were found supportive of the households' differential vulnerability characteristics. The dynamic and unique features of the models that address the relevant issues in the study areas exposed to drought hazard and socio-economic vulnerabilities are among the proves. The PMT on the other hand is an appropriate tool to examine drought risks in the light of the transient climate. So, entirely, all the incorporated theories are of a crucial role to enhance the rural resilience building in the Gamo lowlands and other areas with analogous context.

## 5. Conclusion and future concerns

This study was conducted to schematize households' perceptions and understanding of vulnerability in the drought-prone rural lowland setup. The Gamo lowlands are exposed to multiple intertwined vulnerabilities for what the people have varied perceptions. Communities' vulnerability perceptions and understanding widely encompass the existing context. Among, people's predispositions to drought hazard, inconsistent rainfall, poor income, food shortfalls and insecure livelihoods have been commonly discoursed. Also, the animal and human disease prevalence, lack of livestock, landholding and market access and poor sociality were the other vulnerability manifestations. For the vast majority of the households, vulnerability is differential idiosyncratically.

Category 1 (90%)	Response categories Category 2 (80%)	Category 3 (50–70%)
Low living standard	Low educational status	Oldness
High dependency ratio	Lack of livestock	Female-headship
Lack of good governance	Lack of water (drought)	Backward cultivation method
Inhospitable environment	Capacity difference	Lack of market
		Large family size
		Small family size

**Table 5.**  
Categorized causes of uniform vulnerability in the Gamo lowlands

Source: Survey finding (2020)



Across the Gamo lowlands, the female-headed, old-aged and large-sized households with no supportive forces were disproportionately vulnerable. The vulnerabilities originate from a myriad of sources. The combined effects of drought hazard, elderliness, lack of labour force, female-headship, large dependent family members, low educational level, differential agroecology and lack of market and information access are among the sources. So, the study results are important as they indicate the existing vulnerabilities and people's perceptions signalling the intervention areas to build the communities' capacity. This condition agrees with one of the prioritized areas of the Sendai framework of 2015–2030, specifically, resilience-building achieved via disaster risk reduction strategies. Furthermore, due inputs might be harnessed from the results for disaster/vulnerability assessment and management advocating theories. This way, the existing theoretical lacunas and implications for the other geographies would be featured.

For better resilience, enhancing people's perceptions and understanding of vulnerability via continuous awareness creation is recommended as the majority was lowly educated. Also, access to market and water, more drought coping strategies and ways how to make the large-sized dependent family members as a remedy of vulnerability rather than becoming its cause still seek the strong commitment of the concerned bodies. Additionally, the existing socio-economic and environmental circumstances urge for revisiting the policy-related interventions pursued by stakeholders in the drought-prone rural lowland areas to properly build resilience.

The study was a community-based cross-sectional survey conducted at one time. Mostly, the vulnerability assessment issues such as investigating the perceptions and implementations tied with food and livelihood security shortfalls demand a repeated visit. So, in other geographies, similar assessments are welcome with the research designs that allow iterative accommodations of rural vulnerability parameters. In a nutshell, such issues deserve to receive the appropriate attention by stakeholders to attain the sustainable development goals per the situations of the vulnerable rural communities.

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