

INDIGENOUS KNOWLEDGE FOR RESILIENCE AND ADAPTATION IN PASTORAL PRODUCTION SYSTEM OF SOMALI REGIONAL STATE IN ETHIOPIA

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ABSTRACT

The study attempts to highlight the importance and opportunities of indigenous knowledge for resilience and adaptation of the pastoral production system in the Sheygosh woreda of Somali region of Ethiopia. The study used data from primary and secondary sources. The primary data collected through key informants, focus group discussions, observations, ranking, and life history. The study highlights the fact that indigenous knowledge for resilience and adaptation contributes to reducing of vulnerability results from climate variability and also plays a critical role in adaptation, mitigation and coping with hazards and shocks in the past time. However, due to recurrent hazards and prolonged shocks and climate change, the use of traditional knowledge of coping mechanisms are under tremendous threats and will not be viable and sustainable in the coming years. In conclusion, the indigenous knowledge in the pastoral community deserves to recognize and support in view of their coping with, adapting to and withstand to hazard and climate chance. Thus, it needs to integrate in policies of the country.

KEY WORDS

indigenous knowledge, resilience, adaptation, pastoral, production system, Ethiopia

CLASSIFICATION

JEL: Q15, Q56, R14

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BACKGROUND AND JUSTIFICATION

Pastoralism system is and has been practiced in many regions of the world for centuries [1], and plays a significant role in conserving of natural and environmental capital [2]. According to [3], it is widely accepted that livestock production system is a rational economic enterprise in the pastoral communities.

Worldwide, pastoralism supports about 200 million households and herds of nearly about a billion head of animals such as goats, cattle and camels [4] and occupies a quarter of the world's land area which is predominantly arid and semi-arid lands and supports millions of pastoral households in which 60 % are living in Africa [5, 6].

According to CSA projection population [7], Ethiopia is the second most populous country in Africa, and one of the continent's largest areas. Ethiopia has the largest livestock population in Africa [8, 9]. Based on livestock and livestock characteristics assessment carried out by CSA in mid-2014/2015, this sector substantially has been contributing the economic development of the country in both products and by-products forms. According to Mulu [10], pastoral areas in Ethiopia covers more than 62 % of the country's land mass. As S. Desta [6] pointed out, that means that two thirds of the land mass of the country support 12-15 % of the country's human population. However, this area with livelihood system has been faced a continuous drought, conflict and famine for the last decades [11].

In this regard, the Ethiopian government has initiated several developmental projects in the pastoral areas to address pastoral problems which adversely effects on growth and economic development of the country. These projects include Pastoral Forum of Ethiopia (PFE) et al. [12], South East Rangeland Project (SERP), Pastoral Pilot Project, Pastoral safety net Programme (PSNP), Pastoral community Development Project (PCDP) and others implemented by NGO's such as Pastoral Livelihoods Initiative (PLI) I and II, Revitalizing Agricultural/Pastoral Incomes and New Markets (RAIN), Pastoralists Areas Resilience Improvement through Market Expansion (PRIMA) and so on were directly concentrated on two key pillars of disaster risk reduction fundamentals, namely minimizing of vulnerability of pastoral communities and maximizing of resilience and adaptive capacity to hazards and climate variability.

Despite enormous efforts exerted towards improving the pastoral livelihoods as a vital system in the drylands of Africa in general and particular in Ethiopia, the outcomes of these program/projects as Hogg [13], pointed out was insignificant and little have done to increase livestock production and productivity or to change the quality standard of pastoral peoples. Several reasons have been pinpointed for this poor performance, include neglecting of the indigenous knowledge, socio-cultural and ecological aspects of the pastoralist, ignoring of indigenous social structure and low level of participation of local knowledge in their design [13, 14].

Nevertheless, it is time to invest in pastoral production system reasonable manner – in terms of research, and financial – in order to reduce vulnerability to hazards, climate variability and other external human-induced disasters, and to enable the pastoral production system to be a more productive system and sustainable livelihood. The study, thus, examines indigenous knowledge and its role in building of risk minimization strategies.

CONCEPTUAL FRAMEWORK OF THE STUDY

The conceptual framework is the system of collective concepts, assumptions, expectations, beliefs, and theories that support and guide the research goals and it can be a graphic or in narrative form. Based on that, the conceptual framework of this study is based on the ideas of resilience and adaptation theory with additional input from Sustainable Livelihood Approach,

as Figure 1 shows. The ongoing discussion on climate changes and hazards of the pastoral traditional system is also considered. Therefore, the conceptual framework of the study attempts to connect to all aspects of inquiry include problem and questions, purpose, literature review, methodology, data collection and analysis.

The conceptual framework indicates that the pastoral traditional system has characteristics and opportunities for the sustained livelihood in their livelihood system, including resilience, adaptive capacity to hazards and coping mechanism with their environment. At the same time there are internal and external threats to the persistent of pastoral production system. These factors are mainly vulnerability factors and risks elements of the pastoral production system, notably social network aspects and social protection supports, economic and political dimensions, and ecosystem and environments.

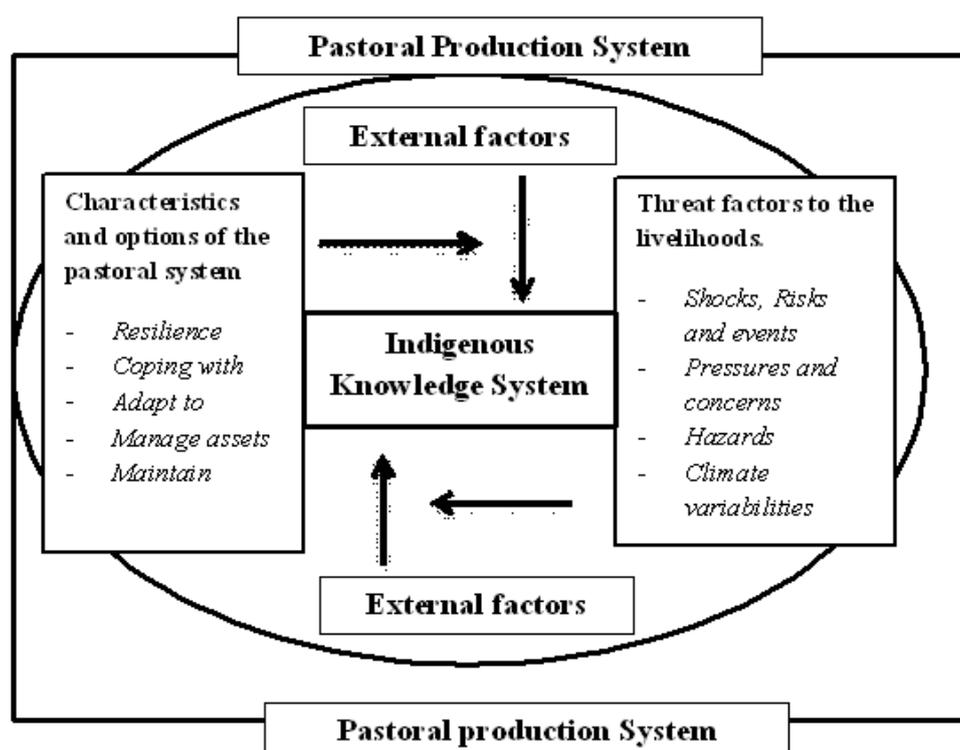


Figure 1. Conceptual framework of the study.

DESCRIPTION OF THE STUDY AREA

The Somali Regional State (SRS) is one of the nine regional states of the Federal Democratic Republic of Ethiopia (FDRE). Geographically, SRS is the second largest in the country. It covers a total area of 350 000 km². According to the last Population and Housing Censuses in 2007, the regions' population is estimated about 4 439 147 million [9]. In 2013 an unofficial projected population census produced by regional Bureau of Finance and Economic Development (BoFED), the population of the region is projected about 5,3 million. The region has 9 administrative zones which encompass up to 68 districts and four administrative towns or councils and more than 780 centres/*kebeles* [14]. It borders Djibouti to the north; Somalia to the east and northeast; Kenya to the south; Oromiya Region to the west and Afar Region in the north-west, Figure 2.

METHODS OF DATA COLLECTING

The study attempts to employ one of the most effective methods for information gathering from the community those deemed to have enough knowledge about what the study attempts

to address. The method for data collection includes a gender responsive participatory approach based on the understanding that men and women have different indigenous knowledge regarding to their locality context. The study used primary data collection such as 3 Focus Group Discussion; 4 Key informant interviews including government staffs, and women and youth offices and direct observation. Also the study used secondary data collection, such as, from available documents, books, journals, official reports, e-books and all possible knowledge sources and hubs.

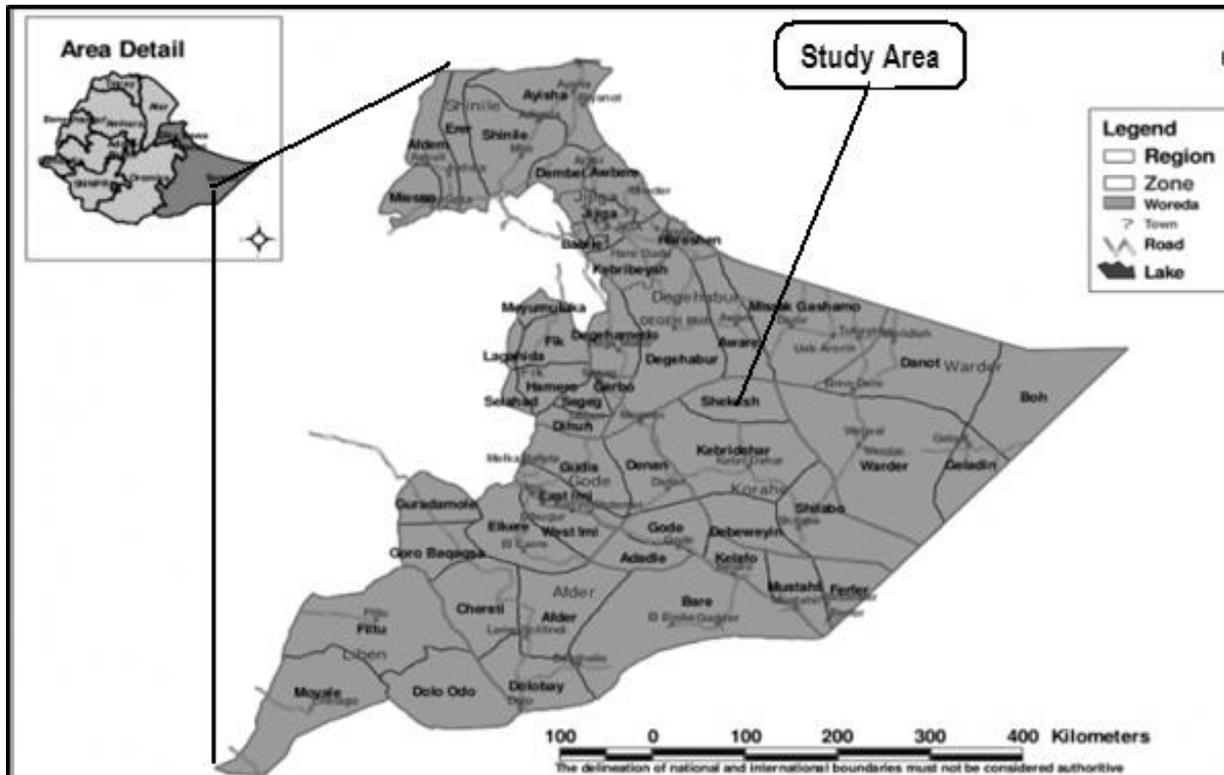


Figure 2. Map of the study area [14].

DATA SAMPLING TECHNIQUES

The study uses qualitative methods to answer the questions of the study pertinent to what, why and how, in understanding of human behaviour, opinions and experiences, they have or practiced in his environment. Sampling selection of the study uses is a purposive sampling method. The rationale behind or using this method is to interview a knowledgeable and competent traditional elder who have the required criteria according the study approach. Therefore, the case study was conducted in purposively selected Sheygoch *woreda* and four *kebeles* namely, Raad dooyo, maro-guduudsi, *kebele* 10 and *kebele* 02 from Sheygoch *woreda*. The *woreda* is predominantly pastoralist, but due to recurrent hazards the *woreda* has recently become agro-pastoralist livelihood.

In this case, the study systematically employs a number of techniques including Participatory Rural Appraisal (PRA), because the growth of PRA as a technique has seen a proliferation in social research of its application and use.

METHODS OF DATA ANALYSIS

Data analysis and process starts by understanding and describing the overall situation. In order to analyse the data collected from field appropriate methods, instruments and procedures used. A qualitative data analysis method used to analyse the data. From the

qualitative data analysis methods thematic and content based techniques also used. Finally, all data obtained from documents, interviews and questionnaires triangulated in order to properly answer the essential research questions and postulates proposed by the study.

RESULTS AND DISCUSSION

PASTORAL PRODUCTION SYSTEM IN SHEYGOSH WOREDA

Pastoralist production system everywhere on the earth their live heavily derive from livestock products and by-products by consumption or by sales [15]. In Ethiopia, livestock production is the main source and asset of the income for pastoralists and agro-pastoralists, also the sector considerably contribute to the country's GDP [16, 17].

Somali Region has the largest area and the most population of Ethiopia's dry land pastoral area [18]. Livestock production sales constitutes up to 50 % or more of all their income. Population of the region is categorized into a pastoralist which is majority, agro-pastoralists, pure farmers, and about 14 % of urban population [19]. The region has about 17 food economy zones or livelihoods system. Among of these, eight are categorized as a pure pastoralist, whereas six are agro-pastoralist and only three are pure agricultural [18]. Livelihood based-livestock rearing is the dominant way of life of Somali region pastoralist. Livestock production system is the mainstay of pastoralists' livelihoods throughout the region.

Pastoralists of the Somali regional locate in dry land and harsh environment characterized by water shortage and pasture due to recurrent droughts, land degradation, other human-induced shocks. In turn, the pastoralist production system in the region becomes increasingly vulnerable to hazards and gradually loses its resilient and adaptive capacity of the traditional pastoral system.

The livelihood transforming has triggered the trend of hazards and shocks in the *woreda*, which generates a number of unwilling options of livelihoods. The livelihood systems in which people in the *woreda* depend as group discussants confirmed are traditional pastoral production system, agro-pastoralist, petty trades, daily labour and others (temporary work).

The pastoralist in the *woreda* depends on two types of livestock production. First type comprises products and by-products such as milk, meat, cheese, and butter supply to the local market on weekly or daily basis. The second type is livestock itself; sale animals, hides and skin through local market on a need basis.

According to the agro-pastoralists or semi-sedentary, they derive their livelihood from animal products and by-products (at low level) and partially from farming system which is rain-fed system. However, as Figure 3 indicates, about 75 % of the majority people of Sheygoch *woreda* depend on livestock production system, while sizeable numbers 15 % of population is agro-pastoralist. About 10 % are deriving their income through daily labour, such as construction activities, donkey cart and other daily activities. The majority of this group are ex-pastoralists or drop-out pastoralists, those who lost their assets and property and subsequently migrated to the villages and towns. Only 2 % are engaging in trade and business related activities, such as food staple, clothes, normal shopping, restaurant, *chat* and other private activities, while 3 % work in temporary and occasional opportunities including trees cutting and wood collection, charcoal burning etc.

CHALLENGES OF PASTORAL PRODUCTION SYSTEM

Pastoral production was an oldest livelihood and overriding system which Somali community depends on it a long period of time. As focus group discussants confirmed, this system was traditionally strong and manageable and people were genuinely proud for being pastoralists. However, currently the traditional pastoral system practicing is declining and gradually losing

Livelihood types and income sources

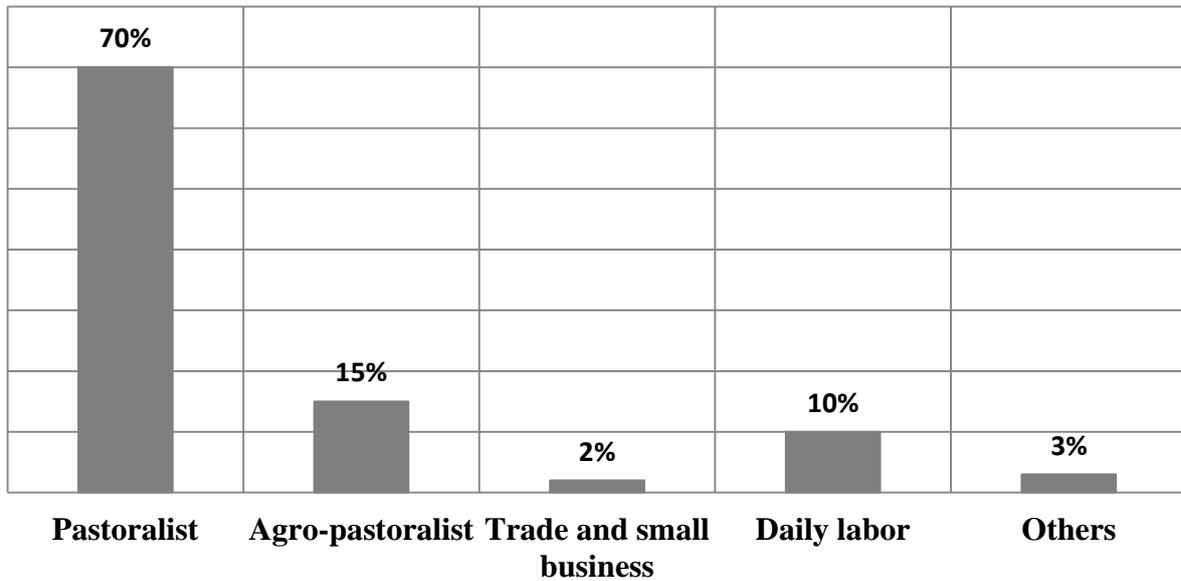


Figure 3. Livelihood types and income sources. Source: Focus Group Discussions.

its cherished possession. Several reasons attributed by community to the underlining causes of decreasing of practicing of pastoral production system. The main roots of challenges is summarised further in the text.

Recurring Drought: Drought in the pastoral area is a climatic-phenomenon. According to key informants and experts, the drought trend of severity and frequency is doubled recent years. As a result, drought has adversely affected on the pastoralist production system by disrupting income source, trade and value chain, social structure network and valued norms, ecosystem and natural resources and overall of livestock production and by-products. A number of studies conducted showed the significant impact of drought on the livestock production system in lowland. Their findings revealed that during drought livestock population and production had decreased dramatically (Fasil et al. as cited in [20]).

Disclose new alternative of livelihoods: Somali pastoralists dating were professionally practicing the pastoral system dating back thousands of years. This system was the dominant livelihood in region’s inhabitant. However, the respondents observed that due to the recurrent and prolonged hazards people attempt to look for another livelihood option which is better and more sustained rather than fragile pastoral system. Among of them had introduced a mixed system namely, agro-pastoralist, petty trade and other activities. All these new alternative activities reduced partially pure pastoral production system.

Better education for children: The number size of pastoralist family is a considerable important, even in some parts the big family is considered as a part of wealth characteristics. Although the pastoralists have an old system of learning of children for Koranic education and other Islamic teachings *duksis*, which is based on mobile schools, but when government has introduced informal and formal education in the pastoral areas such as alternative basic education (ABE) and mobile education, it has changed their perception toward the role of education. Based on that, pastoralist households those have sizeable number of children, splits into two; some of them send to their relatives in towns in order to obtain formal education, and some of them remain with family to care take animals.

Restriction of movement and mobility: The most important mechanism of pastoralists is the mobility both during dry and rain seasons. The mobility meant to the pastoral context a search of pasture and adequate water for their animals and trade and food supply for human. However, any restriction action and limitation of pastoralists' movement is heavily paralyzing of their livelihood and food security. The major restrictions that pastoralist complaint includes, livestock trade cross border, which government labelled an illegal trade or contraband action, rangeland degradation by the name of exploration /investments, increased sedentarisation due to proliferation and investing of huge dams and water catchments in rangelands and security restriction. All these factors and others not mentioned here have triggered the weakness of the pastoral production system.

Migration from rural to urban area: Migration from rural is a new phenomenon relatively in the pastoral area. This phenomenon span is about a decade. Many factors underlining the migration include, looking a better life, distraction, security aspects, family conflicts etc. However, the majority of these migrants is young generation and is considered the mainstay of households. The migration of this category of generation is indication of desperation and the beginning of the end of collapsing of pastoralist household structure.

Low basic service delivery and social protection: The frequent drought and shocks in the pastoral areas forced to the pastoralists to be a more reliant on government and NGO supports. However, although many basic services and social protection projects and programs have been implemented in a vast area of pastoralist localities, still the pastoralists claims more to do in safeguarding of their assets and livelihoods in the face of the climate variability.

Moderation and change of mindsets: Though the pastoral production system is an old livelihood system based on strong values and traditional norms, but many pastoralists start to change their attitude towards this livelihood system, thinking that pastoralists is a backward system not compatible with the new life and the sophisticated civilization. Eventually, they categorized the pastoralists' community as a backwardness society. And they believe pastoral production system is taboo issue and people exclude them from the existence.

Increase of bad habits which are an exotic in Somalis pastoralist values and norms: The proximity between urban and rural communities generates a number of interactions and sharing of values, whether it is a bad habit or a good conduct. It was observed that many male pastoralists (at all levels) chew *Khat (Catha edulis)* and smoke cigarettes. These two habits were unusual in the pastoralist communities. However, practicing these bad habits on a daily basis (addictions) has negative consequences and rapidly deteriorates the household incomes and their assets, creating in many situations the social problems in families, such as a breakdown.

INDIGENOUS KNOWLEDGE FOR RESILIENCE AND ADAPTATION

INDIGENOUS KNOWLEDGE OF RESILIENCE

Resilience in the new paradigm of disaster risk reduction is defined as the capacity of a community, society or system to resist potentially to hazards in order to pursue the existing functioning or to maintain an acceptable level of new functioning and structure [21]. However, according to the group discussion, the resilience-locally refers to *adkeysii* opposite of vulnerability *nugul* – for the pastoralist means the ability to resist and to recover from hazards and risks occur in their locality. This resilience traditionally is classified into four main categories, the first resilience of human/herder, the second resilience of the pastoral community social network, third resilience of livestock, and the fourth resilience of ecosystem/habitat.

RESILIENCE OF PASTORALIST/HERDER

Broadly speaking, for the long time, the pastoralists were strong enough *Lihin* and capable to adapt to all tough conditions. Despite, the hunger and thirst, at the same time they are proud of their tedious and tiresome work under hard circumstance. They used to exercise their routine activities, such as caring animals, movement, watering livestock, cutting trees for making home equipment and accessories, meetings with elders for information sharing and exchange news on situation and other necessary activities. Another hand pastoralists /herders have high self-assurance and enjoy complete freedom and independence without any stress.

Regarding Table 1, the discussants have attributed to that the pastoralists at the previous time used to drink the fresh milk and eating animal meats. Also, in their habitat has a plenty of vegetation *dihin* suitable for eating with high ingredients of nutrient, fibre and many types of vitamins, which called loosely *Qadhabsi*. In addition to that they have fresh air and clean atmosphere. Result of these positive composition, pastoralist were more healthy, more strong, more resistant to the harsh environment and less strain from external difficulties.

However, nowadays unfortunately, fitness of the pastoralists for exercising their responsibility toward household and livestock is dramatically fading. There are determinant factors for deterioration of the condition to that level, such as recurrent droughts, prolonged shocks and risks and climate variability, the rangeland and forest areas is disappearing and vegetation is shrinking in vast areas of the region. All these combinations result the decreasing of livestock production and by-products, also. This in turn, the physical and mental power of pastoralists adversely has affected. Similarly, pastoralist/herder does not eat adequate food that contains sufficient nutrients. Other political, social and economic elements are associated with the abovementioned factors.

It is important to note here that there is a considerable number of pastoralists practicing some harmful habits which has a negative impact on their health and social interactions, notably the chewing of *Khat* and smoking.

Table 1. Resilience characteristics of pastoralist/herder. Sources: Focus Group Discussions and Key informant interviews.

Characteristic	Detail activities
Dynamism	They have ability to achieve in a day a number of activities in different areas without rest. The main activities they used to exercise such as caring animals, movement or travelling for purchasing stable food, watering livestock, cutting trees for making home equipment and accessories, meetings with elders for information sharing and exchange news on situation and other necessary activities.
Durability	They may walk tens or hundreds of km under harsh climate, rough and roadless, with little of drinking water and food, in order to accomplish a specific task, for instance, when a herder man travels long distances in search of grazing place or water or lost animals or for other reasons.
Desirability	They do their responsible independently with high eagerness, with less control and pressure from outside. Additional to their daily routine, they like to be in frontline voluntarily to participate in all social support activities, for example, in a meeting for sensitive issues, solving of conflicts, collecting of supports for needy people and so on.
Knowledgeable	Pastoralists/herders have knowledge and skills through practical experiences in their environment. They know name of vegetation, terrain, landscape and habitat, type of soil, type of salt, livestock species and diversity, seasonal calendar, weather predicating, traditional healing both human and livestock and so on.

RESILIENCE OF SOCIAL STRUCTURE

Somali society is well-known for its strong social network and relationship. This system is rooted on Islamic principal teaching and old Somali traditional of social structure. The social network system functions in different ranges and has several pillars. Some of them are compulsory, others are socially mandated, and some are individual voluntary-based. The social network considerably contributes building of social capacity, minimizing of vulnerability, sustaining of recovery as well maintaining of social existence. However, the main aim behind this social mechanism support is to promote social relationship, social protection, reduce poverty and vulnerability and to increase social equality. As a group discussants revealed, the main pillars of social structure of Somali pastoral community one can categorize in three sections, as described further in this text.

Section one: Compulsory

Zakat is a form of Islamic social financing system through which required from all better off to provide a certain amount of their wealth or assets (money or livestock or seed crop) to the people in need based on Sharia requirements. This both rural and urban is required equally. This form of social support performs a great in terms of supporting destitute people and gives them a mechanism to govern and recover newly on their livelihood after hazards or shocks.

Section two: Socially mandated

This section of social support network mostly practices in rural communities. The system is based on social or society obligation between community parts in a certain area. This can be a clan based form, or locality based form or other forms of agreement *xeer* which agreed by a specific community. Mainly, this system is not a long time social support system rather than a one-off disposal support, in order to reduce vulnerability and increase of resilience of the needy households. The most acknowledged types of this system are as follows.

Qaadhaan (risk pooling) this system of social network, is used when membership of community commits an action like killing to someone whether it is deliberately (*ula-kac*) or not deliberately (*kama*). In this case, the community automatically paying the *dia* which is a certain amount or livestock (mostly camels) according to Somali customary law (*xeer*) as a compensation of the action. Traditionally, 100 camels must be paid if the victim is male and 50 camels if the victim is female. The terms of the payment type and time and how to collect depend on relationship ties between the paying clan or group.

Xoolo-geyn (unconditioned free gift) is a type of social support network based on free gift. Whenever a member of community experiences sudden shock or loss of livestock or asset, the elders or leaders collect livestock from community and provide with it the destitute *cayd* who lost all animals or assets.

Dhowrto (surplus milk stored): This type of social support is more pro-active and preparedness. The system aims to collect and store the surplus milk in the better time in order to distribute the pro-poor families with no milking animals in the dry season.

Section three: individual voluntary based

Broadly, this section of social support network is based on personal willingness without any pressure from social authority. This type is merely more clan kinship and relative connection basis.

Maalsin or *irmansi* (temporary loan). This is to provide a member of your kinship to lactating animals (cattle or goats) in a loan basis for a period of time. Usually the agreement

is between two individuals. The animals will return when the condition of borrower changes to better or livestock gives birth. *Sadaqah* (almsgiving) is given to all people in need, kinship or not. This can be a form of money, livestock, kind or whatever has a value to the needy person. Obviously, this type of alms giving is unlimited in terms of quantity and the timeframe.

Qowsaar or Raci (livestock care). Poor households arrange their younger or children men during hardship time to look for or herd the better off households to their livestock in order to get food and other benefits as a payment. Based on focus group discussion and key informants, all these religious donations and cultural network supports are common and still practices in the Sheygosh *woreda* particularly in the pastoral community. Unfortunately, with recurrent droughts, calamities, shocks and other associated factors those triggered vulnerability of the pastoral community, the social reciprocal system is increasingly declining and less unfeasible specifically social and individual based, as certain groups may become more disadvantaged than others.

Resilience of livestock. Livestock is the mainstay of pastoralists' livelihood dating back to thousands of years. Based on that, livestock has given highly consideration and priority, in terms of caring, searching for apt grazing, watering, salting, inspecting from diseases by providing drugs, looking for apt grazing and rangeland and so on. Therefore, livestock resilience to diseases, heat, walking to a long distance, interval period for watering and more others were extremely amazing.

The mechanisms and strategies for increasing livestock resilience practice by the pastoral community in Sheygosh specifically and the Somali pastoralists in general are more than to summarize in these pages. However, the pastoral indigenous knowledge in resilience and adaptation (environment, biodiversity, rangeland and vegetation) is priceless knowledge needed to collect and document.

Resilience of vegetation/habitat. The range land is part of pastoral livestock livelihood as pastoralists believe. There is a darling relationship between pastoralists, livestock and their environment due to their proximity. The land is their key asset, makes it possible to use its natural resource. However, as interviewed groups, in previous era the pastoral ecosystem was rich and full of vegetation, has all types of plants, flora, and minerals which suitable for both human being and animals life.

For the last couple of decade, rangelands, forests and all types of vegetation gradually change from fertile lands into a desert land, due to recurrent hazards, climate variability, and other calamities, notably, gully erosion, soil degradation, intensive clearing and cutting of trees. As a consequence, palatable grass species and shrubs in the grazing area disappear, and this in turn, gradual invasions of unusual plants and vegetation drive away edible grazing species which livestock unable to digest or in cases cause unknown diseases or kill livestock. Also, insects, biting flies and infestation increase.

According to Figure 4, the pastoralists resilience capacity over the past decades shown that their anticipative and absorptive capacity to minimize the shocks through planning and preparedness and also their adaptive capacity to respond to situations were effective and strongly reduced their vulnerability and support to their withstand to future events. However, transformative capacity through well-functioning system of disaster risk management is vital and important currently. This transformation for changing and improving of the critical situation faces pastoralists in the region amidst climate change and recurrent hazards required a comprehensive strategy applicable to the pastoral community nature. Though a number of strategies have been put in place, many of these policies were more agricultural-oriented and lack a profound understanding of pastoral community context, and thus eventually the expected results and outcomes completely did not achieve its targets.

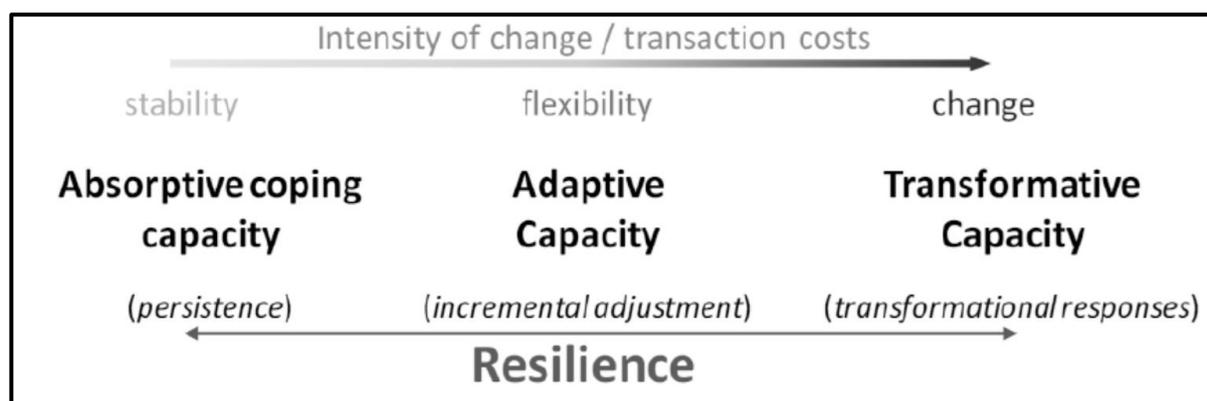


Figure 4. The relationship between three types of capacities for strengthening resilience [22].

Broadly speaking, the resilience situation of the pastoral community in Sheygosh *woreda* is in a brink, in all aspects, socially, environmental, economical. Therefore, unless pertinent mechanisms put in place to address the underlying causes of existing vulnerability, the resilience capacity of pastoralist communities in Ethiopia will not persist and become more collective [23].

INDIGENOUS KNOWLEDGE ADAPTED BY PASTORALISTS IN SHEYGOSH

Pastoral livelihood production in Somali community is subject to hazards and unpredictable shocks. At the same time this community inhabited arid and semi-arid climatic zone which is categorized one of highly susceptible to environment hazard. These adverse climatic conditions have led to be vulnerable and insecure pastoral livelihoods. Therefore, as group discussants discussed, the pastoral community has adapted different strategies and mechanisms in order to withstand in harsh ecology and ecosystem.

According to Sheygosh community, the pastoral community has a long history of resilience and adaptation that practices over years. These strategies rely on mobility and movement, keep herds mixed types, informal social support network system, traditional institutions structure and knowledge reduce consumption of food, diversity of consumption, reducing non-essential spending and local migration and household member splitting and sending to towns and so on. However, these survival strategies are gradually adapted based on priority and importance. For instance, strategies which are most damaging to livelihood of community status or social structures are adapted last such as selling assets, farmlands and other prestige properties [19]. Pastoralists in semi and arid semi environment have the most strong and successful adaptable system among rural population systems [24].

Adaptation strategies practiced by the pastoral community in Sheygosh *woreda* as discussion groups revealed are more. But the common and the most useable in pastoralists to reduce the vulnerability results often from unpredictable and weather variability patterns.

INDIGENOUS KNOWLEDGE FOR WEATHER FORECASTING

Somali pastoralists in the study area have developed their own early warning system based on long-term observation and experience which is highly perceived as a source of anticipating and a tool for decision making. Therefore, in order to understand these weather forecasting traditional indicators, the outcomes of the discussions are grouped in the following sections. The pastoralists have been used various indicators as shown in Table 2.

Table 2. Major indicators use the pastoralists for forecasting. Sources: Focus Group Discussions and Key informant interviews. Key is rank ranging from low (1) to high (5).

S/n	Indicators of weather prediction	Rank by priority based on community discussion outcomes
1	Astral bodies indicators (stars, moon, sun)	5
2	Seasonal calendar	4
3	Fauna (behaviours of livestock, animals, birds)	2
4	Atmospheric indicators (clouds, winds, lighting)	3
5	Flora (behaviours of plants and vegetation)	2
6	Human practices, norm and cultures	1

TRADITIONAL COPING AND ADAPTATION STRATEGIES

Sahan (scouts). *Sahan* (scout) is a major source of information about the weather and climate change, since they are periodically on move in search of better pasture and water for their animals. *Sahan* system also plays a pivotal role on decision making processes on migration patterns. Normally, the assessment include, distance and condition of pasture and water, estimation on how long the fodder and water sustain a given number of livestock, type of fodder and others.

Mobility/Migration (*Hayan* or *keynaan*). Mobility is the key strategic of coping with, adapting to and withstand in the pastoral community to reduce stresses. Mobility is an old existing dynamic system for pastoralists for move in and move out strategy. The mobility of pastoralists with their herds is well pre-planned and enough consultation with the elders in that locality. Before movement start, a few respected and knowledgeable men sent to survey areas which are expected to have better forage, free from insects and biting flies and suitable for residing. If a survey team finds a better place, *Sahan* marks the area and immediately informs the elders to move in the direction of the new location.

According to the group discussion results, the pastoral community practices mobility over decades as a risk minimize and adapting mechanism strategy to hazards.

Splitting of Herds and Families. During dry period when the access and availability of pasture and water deplete, pastoralists split their herds and families into different locations. Splitting of herds and families is one of the coping and adaptation strategies in order to reduce adverse impacts of hazards. The splitting of herds and families depends on the types and condition of animals and labour availability and requirement for those particular animals in particular location.

The splitting of herds and families are risk reduction mechanisms that have been practiced for long by pastoralists. Animals may be kept in several different areas which reduce the effects of localized droughts, and disease outbreak.

Eating wild trees (*Qadhaabsi*). During severe droughts people used to consume wild trees those have fruits or seeds as an alternative of stable food because of food deficiency. The common tree is *Garas* (tree species *Dobera Glabra*). This tree has seeds similar to beans seed and is evergreen tree. Before eating they dry under sun then kept/stored for household consumption throughout drought time.

Land closure. Although closure or preserving land for grazing purpose was not commonly known in the study area, but for the last couple decade people were seen practiced in this type of coping particularly agro-pastoralists communities. The intention behind is to create a fodder bank for the use in drought time to mitigate the adverse impact of the drought on animals. This kind of land closure pastoralist termed on *Jarmi*.

CONCLUSION AND RECOMMENDATIONS

CONCLUSION

The objective of the study was to explore the existing indigenous knowledge in pastoral livelihood system for resilience and adaptation used by communities in Sheygosh *woreda* as coping mechanisms to response hazards threat to their livelihood and environment. The Study found that pastoral production system is still the dominant livelihood in Sheygosh *woreda* for about 75 % of population. Nevertheless, the new move to agro-pastoralists is an alternative livelihood for nearly 15-20 % of population.

According to the perception of Sheygosh *woreda*, over the last couple decades severe and frequent climate variability is observed notably, drought which is a recurrent phenomenon in their locality and has adverse impacts on people livelihood, ecosystem of rangeland, natural resources and social aspects as well livestock production. As a result, the traditional pastoral production system has faced a number of challenges that affecting the practicing of pastoral production system. The main attribute underlying reasons are recurring drought, generating of new alternative livelihoods, education role, restriction of movement and mobility, migration from rural to urban area, low basic service delivery and social protection, moderation and mindsets towards rural livelihood.

The study shown that the pastoral community in the study location has numerous of effective traditional knowledge for resilience and adaptation strategies in the past, used to increase the livestock productivity and to minimize vulnerability. These strategies rely more or less on mobility and movement, diversity of livestock, social support network system (Zakat, *xool-goyn* – unconditioned free gift, *dhowrto* – surplus milk stored, *sadaqah* – almsgiving, *qaadhaan* – risk pooling, *maalsin or irmansi* – temporary loan), customary institution structure and traditional knowledge, reduce consumption of food, diversity of consumption, reducing non-essential spending and local migration.

Broadly speaking, despite the effectiveness of indigenous knowledge strategies, the pastoral traditional risk management and coping strategies have increasingly become ineffective and will not be viable and sustainable in the coming years, due several underlying causes, including climate variability and prolonged hazards, lack of pro-poor livestock policies, absence of effective investment and intervention address social chronic problems, natural and environment problems and similarly economic and investment dimension of pastoral production.

RECOMMENDATIONS

Based on findings, this research proposes the following recommendations in order to build upon and promote pastoral indigenous knowledge in order to sustain the pastoral production system in the face of climate variability and prolonged calamities:

- strengthening and restructuring of social protection intervention projects, includes expand microfinance systems, including pastoral and agro-pastoralist as a safeguard mechanisms,
- multi-sectoral direct addressing to the underlying causes of low productivity and production of livestock, land degradation and rangeland habitats.
- despite the pastoralists have traditional strategies for adapting to and withstand to climate variability very well, there is in dire need to build and support their mechanisms technical knowledge, in order to incorporate indigenous knowledge into national policy of disaster risk reduction,
- documenting and identifying all pastoral resilience and adaptation strategies, such as environment, grazing land, livestock, social and also their knowledge for forecasting and indicators such as the trees, plants and birds which have traditional knowledge and value as climate indicators, declare them as protected species,

- although such strategies relevant to grazing system initiated several times, but still there is urgent need to put in place appropriate grassland management system, which contribute to increase resilience and adaptation and mitigation, as well as increasing pastoral production and food security minimize and reducing vulnerably,
- recurrent shocks, risks and hazards have increasingly dictated to initiate proper risk management mechanisms or to reinforce already existing mechanisms to cope with the impacts of extreme climatic events, notably early warning systems, and risks and vulnerability mitigation activities.

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