POVERTY, RANGELAND DEGRADATION AND LIVELIHOODS OF PASTORALISTS IN BOORANA RANGELAND SYSTEM, SOUTHERN ETHIOPIA

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Dissertation Approval

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This is to certify that the dissertation prepared by Galgalo Dika, entitled: "*Poverty, Rangeland Degradation and Livelihoods of Pastoralists in Boorana Rangeland System, Southern Ethiopia*" is submitted in fulfillment of the requirements for the Degree of Doctor of Philosophy (PhD) in Development Studies (Environment and Development) complies with the regulation of the university and meets the accepted standards with respect to originality and quality.

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Declaration

I, the undersigned, declare that this PhD dissertation is my own original work and that neither the whole work nor any part of it has been submitted for any type of academic degree in this or any other university. All sources of information used in this dissertation have been fully acknowledged.

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ABSTRACT

Poverty, socioeconomic marginalization, and resource degradation has been unique features of pastoralists in Arid and Semi-arid Lands (ASAL) in general and in Ethiopia in particular. This dissertation assessed pastoralist understanding of poverty from multiple perspectives, rangeland degradation based on the Gadaa[1] timeline and investigated livelihoods of pastoralist in Boorana rangeland system. The study argued that understanding pastoralist poverty and livelihoods, and constructions of pastoralist knowledge on rangeland degradation and its impacts could make crucial scientific contributions.

The study relied on the Vicious Circle Model (VCM) to understand the relationships between poverty and rangeland degradation. The study was based on mixed method approaches. Both qualitative and quantitative methods were used in the data collection and analysis. Large amounts of primary data were obtained from pastoral community by household questionnaire survey, semi-structured interviews and focus group discussions. Observation was also another tools used to document the area in its physical settings. To analyze the data the study adopted Sustainable Livelihood Framework (SLF), and Alkire and Foster method of multidimensional poverty analysis. Quantitative data were analyzed by various descriptive statistics and systematic summarizations of survey data. In addition, the study also employed econometric models like Logit and Multivariate Probit model (MVP) in quantitative data analysis. Qualitative data were analyzed by descriptions of responses, narrations of cases and systematic summarizations of qualitative responses.

The results showed that pastoralists perceive poverty as lack of livestock, low health, and lack of money, education, and jobs. Poverty is caused by climate change and variability, deteriorations of pasture and water, lack of education, and over utilization of resources. The result showed that, diversification of income sources, crop cultivation, improvements of pastoral education, destocking, and returning to forefathers' cultural practices could help in surviving poverty. Using Alkire and Foster method the result showed that 87.3% of Boorana pastoralist households were multidimensionally poor with 62.1% of intensity of poverty. Multidimensional poverty index (MPI) for Boorana pastoralist was high (54.2%). Majority of Boorana pastoralist households were deprived in cooking fuel, drinking water, electricity, ownership of durable assets, housing, child school attendance and years of schooling. Deprivation in education was the largest contributor to MPI followed by standard of living and health dimension. The result of logit model indicated that multidimensional poverty was positively associated with household head gender and age, and size of

[1] *Gadaa* is an indigenous political system of Oromo people. The Gadaa system is divided into different age sets, generational classes and Gadaa grades. Boorana Oromo have strongly maintained the cultural heritage of the original Gadaa intact. The thesis analyzed the conditions of rangeland based on Gadaa timeline (from Gadaa of Boruu Madhaa to Kuraa Jaarsoo). Boruu Madha (1992-2000), Liiban Jaldeessaa (2000 -2008), Guyyoo Gobbaa (2008-2016) and kuraa Jaarsoo (2016 – 2024)

cultivated land. In contrast, it is negatively associated with highest education level of household member, sanitation, home to center distance and production per hectare of land among others.

The study found that currently the potential of Boorana rangelands has been decreasing over time and degradation showed increasing trends. The progressive degradation of rangeland resources has jeopardized rangeland production, livestock productivity and human wellbeing in Boorana rangeland system. Rangeland degradation has put pastoral livelihoods into risks and increased the vulnerability of pastoralist. Given high vulnerability of pastoralist, it is elucidated that the main livelihood assets of pastoralist are under threat. However, pastoralists manage risks by engaging into diverse set of income generating portfolios. Though pastoralism is still the dominant way of living people are now engaging in a diverse range and combination of activities to reduce vulnerability. Beside pastoralism respondents prefers to go for intensive rain-fed farming and non-farm activities, labour works, diversifications, mobility and hired herder as ways of living. Multivariate probit model result revealed that the decisions of household to simultaneous choose different livelihood strategies are determined by various socioeconomic characteristics of households.

The study concluded that given current status quo of widespread poverty, increased rangeland degradation and pastoral livelihood crisis, sustainable pastoral production would be highly impaired. However, current research is optimistic that poverty can be reduced and pastoral livelihood would be improved. To reduce pastoral poverty, improve pastoralist livelihoods, and sustainably manage and utilize rangeland resources there should be enabling institutional, policy and legal frameworks. Thus, to reduce pastoral poverty recognitions of environmental, socioeconomic and political dynamics in pastoral areas and inclusion of pastoralist issues into national and international agendas is very important. Further, the study also suggested that improvement of pastoralist access to education and standard of living through improving pastoralist access to electricity, clean water and health facilities should be priority for policy to reduce multidimensional poverty. In addition, sustainable management of rangeland resources also requires understanding, recognition and promotion of Boorana pastoralist knowledge of rangeland ecology, incorporation of indigenous and ecological techniques in rangeland managements and restorations, and prohibitions of privatization and maintaining of community based zonation and mapping of traditional land use types. The study also suggested that achieving sustainable pastoral livelihood requires policy options and interventions that can improve and support pastoralist ways of life and built on what constitute the dynamics of pastoral livelihoods in arid and semi-arid environments.

Keywords: Poverty, Rangeland degradation, Indigenous knowledge, Pastoral livelihood, Multidimensional poverty, Policy implications, Vulnerability context, Boorana, Ethiopia

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Galgalo Dika Godana
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Dedication

To my parents, my father Dika Godana and my mother Galmo Dika and to my family, my beloved wife Qabbale Racho and my son Liban Galgalo for their love, support and encouragement.

Lists of Published, Under Review, and Ready for Submission Papers

This dissertation is based on two published and one under review and one ready for submission articles.

Paper I. Under review as Galgalo Dika, Degefa Tolossa & Shiferaw Muleta. Understanding Poverty and Survival Strategy among Ethiopian Pastoralists: The Boorana Pastoralist Perspectives. *International Journal of Rural Management.*

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Paper III. Manuscript prepared as Galgalo Dika, Degefa Tolossa & Shiferaw Muleta. Rangeland Degradation in Boorana Rangeland System and Its Impacts Post-1992: Constructing the Perceptions of Pastoralist.

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LISTS OF ABBREVIATIONS AND ACRONYMS

AF	Alkire and Foster
ASAL	Arid and Semi-Arid Land
DFID	Department for International Development
FDG	Focus Group Discussions
GDP	Growth Domestic Product
HDI	Human Development Index
HDR	Human Development Report
HPI	Human Poverty Index
LS	Livelihood Strategy
MDGs	Development Goals
MPI	Multidimensional Poverty Index
MVP	Multivariate Probit Model
NGOs	Nongovernmental Organization
NMA	National Metrological Agency
OLA	Oromo Liberation Army
OPADC	Oromia Pastoral Area Development Commission
OPHI	Oxford Poverty and Human Development Initiatives

PPA	Participatory Poverty Assessment
PPP	Purchasing Power Party
PSNP	Productive Safety Net Program
RPLRP	Regional Pastoral Livelihoods Resilience Project
SDG	Sustainable Development Goals
SLA	Sustainable Livelihood Approach
SLF	Sustainable Livelihood Framework
SNNP	Southern Nation Nationalities and Peoples
TLU	Tropical Livestock Unit
VCM	Vicious Circle Model
UN/FAO	United Nations Food and Agricultural Organization
UNDP	United Nations Development Program
UNSD	United Nations Statistical Divesion
WBO	Waraana Bilisumma Oromoo (Afaan Oromo name for OLA)
WCED	World Commission on Environment and Development

1 GENERAL INTRODUCTION

1.1 Background to the Research

The estimated figure of people in the globe who live in extreme poverty has become perpetually more significant indicator for measuring development progress (Ferreira, et al., 2015). As a result, several countries have been tirelessly working on poverty reduction and progress in development. Since 1990s, many countries have made intense progress in reducing extreme poverty though the global whole is dominated by reductions in the two largest countries, China and India. Until 2002, however, severe poverty rate did not fall below its 1990 level in sub-Saharan Africa (World Bank, 2016). Even though macroeconomic performance and growth in GDP are believed to have reduced poverty in general, the condition of Ethiopia is also similar to its sub-Saharan Africa (World Bank Group, 2018). For instance, in 2000 Ethiopia had one of the uppermost poverty rates in the world, with 56% of the population lived below the international poverty line of US$1.25 PPP a day. Ethiopian households had experienced a decade of significant progress in well-being since then and at end of the decade, less than 30% of the population was counted as poor. Agricultural growth drove decline in poverty, reinforced by pro-poor spending on basic services and effective rural safety nets (World Bank, 2015). Absence of pro-poor policies however, is still the major factors holding sub-Saharan Africa in poverty (Kabuya, 2015). In addition, even though the growth of manufacturing sectors began to reduce poverty in urban areas, in the history of Ethiopians progress, structural change is remarkably very low at the end of the decade (World Bank, 2015).

A closer look at the literatures; national and international policies; millennium and sustainable development goals revealed that, ending poverty is priority concerns of all nations in the globe. This is quite magnificent idea; nonetheless, the query is how and when millions of people living in absolute poverty will be lifted out of where they are? Thus, in order to eliminate poverty, as Ravallion (2016) stated, poverty should not be pardoned, rather countries should work hard on explaining the cause and finding the way to eradicate it with its roots. The fundamental causes of poverty in sub-Saharan Africa are lack of pro-poor policies, scrawny economic and political institutions (Kabuya, 2015) and land degradation (Gashaw, Bantider, & Silassie, 2014) among others. Land degradation mostly affects rural inhabitants of low and middle-income countries (Barbier & Hochard, 2016). Land

degradation also reduces the provision of terrestrial ecosystem services (Gerber, Nkonya, & Braun, 2014), productivity of the land and aggravates the effects of drought, such as famine and migration (Haile, Herweg, & Stillhardt, 2006) and thereby increases poverty. Deterioration of environment makes life most difficult, challenging and uncertain for poor (Gerber et al., 2014). Poverty can also limit the responses households have to environmental changes. Impoverished households may be less likely to have suitable land resources and have fewer resources to be able to obtain new land (Bremner, López-Carr, Suter, & Davis, 2010). On the other hands, shorthanded households are highly vulnerable to the impacts of land degradation and land degradation itself deepens rural poverty and erodes their ability to cope with the problems (Mailumo, Ben, & Omolehin, 2013).

In the context of Ethiopia, land degradation is widespread, but not all areas of the country are equally worsening. Depending on difference in land use, land cover, ecology, soil types, rainfall and topography land degradation manifests spatial variations in its both extent and severity (Birhanu, 2014). Population pressure also plays dominant roles in land degradation. Even though population growth rate is steady since 1960, however, after then, population growth in Ethiopia was very rapid due to change in socio-economic states of the world (Minale, 2013). Consequently, land fragmentation and degradation through over use was increased and arable land per capita was declined (Bielli, Berhanu, Isaias, & Orasi, 2001). High population growth together with land degradation has deepened rural poverty, which affects more than half of the rural population (Rahmato, Admassie, & Mekonnen, 2007). A closer look at the comparison of incidence of poverty in urban and rural Ethiopia revealed that poverty is higher in the rural settings than in urban areas. This is mainly due to the fact that, urban people have relatively better physical access to basic social and economic infrastructures, vulnerability to natural disaster is higher in rural settings and possibility to secure means of subsistence are better in the towns (Tolossa, 2005). Therefore, investigating rural poverty should be given priority to inform policy about the poor, to put poor on the policy agenda and to evaluate and monitor programs targeted to eradicate poverty (Haughton & Khandker, 2009). This study thus gave particular emphasis to pastoral poverty, rangeland degradation and pastoral livelihoods. The study argued that understanding pastoralist poverty and livelihoods, and construction of pastoralist expert knowledge on rangeland degradation and its impacts could make crucial scientific contributions.

Pastoralism is a complex interaction of people, natural resources, and livestock, predominantly practiced globally in arid and semi-arid lowlands (ASALs) and hot sub-humid pockets (Esayas, Solomon, & Girma, 2019). It is an economic activity, a land use system, and a way of life for people who derive most of their income or sustenance from keeping domestic livestock. Pastoralists supply very substantial numbers of livestock to domestic, regional and international markets and therefore, make crucial – but often undervalued contributions (African Union, 2010). This is particularly true for African pastoralists. African pastoralism is defined by a high reliance on livestock as a source of economic and social wellbeing, and various types of strategic mobility to access water and grazing resources in areas of high rainfall variability (African Union, 2010). East African pastoralists faces various challenges ranging from population growth, loss of herding lands to farmers, ranchers, game parks, and urban growth, increased commoditization of the livestock economy, out-migration by poor pastoralists, and dislocations brought about by drought, famine, and civil war throughout the region (Fratkin, 2001). Climate related ills like low and erratic rainfall, high temperatures, and consequently, high evaporation rates are also common features of East African pastoralists (Humanitarian Policy Group, 2010).

Pastoralism is the dominant economic activity in Ethiopia. About 12 - 15 million people depend on pastoralism for their livelihood (Berhanu, 2019; Esayas et al., 2019) where they manage about 60% of the country's landmass (Berhanu, 2019). Therefore, the country's vast areas of land are inhabited by pastoralist and agro pastoralist communities. Livestock production is the main stay of people in rangelands. Livestock production is not only the main sources of living for pastoralist but also largest contributors to the country's economy. In Ethiopia livestock contributes 12 - 16 percent to total Ethiopia's GDP and 30 - 35 percent to its agricultural GDP (Esayas et al., 2019). In addition, livestock sectors also contribute 12.2 percent of the country's foreign exchange earnings (Berhanu, 2019). Though livestock sector contribute to country's development by large pastoralist are not enjoying their fair share from country's economic development. As a result poverty, economic, social and political marginalization have been unique features of pastoralists in Ethiopia (World bank, 2016). Multidimensional poverty is pervasive in pastoralist areas. For instance, pastoralist in Somali and Afar Regional States are poor from multiple dimensions (i.e. education, health and standard of living) (Jemal, Legesse, Haji, & Ketema, 2017).

Therefore, it is clear that pastoral production is under enormous threat (Abule, Snyman, & Smit, 2005; Kassahun, Snyman, & Smit, 2008). Pastoral poverty crisis had been proclaimed since the 1970s (Little, Mcpeak, Barrett, & Kristjanson, 2008) and Ethiopian pastoralist are among the poor. In addition, in pastoralist areas of Ethiopia rangeland resources are under severe pressure. Rangelands have been changing in its resources and management due to various reasons. For instance, in Somali Regional State of Ethiopia mismanagement of rangeland resources has resulted in increase of drought, aridity and rangeland degradation (Kassahun et al., 2008). Rangeland degradation resulted in widespread of poverty and decline of traditional coping mechanisms. Likewise in Afar region inappropriate development interventions put rangelands under severe pressure (Tilahun, Angassa, Abebe, & Mengistu, 2016). In particular the effects of large scale irrigation in Awash Valley is now apparent (Behnke & Kerven, 2011). Generally, Ethiopian pastoralists are under double threat of natural and manmade factors. Climate change and variability and associated environmental ills and misguided development interventions and lack of appropriate policies are peculiar features of pastoralist in Ethiopia (Kassahun et al., 2008; Tilahun et al., 2016; Tolera & Senbeta, 2019).

Boorana pastoralist areas have also been facing the similar bottlenecks. In the context of Boorana pastoralist rangeland resources had experienced extensive change (Abate & Angassa, 2016). The condition of rangeland had declined overtime (Angassa & Beyene, 2003; Solomon, Snyman, & Smit, 2007). In 2000, encroached vegetation had a significantly lower score for range degradation and rangeland condition was good (Angassa & Baars, 2000). In just a few years, however, ecological changes and increase of bush encroachment had become major problem of pastoral rangeland management (Angassa, 2005). In addition, Dalle, Maass and Isselstein (2006) found that encroachment of woody plants has been among the major threats to the livelihoods of Boorana pastoralists. Therefore, conversion of rangelands into other land use is the main challenges of rangeland management (Elias et al., 2015). Abate and Angassa (2016) in their study on the conversion of savanna rangeland identified that grass and shrubby grassland cover were rapidly declined in Boorana pastoral area with rapid proliferation of woody cover.

Besides, impacts of climate change and underlying factors has been exacerbating degradation of rangeland resources in pastoral areas of Boorana (Riché, Hachileka, Awuor, & Hammill, 2009). Drought is the major impacts of climate change in Boorana with frequency of every 5-

10 years (Coppock, 1994) in the past. However, the frequency of the drought has now increased to every 1-2 years (Riché et al., 2009). Currently, drought is recurrent and unpredictable. It has been causing a devastating damage to pastoral production every year. Therefore, rangeland degradation, climate change and underlying factors contributed to decline of pastoral productivity, vulnerability and destitutions. Even though, considered as the most sustainable and productive rangeland amongst pastoralist in East Africa (Homann, Rischkowsky, Steinbach, Kirk, & Mathias, 2008), productivity of Boorana pastoralists has been changing and wealth category is dominated by poor (Tache & Oba, 2010). Generally, recurrent droughts has reduced pastoral resilience (Birhanu, Ambelu, Berhanu, Tesfaye, & Woldemichael, 2017) and increased food insecurity (Megersa, Markemann, Angassa, & Valle Zárate, 2014).

1.2 Problem Statement

Land degradation is a major problem of our planet, and it is highly connected to food insecurity, vulnerability to climate change and poverty (Gerber et al., 2014; Barbier & Hochard, 2016). Mostly rural inhabitants of low and middle-income countries are affected by land degradation (Barbier & Hochard, 2016). Particularly in lowlands areas inhabited by pastoralist, rangeland degradation has become the topical issues. For instance, in the lowlands of Ethiopia, rangeland degradation remains a serious impairment for improvements of pastoral livelihoods (Mussa, Hashim, & Teha, 2016). To mention an example, in Somali region of Ethiopia, due to policy impediment and rangeland degradation traditional coping mechanism of pastoralist has eroded (Kassahun et al., 2008). In addition, the study in Afar by Abule et al. (2005) revealed poor rangeland conditions. The study by Homann et al. (2008) in Boorana revealed that, pastoral rangeland management was deteriorated. Generally, in the pastoral areas of Ethiopia climate change and underlying factors drives rangeland degradation (Mussa et al., 2016). Furthermore, ignoring pastoralists' technical and organizational capacities can lead to continued rangeland degradation and the erosion of social structures (Homann et al., 2008). Therefore, rangeland degradation remains a major policy concern globally and the subject of widespread scientific study (Jamsranjav et al., 2018). Since, rangeland degradation is linked to the expansion of aridity, food insecurity and poverty to the extent of food aid, engaging in alternative survival options has become the primary option for pastoralist.

Pastoralist are usually epitome of risk managers (Coppock et al., 2017) under difficult circumstances. Therefore, to survive overwhelming threats from varied sources pastoralists are now diversifying sources of income. In many areas, pastoralists engage in rain-fed mixed farming not only as the alternative, but also as the promising livelihood strategy. However, vagaries of weather and land degradation (Adimassu, Kessler, Yirga, & Stroosnijder, 2013) had resulted in the decline of crop production. These can aggravate the effects of drought like famine and destitution (Haile et al., 2006) which in turn weaken the state of wellbeing of household. Likewise, if the state of wellbeing of households is impaired poverty occurs and this may lead to land degradation since poor household could exploit the resources to survive. In the lowlands of Boorana, progressive rangeland degradation (Elias et al., 2015) together with the impacts of climate change (Ayal, Radeny, Desta, & Gebru, 2018; Megersa, 2013) have exacerbated the vulnerability of pastoralists and weakened the pastoral system. Therefore, this study emphasized the understanding of poverty from the perspectives of pastoralist, assessing rangeland degradation based on the Gadaa timeline and investigation of pastoral livelihoods. By doing so, the study could make crucial scientific and practical contributions in the formulation of policies and strategies suitable for pastoralist.

Tache and Sjaastad (2010) used traditional wealth ranking system of Boorana to study pastoral poverty. Similar study revealed that 80 percent of households in Boorana were poor (Tache & Oba, 2010). The most recent study also revealed that impoverishments had expanded over time in Boorana (Tolossa, 2018). However, these studies did not indicate the way Boorana pastoralist look at poverty and its coping mechanisms; rather they looked at pastoral livelihood transformation, wealth ranking and indicators of poverty. Hence, there was the knowledge gap on the understanding of poverty form the perspectives of pastoralist in the extant literature. Understanding how individuals perceive the causes of poverty is vital in developing strategies for poverty alleviation (Maseko, Viljoen, & Muzindutsi, 2015). Therefore, this study has tried to narrow the knowledge gap by assessing the understanding of poverty and its coping mechanisms from the perspectives of pastoralists themselves. In addition, many of previous studies (Asongu & Roux, 2019; Berhanu, 2019; Tache & Oba, 2010) depend on either unidimensional or traditional measures or combination of both to assess pastoral poverty. This also reflects that there were gaps in analyzing pastoral poverty using multidimensional poverty analysis. This study argues that, in such dynamic and perilous environment of pastoralist, destitution is the result of multifaceted indicators, such that pastoral poverty analysis requires a measures that can addresses multiple features of

poverty. Thus, comprehension of multiple deprivation of pastoralist would not only sheds light on the dimensions and extents of poverty, but also it has practical implications for policies, strategies and programs for the reduction of multidimensional poverty of pastoralist. Therefore, this study narrowed the knowledge gaps and added the knowledge to pastoral poverty analysis by assessing the extents and determinants of multidimensional poverty in the Boorana rangeland system.

Beside poverty assessment, understanding the conditions of the resources upon which pastoralist depend is mandatory. Sustainable livestock production depends on healthy rangelands. Boorana rangeland was one of the most sustainable rangeland in East Africa (Cossins & Upton, 1987). However, Angassa and Beyene (2003) in their study on traditional management strategies indicated that pastoral production system in Boorana was facing serious problems. Many of previous studies treated rangeland ecology, bush encroachments (Abate & Angassa, 2016; Angassa, 2005, 2007; Dalle et al., 2006a) and indigenous resource management (Dika, 2016; Homann, 2004; Homann et al., 2008; Gufu Oba, 1998, 2009) extensively. However, even though construction of community perceptions is the main tool for evaluating the impacts of environmental change and can make crucial methodological contributions (Angassa & Oba, 2008) the literatures are of little help with regard to the study on the historical narrations of changes in rangelands based on the Gadaa timeline. This indicates the gaps in the analysis of the rates, trends and impacts of rangeland degradation from one Gadaa period to another. Therefore, this study has tried to construct the perceptions of Boorana pastoralist towards rangeland degradation and its impact using Gadaa timeline and bridged the knowledge gap with this respect.

In addition, to reduce pastoral poverty, rangeland degradation and prevent related vulnerability pastoralist engages in different mutually exclusive livelihood activities. Alinovi, D'Errico, Mane and Romano (2010) stated the way household adjust themselves and withstands socio-economic shocks lies in options available, in terms of capacity, assets and activities. In Boorana pastoralist area, Tache and Oba (2010) revealed that pastoralist engage in crop cultivation as livelihood activity, which itself did not brought self-sufficiency. This study recommended the need for research to comprehend the role of poverty in inspiring the adoption of alternative livelihood coping strategies. On the other hand, another the study indicated that, crop cultivation increases the availability of food and feeds thereby improve food security of households (Tilahun, Teklu, & Hoag, 2017). In addition, Megersa et al.

(2013) has analyzed the role of livestock diversification in ensuring household food security. Nevertheless, relying solely on livestock diversity may also be highly risky in arid and semi-arid environments, and pastoralist should find and engage in different survival strategies. There are limited evidences on the study of mutually exclusive livelihood activities in Boorana rangeland. Tolossa (2018) identified four livelihood systems (pure pastoralists, agro-pastoralists, integrated agro-pastoralism with petty trading and integrated pure pastoralism with petty trading) in Boorana. Dinku (2018) also assessed the determinants of livelihood diversification in Boorana. However, these studies did not identify the factors that determine choices of mutually exclusive livelihood strategies. Thus, there were gaps on the study on the livelihood choices households want to engage in at the same time and determinants of livelihood strategy. Hence, to understand mutually exclusive livelihood activity of pastoralist understanding the factors that determine each livelihood strategy is necessary. Therefore, this study has contributed its part in this regard by investigating pastoral livelihoods and determinants of livelihood strategy of Boorana pastoralists using Sustainable Livelihood Framework (SLF).

1.3 Objectives of the Study

The overall objective of this study is to analyze pastoral poverty, rangeland resource degradation and livelihoods of pastoralist in Boorana rangeland system. The specific objectives addressed by the research were:

I. To assess Boorana pastoralist understanding of poverty and coping mechanisms (Paper I)

II. To assess the extents and determinants of multidimensional poverty of pastoralist and its implications for policy in Boorana rangeland system (Paper II)

III. To constructed the perceptions of Boorana pastoralist towards rangeland degradation and its impacts post- 1992 using Gadaa timeline (Paper III).

IV. To investigate pastoral livelihoods and determinants of livelihood strategy of Boorana pastoralists (Paper IV).

1.4 Research Questions

The study investigated various aspects of pastoral poverty, degradation of pastoral resources (rangeland) and livelihood of pastoralist in Boorana lowlands. Poverty was assessed from two

perspectives. First, the way pastoralist themselves look at their own poverty was assessed using systematic constructions of community perceptions. Second, the study also investigated the dimensions and extents of multidimensional deprivations in Boorana rangeland system. One of the major causes of pastoral poverty is degradation of pastoral resources (rangeland). Thus, the study constructed the perceptions of pastoralists on rangeland degradation and its impacts using Gadaa timeline. Finally, the study also assessed pastoral livelihoods and determinants of livelihood strategy in Boorana rangeland system. To investigate pastoral poverty, resource degradation, and pastoral livelihood the study was based on the following key questions:

I. How do pastoralists understand and define poverty? What are the roots causes of pastoral poverty? What do pastoralists suggest on poverty reduction and survival strategies that can be employed by poor peoples? (Paper I).

II. What are the extent, depth, and severity of multidimensional poverty in Boorana pastoralist areas? What are determinants of multidimensional poverty and its implications for policy in Boorana rangeland system? (Paper II).

III. Over the period of four Abbaa Gadaa, what are the rate, trends, indicators and impacts of rangeland degradation in Boorana rangelands? How do Boorana pastoralists manage rangelands? (Paper III).

IV. What are major shocks that makes pastoral household vulnerable? What are pastoralist livelihood choices and its determinants? Are there indigenous mutual supports institutions of pastoralist to provide livelihood supports? (Paper IV).

1.5 Scope and Limitations

The study was undertaken in Boorana rangeland system and was geographically delimited to two districts of the Boorana zone. Four pastoral and agro-pastoral *kebele*[2] were selected to generate the data needed for the study. Though Boorana pastoralists were the most researched pastoralist in East Africa, several issues still beg the concerns of researches. The zone is one of administrative zone of Oromia regional state, where socioeconomic and political marginalization, poverty and vulnerability persisted over time. The study investigated pastoral poverty, rangeland degradation and livelihoods of pastoralist in Boorana rangeland

[2] *Kebele* is the lowest administrative unit in Ethiopia that is smaller than districts. In rural cases, kebeles have different villages under it.

system. Pastoralists are in daunting challenges of marginalization, poverty and resource stress. The focus of this research pastoral poverty crisis had been proclaimed since the 1970s (Little et al., 2008). Since then several unidimensional poverty studies were undertaken. This study has tried to look at pastoral poverty using community expert knowledge and multidimensional approach. The study concentrated on pastoral definitions and understanding of poverty, perceived root causes of poverty in pastoralist areas and perceptions of pastoralist on poverty reductions and survival strategies. Pastoralists understanding of poverty were assessed using qualitative explorative analysis. The study also assessed the dimensions, extents and severity of multidimensional poverty in the pastoralist areas. For multidimensional poverty analysis, the study employed Alkire-Foster method of analyzing of the multidimensional poverty.

Pastoral poverty and resources (rangeland) have complex relationships. Rangeland is one of the most important pastoral resources and its degradation or improvements have an impact on pastoral livelihoods. The study has constructed the perceptions of pastoralists on the rates, trends, indicators and impacts of rangeland degradation using Gadaa timeline. Therefore, the conditions of rangeland resource post-1992 (from the year Boruu Madhaa took office) to current Gadaa period (Kuraa Jaarsoo) was assessed. Boruu Madhaa took office in 1992 and served for eight years. By using Gadaa timelines it was understood that pastoralist can better narrates the conditions of resources and other necessary events. Further, the study also investigated pastoral livelihoods and determinants of livelihood strategies by integrating sustainable livelihood framework into pastoral livelihood study. Under this section, the study was focused on what makes pastoralist vulnerable, pastoralist livelihood assets, pastoralist livelihood activities and its determinants.

Boorana pastoralists are in multitudes of problems that cannot be fully addressed with single Ph.D. thesis alone. Though this research has addressed one of the pressing problems of pastoralist, there are still five main limitation of this thesis. First, Boorana pastoral production has been severely affected by climate changes. The long-term impacts of climate changes on pastoralist productivity should have been analyzed using various climate models. This research on its part has not seen into climate change-poverty-livelihood nexus. Second, this research has also limitations on the analysis of land-use and land cover changes, and its association with pastoralist perceptions of change in the rangeland conditions. Third, several factors also limited this research from looking into the detailed analysis of pastoral

households vulnerability to multidimensional poverty. Fourth, this research recognizes the need for the analysis of the impacts of various pastoral livelihood improvement programs. However, the analysis of the impacts and effectiveness of various livelihood projects was constrained by time and resource shortages. Finally, though analysis of indigenous social safety nets for livelihood support is compulsory, this research on its part did not look into this aspect.

Beside above mentioned, research limitations there were also four main challenges during field data collection. First, security was the biggest challenge we faced on the field. Our deployment to the field was marked with heightened political tension in the study area where there was insurgence of OLA (Oromo Liberation Army) in different part of the zone. Southern front OLA (WBO *zoonii kibbaa*) mainly operates in different districts of Boorana zone. During our field days, two kebeles, *Harweeyyuu* from *Yaabello* district and *Aadee Galchat* from *Eelwayyee* district were under regular operations of notorious OLA rebel *Gurraacha Waatoo* and his other comrades. Local residents indicated that *Gurraacha* and his comrades were separated from their southern front OLA few months ago. We encountered with *Gurraacha* on our first field day in *Harweeyyuu*. He interrogated us as we interacted with respondents. He asked us questions like: Why you came here? Who sent you? What is your research about? Is it political? Are you government cabinet? And many more questions. He suspected us as if we came there to spy on them. However, lastly we convinced him that we came to the study sites not to spy on them, but to collect information for completion of research project, which could help pastoralist problems heard at the national and global level. We also encountered them in *Aade Galchat* kebele of *Eelwayyee* district.

Second, the small budget the researcher received was not adequate for every tasks needed for the successful completion of research project. The obvious thing was the miss much between the expectations of the enumerators about daily per diem and the budget the researcher had. Third, transportation was also another challenge. Some of the study sites were far from the center (district towns) with the limited roads that connects village to village. In such cases, we used motorbikes, with high cost and which can only give service for one person. Forth, unavailability of respondents at the village due to their own daily routine was another biggest challenge. Since deployment to the field was marked with the period of prolonged drought, some of respondents were not available in the village due to several responsibilities. For instance, some of them look after livestock, took livestock to watering points and some walk

long distance to bring home water for domestic purpose. As data collection continued to the rainy season the same constraints was faced because some of the respondents undertake farming activities. However, the researcher had managed to contact the respondents at wherever possible places.

1.6 Significance of the Study

The study has contributed the knowledge to the extant literature, methodology, policies and local practices. The main audiences of the study are academicians, policy makers, development practitioners, NGOs, and local, regional and national government. In the academic environments, the study has tried to narrow the knowledge gaps by adding concepts and methods to the extant literature of poverty, livelihoods and rangeland degradation. The study has employed unique approaches by assessing the way pastoralist themselves understand poverty. In addition, by using current approach of poverty analysis the study sheds light on how to investigate multidimensional deprivations in the pastoralist contexts. Moreover, the study was also based on unique approach to construct pastoralist perceptions of conditions of rangeland based on Gadaa timeline. This approach enabled the researchers to understood dynamics of changes in pastoral resources from one Gadaa period to another. In this regard, the study underlined how Boorana pastoralist can better narrates the conditions of their environment and other important events based on the Gadaa timeline. The study has also tried to integrate the concepts of Sustainable Livelihood Framework into pastoralist livelihood studies. By identifying the determinants of mutually exclusive livelihood choices household made the study added to existing literature the methods of pastoral livelihood analysis. Generally, the study can serve academicians as terms of references.

In the policy arena for pastoral development, the study has tried to identify policy implications for pastoral poverty reduction, livelihood improvements and rangeland resource managements. Identification of how pastoralists understand poverty, its root causes and coping mechanisms from the perspectives of pastoralist themselves is vital in developing suitable strategies for poverty alleviation. In addition, investigation of the extent, severity and determinants of multiple deprivations is essential to target appropriate interventions in pastoralist areas. Further, identification of factors associated with pastoralist choice of livelihood activities is crucial inputs for policies, programs and strategies of pastoral livelihood transformation and improvements. In addition, by constructing Boorana pastoralist perceptions of conditions of rangeland resources the study underscored the importance of

incorporating community knowledge in the policies and strategies of pastoral resource management. Finally, it is believed that the study can help and guide local, regional and national government and other stakeholders in their efforts to understand the contexts of pastoralist.

1.7 Philosophical Foundations of the Research

Research is scientific way of investigating the phenomena through scientific principles and procedures. Singh (2006) indicated that the term research consists of two words, ‘re’ and ‘search’. By this, one can understand that research literally means to investigate something again and again. Undertaking the research can be a search for something novel or contributions to already existing. Thus, conducting research entails the search for new knowledge (Jonker & Pennink, 2010) and contributions to the general knowledge (Singh, 2006). The concerns of this research, pastoral areas are highly researched. However, the fact that there are a lot of researches in the area does not mean that there are no problems to be investigated. This research is therefore an effort to contribute knowledge and methodology to extant literatures. The questions of why poverty is persistent in the pastoralist areas, why is the condition of rangeland resources is so poor and is affecting the livelihoods of pastoralists, and what are the factors that are associated with pastoralist choice of livelihood in such rapidly changing environments has motivated the researcher. It was with these questions in mind the researchers picked and investigated these problems.

To understand these scientific problems the research has its own philosophical foundations. Although philosophical ideas remain largely hidden in research (Jown W Creswell, 2008) it is a way of thinking about certain sorts of questions. The basic questions raised by this research as indicated in the above paragraph were how does pastoralist understand poverty, and how pastoralist resource (rangeland) degradation can affects pastoral livelihoods? The most distinctive feature of philosophy is the use of logical argument (Warburton, 2013). Therefore, to answer the central questions of the research the study was based on well-established scientific procedures, and organization and articulation of arguments. By this, it can be understood that the philosophy of doing research includes thoughts that form the basis for various ways of doing research; thoughts that justify research methodology and rationale for using certain methods in research. Generally, philosophy is a rational enquiry into the forms, contents and implications of experiences. These rational inquiries are grounded in what we can know about the world around us and how.

Considering the two major aspects of metaphysics (ontology and epistemology), the research investigated the reality of the problems that exists on the ground, that is nature of existence. The questions about the reality and nature of existence are basic ontological questions. Ontology is related to the assumptions we hold about reality, whether it is external or a construct of our mind (Jonker & Pennink, 2010). The ontological question is about what we study, that is, the object of investigation (Porta & Keating, 2008). The reality and existence of pastoral poverty, rangeland resources degradation and pastoral livelihood was investigated. Considering the reality of pastoral poverty Little et al. (2008) stated that pastoral poverty was first claimed during 1970s. Currently poverty is one of the leading problems of pastoralists. Different studies (Haughton & Khandker, 2009; Ravallion, 2016; Tache & Oba, 2010; Tigre, 2018; Tolossa, 2018) have already consistently indicated that poverty is one of the dreadful problem of humanity. Though the reality that poverty exists is the same for all there is difference in what constitute poverty, the depth and breadth of poverty form place to place.

Another object of investigation was rangeland resource degradation. It is evident the conditions of rangeland resources has been changing from time to time. Different studies (Angassa & Beyene, 2003; Cossins & Upton, 1987; Dalle, Maass, & Isselstein, 2006b) had confirmed the reality of changes in rangeland conditions. However, this ontological basis differs in space and time. The conditions of rangeland resource degradation vary from place to place and time to time. In the context of Boorana, rangeland system the reality of rangeland degradation and how it is constructed in the mind of pastoralist themselves is not adequately addressed in the extant literature. This research is an effort to reveal reality constructed in mind by assessing the nature of the rangeland degradation and its impacts using Gadaa timeline. Whenever there are the changes in environmental resources and poverty is widespread community looks for another alternatives means of living. It was already acknowledged that rural households in developing counties are engaging in diverse set of income generating activities (Ellis, 2000; Jiao, Pouliot, & Walelign, 2017; Khatiwada et al., 2017).

Though the views of reality of pastoral poverty, rangeland resource degradation and pastoral livelihood are well documented, there is difference in the forms, depth and breadth of problems associated with these realities. However, through scientific inquiry the research has tried to know about those problems. That was what the researchers had known about the problems. The questions of what we know about something and how to know are

epistemological questions. Epistemology is about how we know things (Porta & Keating, 2008). Epistemology is the theory of knowledge and it can enable the researcher to clarify what the conception of knowledge involves, how it is applied, and how to explain why it has the features it does (Rescher, 2003). The researcher has tried to know about the problems under investigations based on well-established scientific procedures. Since epistemology involves both preposition and procedures the researcher has used the suitable methodologies and scientific procedures to know about the problems under investigation.

To answer these ontological, epistemological and methodological questions, this research was based on two main worldviews or paradigms (**Table 1.1**). Paradigms are the fundamental models we use to organize our observations and reasoning. Each research approaches uses different paradigms (Creswell, 2014). One of the world views used for this research was pragmatism, in which qualitative and quantitative data are used together in the design and analysis. Pragmatism has evolved into a set of procedures that the researcher can use (Creswell, 2014) and involves the collection, analysis, and integration of quantitative and qualitative data in a single or multiphase study. Pragmatism has its origin in the counter arguments of incompatibility thesis and on consideration of how mixing qualitative and quantitative data can enhance the understanding of social realities (Tolossa, 2005). Mixed methods research designs are moving across the disciplines and their influence is accelerating considerably, especially over the past decade (Hesse-Biber, 2010). Ontologically pragmatism states that social phenomenon exists in objective world and knowledge can be obtained from both objective and subjective point of view (Petty, Thomson, & Stew, 2012a; Tolossa, 2005). In pragmatism, the role of values in interpreting the results and the existence of cause effect relationships is acknowledged. In addition pragmatism also indicates the possibility of conceptual generalization (Tolossa, 2005). Pragmatism also depends on deductive and inductive reasoning to understand problems (Petty et al., 2012a; Tolossa, 2005).

The study is also guided by constructivism to understand social realities. Construction of social realities, experiences and perceptions enable the researcher to understand the context that cannot be answered by use of numerical expressions. Constructivism involves the use of the methods that enable people to learn and how to discover and change their own reality. Tolossa (2005) stated that constructionist ontology depend on multiple realities. The reality is social constructed (Petty et al., 2012a). Constructivism understands multiple social constructions of meaning and knowledge. It is believed that in constructivism the

generalization of concepts and distinguishing of causes from effects are not possible (Petty et al., 2012a; Tolossa, 2005). In this sense the researcher develop the knowledge that is also shared by the participants (Jonker & Pennink, 2010). Constructivism underlined that the participants has active role in research and the researcher and the researched are inseparable. In addition in constructivism the study is guided by inductive reasoning.

Table 1.1: Comparisons of Constructivism and Pragmatism Worldview

Features	Constructivism	Pragmatism
Methods	Qualitative	Mixed (qualitative & quantitative)
Ontology	Multiple realities (perspectives), social constructed	Social phenomenon exists in objective world
Epistemology	Understand multiple social constructions of meaning and knowledge.	Both objective and subjective point of view
Hypothesis/questions	Broad research questions	Multiple research questions
Role of values	Social values plays critical role	Value plays a large role in interpreting research results
Generalization/context	Time and context-free generalizations are not possible	Conceptual generalization is possible
Causal linkages	Impossible to distinguish cause from effect	There may be causal relationships that we will never able to identify
r/ship between researcher and participants	Participants actively involves in research	Partial involvement/not active
Logic	Inductive reasoning	Deductive and inductive

Source: Compiled based on Tolossa (2005) & Petty et al. (2012)

1.8 Methodological Approaches

Research methodology and methods are often used interchangeably. Nevertheless, the two have different meanings. A methodology indicates the main path to the destination, while, methods indicate specific steps (or actions, phases, stepwise approaches, etc.) that should be taken in a certain, eventually stringent order during the research (Jonker & Pennink, 2010). The path to the destination depends on the strategy of enquiry that guides a set of procedures (Petty, Thomson, & Stew, 2012b). Methods are techniques or tools used to obtain data to generate knowledge. Methods also includes the instruments used for data analysis (Petty et al., 2012b). In general methods are the specific ways through which we investigate the research questions (Cibangu, 2010). There are different research approaches or methods developed so far; however, the three (a) qualitative, (b) quantitative, and (c) mixed methods are the most widely used (Creswell, 2014). Selection of a research design is based on the nature of the research problems or issue being addressed, the researchers' personal experiences, and audience for the study (Creswell, 2014; Creswell, 2008). This study was generally guided by mixed method approaches. From mixed approaches, the research depends on concurrent triangulation strategy. Concurrent triangulation strategy was used to corroborate and cross-validate the finding within the study. However, qualitative approach was also employed to specific research objective.

Qualitative researches approach had its origin in social science. Many social sciences like anthropology, sociology and humanities mostly depend on qualitative research approaches. Though qualitative researches had its origin in social science currently qualitative research has been applied into different discipline together with other methods. Qualitative researchers depend on intensive methods to know about social realities using small number of cases (Tolossa, 2005). Qualitative researches are characterized by its focus on natural settings, its interest in meanings, perspectives and understanding and inductive analysis and grounded theory (Woods, 1999). Ritchie and Lewis (2003) also indicated that qualitative research is naturalistic and constructionist in its approach which deals with understanding of the meaning. Qualitative research answer the questions by investigating different social settings (Berg, 2001). For this study, qualitative research was employed to answer a specific research question. In addition, the study employed qualitative data to add meaning to quantitative data and to fully understand the subjects.

Mixed method research involves mixing of the elements of qualitative and quantitative data (Griensven, Moore, & Hall, 2014). In this method mixing of words, pictures and narratives adds meaning to numbers and thus provides more complete understanding of subjects under investigation (Hesse-Biber, 2010). In addition, the two forms of data are integrated in the design analysis through merging the data, connecting the data, or embedding (Creswell, 2014). Therefore, the study employed mixed method approach to understand the subject under investigation. Mixed method was used to cross-validate and corroborate data and findings within a study. Therefore, data collections were concurrent and both methods were used to overcome a weakness in using one method with the strengths of another. Hesse-Biber (2010) stated that there are various reasons for using mixed method approaches; nonetheless, these five are the main reason for using it in this study. First, reason is *triangulation.* This method enabled the researcher to use more than one method while studying the same subject. Second, *complementarity* of the method enabled the researcher to understand the problem. Third, it has synergic effect, which means results from one method help *develop* the other method. Fourth, the study finding can *initiate* a new study. Finally, the use of mixed method can *expand* the breadth and range of inquiry. In addition, qualitative work can be used to improve the quality of data collected through surveys (Michael, 1999).

1.9 Structure of the Dissertation

Including this section, this dissertation is organized into seven parts. The introductory section gives a clear overview of the study by focusing on the backgrounds, justification of the problems, objectives, research questions, the scope and limitations of the study, and audiences of research, philosophical underpinning of research, and methodological approaches. This section discusses why this topic is worth researching, and the research gaps. This section also consists of basic philosophical underpinning of the research and research approaches and designs. In the second section, the reviews of theoretical and empirical literatures related to research objectives are presented. Under section three, an attempt is made to answer the questions related to the pastoral understanding of poverty, perceived root causes and suggestions of pastoralists on poverty reductions and survival strategies of pastoralists. This section includes how pastoralist defines poverty from different perspectives and clearly shows the indicators pastoralist uses in defining poverty.

Section four gives an emphasis on the multidimensional deprivations of pastoralists and its policy implications. This section gave an overview of the dimensions, indicators, the extent

and severity of multidimensional poverty. In addition, the questions of factors associated with multidimensional poverty of pastoralist and implications for policy are assessed under this section. The indices of poverty as; headcount ratio, the intensity of poverty and multidimensional poverty index (MPI) is clearly presented in this section. In addition, MPI is decomposed by dimensions, indicators and demographic backgrounds of the respondents. In section five an effort is made to construct the pastoralist perceptions on rangeland degradation and its impacts. This section answers the questions like what are the rates, trends, indicators and impacts of rangeland degradation and what are indigenous knowledge of pastoralist in rangeland management. In this section the researcher clearly shows how the conditions of rangelands have been changing overtime from one Gadaa period to another. Pastoralist livelihood activities and determinants of livelihood strategies are the main focus of section six. Here the researcher has tried to integrate sustainable livelihood framework into pastoralist livelihood study. Here the researcher has taken the opportunity to assess pastoral vulnerability, livelihood activities and its determinants. Finally, under section seven the study has taken an opportunity to put forward the summary, synthesis, conclusion and further implications.

2 REVIEW OF RELATED LITERATURE

2.1 The Concepts and Theoretical Literature

2.1.1 Defining Poverty and Land Degradation

Poverty is noticeable deficiency in well-being that encompasses low income and incapability to obtain basic goods and services needed for survival with dignity. It includes minimum levels of education and health, insufficient physical security, lack of voice, poor access to clean water and sanitation, and inadequate capacity and opportunity to better one's life (Maier, 2015). This indicates shift of focus from the one-dimensional nature of poverty to multidimensional nature of poverty (Tigre, 2018). Understanding poverty as multidimensional concepts has gained much concerns (Bourguignon & Chakravarty, 2003) and can helps in shedding light on intertwined causes of household poverty. Therefore, poverty can be defined as deprivation in multiple dimensions like living standards, health and educations. Poverty has also been defined in terms of relative deprivation (Forsyth, Leach, & Scoones, 1998). In this sense, poverty is noted as a condition of denial relative to those standards of living that other members of the same society enjoy. An individual, family or groups are in poverty when they have no capacity to have types of diet, participate in activities and enjoy the living conditions and amenities, which are customary in the society. In this study, poverty was defined based on the pastoralist understanding of poverty and multidimensional indicators of poverty.

Land is a vital resource (Bowyer et al., 2009) and a delineable area of earth's terrestrial surfaces encompassing everything. Land degradation is also an inclusive term and has no features to be singled out, rather describes the deterioration of one or more of land resources (rangeland, vegetation, water, soil, air, and climate). Land degradation can be seen from various perspectives. United Nations Food and Agricultural Organization (UN/FAO) defined land degradation as the temporary or permanent decline in the productive capacity of the land. Furthermore, it can be change in land that makes it less useful for human wellbeing. Land degradation is also defined as ecosystem productivity and function decline in the long term (Li, Wang, Wang, & Gao, 2015). Moreover, land degradation can also be defined based on several subjects need to be emphasized (Filho, Cochranne, Norton, Caviglione, & Johansson, 2001). For instance, those components can be soil, forest, water, rangeland and so forth. Therefore, for purpose of this study the subject of emphasis is rangeland degradation.

Rangeland covers the vast land cover type on earth (Briske, 2017) and is the dominant pastoral resources. Pastoral region is known by wide and remote geographical areas characterized by extreme diversity in environments (Squires, Limin, Degang, & Guolin, 2010). Rangeland is defined as "landscapes largely unsuitable for sustained cultivation providing forage, water, and cover for grazing and browsing animals" (Coppock et al., 2017). Rangeland has become the fragile ecosystem due to aridity and low productivity (Reeves & Baggett, 2014). Rangeland degradation is the common features of global rangelands (Squires et al., 2010). Jamsranjav et al (2018) defined rangeland degradation as a sequential process of progressive departure from a reference ecological state for a given ecological site. In addition, it is permanent and temporary decline in the productive capacity of rangeland resources, which make it less useful for pastoral communities. Rangeland degradation is not only the concern of rangeland people but also the issues of others who rely on rangelands (Harris, 2010). Degradation of rangeland has become the growing concerns throughout the world (Reeves & Baggett, 2014). Generally, rangeland degradation is exacerbated by increasingly scarce range resource and unpredictable rainfall (Homann et al., 2008) together with interrelated factors.

2.1.2 Vicious Circle Model: Linking Poverty and Land Degradation

Land degradation is a social problem. Environmental problems may occur with or without human interference, but for these processes to be described as 'degradation' implies social criteria which relate land to its actual or possible uses (Blaikie & Brookfield, 1987). Human-induced degradation occurs when land is poorly managed or where natural forces are so powerful, that there is no means of management that can check its progress. Degradation is reduction to production potential of lands to the lower ranks. Therefore, as Blaikie and Brookfield (1987) indicated degradation is, best viewed not as a one-way process, but as a result of forces, or the product of an equation, in which both human and natural forces find a place. Therefore, land degradation and society have two-ay relationships and thus, degradation equation can be expressed as:

> Net degradation = (natural degrading processes + human interference) - (natural reproduction + restorative management).

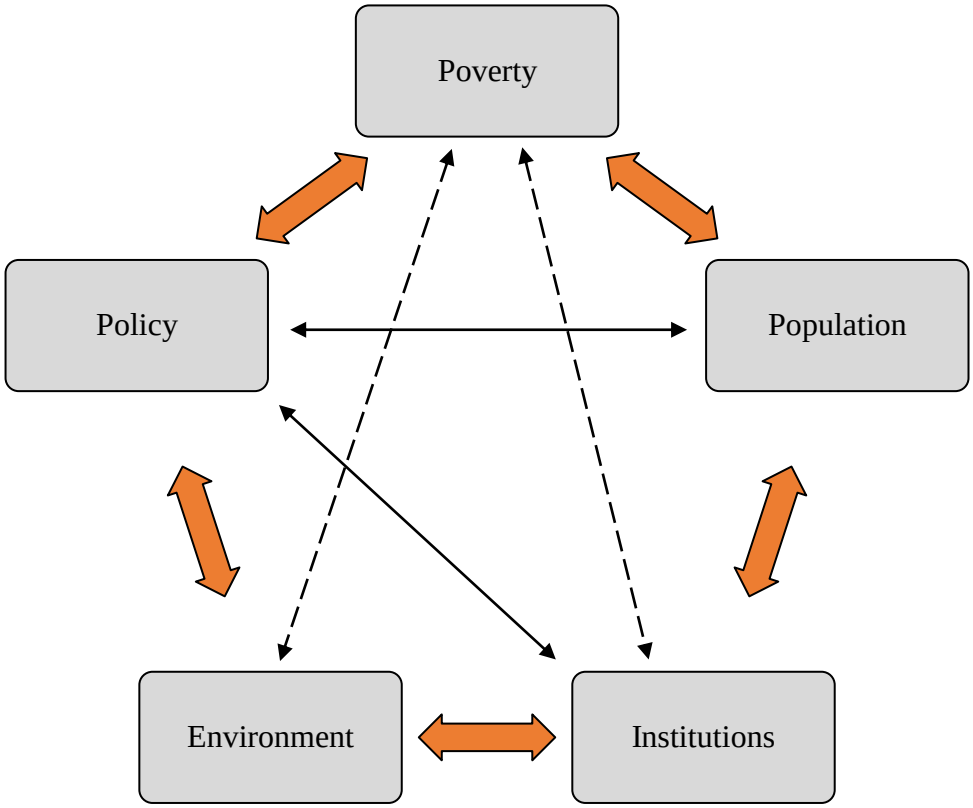
On basis of this, the causes of land degradation can be understood as proximate and underlying causes (Gerber et al., 2014). Gerber et al. (2014) indicated that biophysical factors

and unsustainable land management techniques are the main proximate causes of degradation, while underlying causes of degradations includes the policies, institutional or other socioeconomic factors.

The link between poverty and environment has often been mentioned in the 'sustainable development' debate and is seldom systematically explored (Mailumo et al., 2013). The researches that treat the link between poverty and land degradations usually focused on 'Vicious circle'. The circle is Malthusian in its nature, which proposes that, pushed by poverty, and population growth farmers extends farming to the most fragile marginal land and degrade them. As a result, the yield is reduced and this further impoverishes farmers (Pearce & Warford, 1993).

Research on demographics, livelihoods, and the environment is advised the use of a livelihoods approach as an organizing framework to examine population-environment relationships (Ellis, 2000). The investigation of different types of capital permits for a more complete understanding of population, poverty, and environment nexus. de Sherbinin et al (2008) have confirmed that the livelihood framework can be applied to assess a vicious circle model (VCM) of population, poverty and environment. According to the VCM, downward spiral for poor households occur due to positive feedbacks at the household level among population growth, poverty, and environmental degradation. VCM is a multiple feedback model. It examines how poverty affects population growth and environmental degradation, the effects of population growth on the environment and poverty, and how environmental degradation affects population growth and poverty (López-Carr, Suter, & Davis, 2010). This model has become a very influential paradigm for describing the interactions between population growth, environmental degradation and food insecurity. The linkages is in such a way that stress from one of these sources can trap certain rural societies, especially those living in marginal lands, into a vicious circle of increasingly destructive responses (Lutz & Scherbov, 1999).

Figure 2.1: Linkages between Poverty, Environment and Associated Factors



Source: Own Construction

2.1.3 Rangeland, Poverty and Livelihoods

Rangeland is the most important resources for pastoralist communities around the world. Particularly pastoralists that dwell in arid and semi-arid region of the world make their living directly or indirectly from rangeland resources. Thus, rangeland has become critically important for livelihoods of many rural populations (Bedunah & Angerer, 2012). In developing countries millions of poor depends on rangeland and their livestock (Coppock et al., 2017). In addition, pastoralist production has been facing serious problems (Angassa & Beyene, 2003) due to various factors associated with climate changes and environmental degradation. The changes in rangeland ecology due to encroachment of bushes, human population growth and pastoralist settlements, and change in land use patterns in rangelands due to expansions of cultivation and other land use types are the main driving factors for changes in rangeland. These changes in rangeland ecology and resource degradation have been bottlenecks for pastoralists. Severe rangeland degradation can create significant socioeconomic and environmental problems in developing countries (Bedunah & Angerer, 2012). This is also associated with widespread destitutions and livelihood crisis.

Since 1970s pastoral poverty has become a subject of concerns for many scholars (Little et al., 2008). Many of previously better off pastoralist group failed into chronic poverty. Rangeland degradation is among different factors that contribute to pastoral poverty. Scholars indicated that rangeland degradation is related with increased poverty and less access to basic services (Sulieman & Siddig, 2014). Not only they become poor, pastoralist living in the peripheral environments are also highly vulnerable due to devastating cyclic droughts and insufficient amount of rainfall (Berhanu, 2019). As a result in many rangeland areas poverty has increased (Kassahun et al., 2008). In addition, the decrease in grazing lands erodes indigenous rangeland management and has severe impact on livelihood of the pastoralists (Angassa & Beyene, 2003). Notwithstanding the experiences of such changing environments people in rangelands are still epitome of risk managers (Coppock et al., 2017). Coppock et al. (2017) further stressed that economic development in rangeland can play critical role for improvements and diversification of pastoral livelihoods and improvements in food security. Generating income from diversified sources can helps pastoral livelihoods to be sustainable in perilous environment. In addition, pastoral rangeland degradation gives rise to livestock diversification (Megersa, Markemann, Angassa, Ogutu, et al., 2014). As a results many of people in rangeland depends on various species of livestock. Pastoralist are already integrating and keeping many drought tolerant species of livestock.

2.1.4 Understanding Livelihood and its Concepts

The concept of livelihood in literatures is believed to be originated with works of Robert Chambers in mid-1980s (Kollmair & Gamper, 2002). When dealing with the issues of livelihoods the basic queries that might come to mind are what is livelihood? What is sustainability and sustainable livelihood? Livelihood is literally defined as the means of acquiring living. Livelihood can be described as comprising the capabilities, assets and activities required for a means of living (Chambers & Conway, 1991). The means of living is the way the households or individuals rely on to earn bread needed for normal living. However, to live the way you live you have to be capable, have adequate resources to obtain activities needed for livelihoods. Sustainability is also the major aspects of the concepts of livelihood since it has the meaning of meeting the needs of the future generations without compromising the ability of current generation to meet their needs. Sustainability has become the global buzzwords and is used to refer to many things in different subjects. It can be seen from environmental and social sustainability perspectives. However, in the contexts of

livelihood, Chambers and Conway (1991) defined sustainability as "the ability to maintain and improve livelihoods while maintaining or enhancing the local and global assets and capabilities on which livelihoods depend".

Combining the word livelihood and sustainability, sustainable livelihood is defined as "… a livelihood that can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base" (Hussein & Nelson, 1998). According to Scoones (1998) sustainable livelihood has five indicators, which include (i) gainful employment, (ii) poverty reduction, (iii) wellbeing and capability, (iv) livelihood adaptation, vulnerability and resilience and (v) sustainability of natural resources. Thus, activities household engages in to improve the wellbeing of the family should be resilient to the influence of external shocks, and current use of resources should not cut the hope of future generations on resource use. The term sustainable livelihoods was believed to be first used in report of World Commission on Environment and Development (WCED) in 1987 (Brocklesby & Fisher, 2003) and since then it was widely used by different international organization for research, policy and practices (Solesbury, 2003).

2.1.5 Approaches to Measure Poverty

2.1.5.1 Subsistence and Basic Need Approaches

Poverty was viewed as subsistence or nutritional insufficiency (Mamaru, 2017). The concept of 'absolute' poverty and its definition as some kind of minimum subsistence level is strongly associated with the late nineteenth-century British social reformers Charles Booth and Seebohm Rowntree. To be poor was to be unable to attain those things necessary for survival (Noble, Michael; Ratcliffe, Andrew ; Wright, 2014). Rowntree stated that 'primary poverty' occurs when families total earnings are insufficient to obtain the minimum necessaries for the maintenance of merely physical efficiency. However, subsistence definitions of poverty are far from extinct. New thinkers from the late-1970s onwards have adopted absolute definitions of poverty (Noble, Michael; Ratcliffe, Andrew ; Wright, 2014). The year 1970 was marked by a shift from subsistence to basic needs approach to define poverty (Mamaru, 2017).

Basic need approach is the most influential, and indeed the widely used approach for poverty measurement (Townsend, 1982). In addition, there are also a number of conceptual approaches for the measurement of well-being. The widely used approach to measure

economic welfare is household consumption expenditure or household income. However, there are also non-monetary measures of individual welfare, which include indicators such as life expectancy, the proportion of spending devoted to food, housing conditions, and child schooling. Well-being is a broader concept than economic welfare, which only measures a person's command over commodities (World Bank, 2005). To estimate poverty by monetary measures one has to choose either income or consumptions as indicator of well-being. Many researchers argued that consumptions is better indicator of well-being than income provided detailed household consumption information (Coudouel, Hentschel, & Wodon, n.d.). Consumption includes both goods and services that are purchased, and those that are provided from one's own production ("in-kind") (World Bank, 2005).

Various indicators of wellbeing can be considered by use of household surveys and community-based questionnaires to ascertain a population's access to basic services (United Nations Statisitcs Division, 2005). Households accesses to basic services can then be ranked indexed and can even be changed into percentages. Participatory rural assessments approaches are used to know the levels of poverty. The motive behind this approach is that, villagers and neighborhoods can be asked to define their level of poverty and identify who would be judged poor according to that notion. This approach is appealing in that, it incorporates local ideas and conditions; nevertheless, it produces various non-comparable standards. Moreover, the results typically yield only a reckoning of who is poorer than who, rather than an absolute measure of poverty against a fixed benchmark (United Nations Statisitcs Division, 2005). Poverty measures to be used for reporting for the population as a whole or for a population subgroup can be calculated using Foster Greer and Thorbeck indices like Headcount ratio, poverty gaps and squared poverty gaps.

2.1.5.2 Multiple Depravation Approaches

Since 1980s the dimension of poverty measurements which includes non-monetary aspects such as powerlessness and isolation, vulnerability and insecurity, capabilities and gender are added to the complexity of the meaning of poverty (Mamaru, 2017). Multiple depravation approach identify who is poor based on the person's or household's joint distribution of deprivations (United Nations Economic commission for Europe, 2016). Therefore, the strategies of eradicating poverty are not only economic growth in this case but also improving access to education, health and other services (Mamaru, 2017). One of the methods to measure poverty form multi-dimensions are human development index (HDI) and human

poverty index (HPI). HDI is a composite index focusing on three basic dimensions of human development. The first dimension is the ability to lead a long and healthy life, measured by life expectancy at birth. The second is the ability to acquire knowledge, measured by mean years of schooling and expected years of schooling. The final dimension is the ability to achieve a decent standard of living, measured by gross national income per capita (United Nations Development Programme, 2018). Multidimensional poverty is measured by multidimensional poverty index. Multidimensional poverty index (MPI) has gained high popularity is study of poverty due to several limitations of many of Forster Greer and Thorbeck indices (United Nations Statisitcs Division, 2005). MPI composed of ten indicators corresponding to three dimensions: Education, Health and Standard of Living (Alkire, S. & Santos, 2010; Alkire & Jahan, 2018).

MPI involves identification of the weight of each indicators and deprivation cutoff. For each deprivation cutoff, the weights of health and education indicators is 1.67 each (1/6 of 10) and it is 0.55 each (1/18 of 10) for standard of living (Alkire, S. & Santos, 2010). Therefore**,** a household is multidimensionally poor if the weighted indicators in which he or she is deprived sum up to 30 percent (Alkire et al., 2011). 2018-revised MPI will be used (Alkire, Kanagaratnam, & Suppa, 2018). Having identified who is poor, the AF method generates a unique class of poverty measures (M_α) that goes beyond the simple headcount ratio. These measures are:

*Multidimensional headcount ratio (H)**:*** This measure reflects both the *incidence* of multidimensional poverty (the percentage of the population who are poor) (Mamaru, 2017) and the *intensity* of poverty (the percentage of deprivations suffered by each person or household on average). That is, ***H = q/n*** where ***q*** is the number of poor people and ***n*** is the total population (Alkire & Santos, 2011; Mamaru, 2017). The second component is called the intensity (or breadth) of poverty (A) (Alkire & Santos, 2011). It is the average deprivation score of the multidimensionally poor people and can be expressed as:

$$A = \frac{\sum_{i=1}^{n} C_1(k)}{q}$$

Where $C_1(k)$ is the censored deprivation score of individual I, and q is the number of people who are multidimensionally poor. The MPI is the product of both: MPI = H × A.

- *Adjusted Poverty Gap (M_1):* This measure adds in information about the depth of poverty. The depth of poverty is the average 'gap' (*G*) between the level of

deprivation poor people experience and the poverty cut-off line (Salazar, Roberto Carlos Angulo; Díaz, Beatriz Yadira; Pinzón, 2013). $M_1 = H$ x A x G.

- *Adjusted Squared Poverty Gap (M_2)*: The severity indicator assigns a higher weight to deeper deprivations of poor people; in other words, it emphasizes households or persons that are severely deprived (Salazar, Roberto Carlos Angulo; Díaz, Beatriz Yadira; Pinzón, 2013). This measure reflects inequality among the poor. $M_2 = H$ x A x S, where S is analogous to G, but the average of the squared normalized gaps.

2.2 Review of Empirical Literature

2.2.1 Trends, Distributions and Determinants of Poverty

Poverty level is unacceptably high and are predominantly concentrated in Sub-Saharan Africa and South Asia (World Bank Group, 2016). In 2016, World Bank indicated that Sustainable Development Goal of elimination poverty require a step change from historical growth rates to eliminating extreme poverty (World Bank, 2016). For several decades, East Asia and Pacific, South Asia, and Sub-Saharan Africa have accounted for some 95 percent of global poverty. Sub-Saharan Africa has increased its share of global poverty to 43 percent, with a slower pace of poverty reduction amid high population growth. The poverty rate fell only from 56.0 to 42.6 percent between 1990 and 2012 (World Bank Group, 2016). However, still largest mass remains in poverty (Cruz, Foster, Quillin, & Schellekens, 2015).

In context of Ethiopia since 2005, 2.5 million people have been lifted out of poverty. However, the absolute number of the poor has remained the same at some 25 million over the past 15 years because of high population growth. The incidence of poverty declined markedly between 2004/05 and 2010/11. The headcount poverty rate fell from 38.7 percent in 2004/05 to 29.6 percent in 2010/11 and is estimated to have further declined to 23.4% in 2014/15 (African Development Bank Group, 2016; National Planning Commission, 2016) using a poverty line of US $ 0.60/day. The incidence of poverty has continued to decline, falling to 26.0 percent in 2012/13. In addition, food poverty, which is 38% in 2004/05, is declined to 33.6% in 2010/11 and 31.8% in 2012/13. Furthermore, per capita income which was 171 US$ in 2004/05, has increase to 387 US$ in 2010/11 and 550 US$ in 2012/13. Between 2004/05 and 2010/11, real per adult equivalent consumption increased by 20 percent, which is lower than the increase recorded over 1999/2000 and 2004/05 (United Nations Development Programme, 2015a). The incidence and depth of poverty is higher in rural setting than urban.

The poverty gap index is estimated to be 7.8% while it is 8.0% for rural areas and 6.9% for urban areas (Minstry of Finance and Economic Development, 2012). Furthermore, in 2013, multidimensional poverty index in Ethiopia was 0.564 and the percentages of people who are multidimensional poor were 87.3%. The percentages of people who are poor according to $1.25 and $2 a day income poverty line was 39% and 77.6% respectively. The percentage of people who are poor according to the national income poverty line was 38.9% (Oxford Poverty and Human Development Initiative, 2013).

Poverty remains relatively high in rural areas. In 2010/11, the proportion of the population below the poverty line stood at 30.4% in rural areas, while it was 25.7% in urban areas. African development bank indicated that low agricultural sector productivity is among the factor contributing to high incidence of poverty in rural areas. Spatial disaggregation of poverty also indicates marked disparities among regions, largely attributed to differences in stages of development and resource endowments (African Development Bank Group, 2016). In 2010/11, the poverty head count index was the highest in Afar (36.1%) followed by Somali (32.8%) and Tigray (31.8%), while the estimates were lowest in Harari (11%), Addis Ababa (28.1%) and Dire Dawa (28.3%). In terms of food poverty, the highest poverty was observed in Amhara (42.5%) followed by Tigray (37.1%) and Benehsangul Gumuz (35.1%). The lowest food poverty is found again in Harari (5%) followed by Dire Dawa (21.7%) and Southern Nation Nationalities and Peoples (SNNP) (25.9%) (Minstry of Finance and Economic Development, 2012).

In Ethiopia, several factors constitute household poverty. Mixed rain-fed agriculture in most of low-income countries up on which rural households depend is very risky (Yesuf & Bluffstone, 2009). In such perilous environment, failure in productivity can lead to poverty of household. Factors that are highlighted as contributing to the exacerbation of poverty in Ethiopia are low agricultural production, low education and poor health, low non-farm income, high population growth and weak institutional structures (Enquobahrie, 2004). In addition, multidimensional poverty analysis in Ethiopia using logistic regression revealed that demographic, regional, and household heads' characteristics are major factors in determining poverty (Bersisa & Heshmati, 2016). Furthermore, using fixed effect model study of determinants of consumption expenditure revealed that, demographic, human capital, and socioeconomic characteristics are important determinants of poverty (Berisso, 2016).

A study in Aysaita districts of afar regional states revealed that the main determinants of poverty are diversification of livestock holding, access to irrigated land, improved forage and market centers (Mohammed, Bogale, & Seyoum, 2014). In addition, a study in six rural villages of Ethiopia revealed family size, land and livestock holdings, diversification in crop production, engagement in non-farm activities and utilization of microfinance services to be significant determinants of poverty (Alemu, Bewket, Zeleke, Assefa, & Trutmann, 2011). Furthermore, the study in the north Omo zone of southern Ethiopia revealed that, the size of landholding, access to irrigation water, on-farm land and water conservation practices, literacy of the household head, and years of education of adults are all important determinants of household welfare (Hanjra, Ferede, & Gutta, 2009). In almost all of the above scientific studies, it was indicated that household demographic characteristics and land holdings are the main determinants of poverty.

Understanding and alleviating poverty in Africa has been receiving remarkable attentions. In the pastoralist areas of Kenya, the study challenges the application of orthodox proxies such as income/expenditures in the study of pastoral poverty. In addition, the study attested that pastoralists have diverse livelihoods and wealth differentiations are not homogenous as such. Notwithstanding, high interest to overcome poverty, there is little agreement on what constitutes poverty in rural Africa, how it should be assessed, and what should be done to alleviate it (Little et al., 2008). Therefore, integrating qualitative and quantitative data enriches information about understanding of poverty and the use of qualitative approaches in poverty analysis has been increasing (Angemi, 2011). Boorana rangeland system with long history of sustainable productions is now been under increasing threat of degradations. In addition, crop production has become main means of livelihood no matter the constraints from unpredictable rain-fed conditions and climate changes. Many studies (Tache & Oba, 2010; Tache & Sjaastad, 2010) indicated that poverty has become the persistent problem in the pastoral areas of the Boorana. These authors indicated that, largest proportions of participants are under poverty. Nevertheless, there are limited evidence that clearly shows the way pastoralists look at poverty and its coping mechanisms.

2.2.2 Livelihoods Strategy and its Determinants

There are different factors that determine the choices households make to lead the livelihood of their own. For instance, the study in the rural Kenya using multinomial regression analysis revealed geographic, demographic and financial determinants of livelihood strategy (Brown,

Stephens, Ouma, Murithi, & Barrett, 2006). Similarly, the study in the highland of Ethiopia uses multinomial regression to identify determinants of rural household livelihood strategy. The study indicated that education, access to credit and remittance, membership to formal cooperatives, productivity of family, access to market and business-oriented extension services are the main determinants of livelihood strategy (Gebru & Beyene, 2012). The study in Nepal uncovered that land holding, education, agriculture and skill training, access to credit, and proximity to the road and market center are the major influencing factors on the adoption of higher returning livelihood strategies (Khatiwada et al., 2017). Thus, households' choices to engage in livelihoods of their choices can be influenced by many factors. In addition, the study in the three gorges river of china indicated that the maximum years of education of any household member; the age of the household head; the number of laborers in a household; household location; and formal and informal social networks determines household's choices of livelihoods strategies (Xu et al., 2015). Furthermore, the study in Mozambique indicated how differential access to, or endowment of, livelihood assets determines the choice of a household's strategy in the climatic change context and the risks profiles associated with agro-pastoralist (Ng'ang'a, Jeannette, Notenbaert, Moyo, & Herrero, 2011).

Pastoral communities are vulnerable to the impacts of climate change and associated risks. Poor people, disadvantaged people and people leaving in the remote areas are highly vulnerable to any changes. Change in this case is change in wellbeing of household. Today due to recurrent drought and environmental degradation many of pastoral and agro-pastoral communities in sub-Saharan and East Africa has failed into the escalation poverty. Environmental degradation, climate change and associated bottlenecks have been making sustainable pastoral production system unsustainable. In addition, existing institutional and political environments in which pastoralist operate so far had undervalued the context of pastoralism. These situations have resulted in the condition of escalating poverty of pastoralists and agro-pastoralists. Therefore, as Khatiwada et al (2017) indicated, understanding household livelihood strategies is pivotal to minimize rural poverty. So far there are too many studies conducted in Boorana lowlands of southern Ethiopia. Nevertheless, little is indicated on determinants of livelihood strategy in such rapidly changing pastoral and agro pastoral system.

2.2.3 Ethiopian Pastoralists under Changing Environment

Recent changes in land use and associated environmental ills have contributed to the growing crisis of pastoralism in Africa. The study by Tsegaye (2010) on Afar pastoralists in changing environment revealed that rangelands in northern Afar has changed noticeably during the past 35-years between 1972 and 2007, in which 47% of the total area are changed land cover type. Other study in supports of this stated that, in the early 1970, pastoralists along the awash rapidly loosed their riverine grazing land (Behnke & Kerven, 2011). The main driver for this transformation was due to the introduction of large scale farming (Hundie & Padmanabhan, 2008). Generally, degradation trends showed loss of grassland, decreased woodland and increase in cultivated area and bush land cover (Tsegaye, 2010). Therefore, pastoralism has been shifted from being a core economic activity to being an insurance against failures in other livelihood activities for some groups of households. In Somali region of Ethiopia, the study confirmed the existence of severe rangeland degradation that occurred since 1944 and which was aggravated after the 1974 drought. This contributed to an increase in the number of poor households (Gezahegn, 2006). A similar study, confirmed that the process of transformation in pastoralism is evident and there have been increases in water points and settlements, new land use patterns and changes in natural resource management mechanisms. There has been an increase in the area of land cultivated and a consequent decrease in the area of land open to grazing for pastoralists (Somali Regional State, 2011).

The study from *Erer* and *Aysha* districts in *Shinile* zone of Somali regional state revealed that drought, aridity and rangeland degradation has increased over time due to environmental degradation and mismanagement of rangeland resources. Poor and very poor households have emerged (Kassahun et al., 2008). In addition, development intervention was potentially the main challenges for Afar rangeland. Pastoralist expressed their fear that, the remaining dry season grazing land could be allocated for highly expanding large-scale agriculture investment and settlement programs (Tilahun et al., 2016). Similar study in Rayitu district of Bale revealed poor rangelands condition where there is feed and water shortages and drought (T Abate, Ebro, & Nigatu, 2010).

Boorana rangeland resources had experienced extensive changes (Abate & Angassa, 2016). In addition, the traditional resource management of Boorana was under pressure (Homann et al., 2008) since the 1960s (Angassa & Oba, 2008). Abate and Angassa (2016) studied the

land cover change in pastoral areas and found that grass and shrubby grassland covers were rapidly declined with increase in cultivated land and other cover types. Another study in Boorana pastoralist areas revealed that there is a marked increase in cultivated land. Due to climate change, recurrent droughts and underlying environmental factors rangeland conditions are highly deteriorated (Solomon et al., 2007) and pastoralist in Boorana have been shifting to other livelihood i.e. crop cultivation as a promising livelihood option (Elias et al., 2015). Crop production enhances availability of grain, feed sources (Tilahun et al., 2017) and has been becoming livelihood diversification options (Abate & Angassa, 2016).

So far, pastoralists were better off in many instances, regardless of progressive challenges they faced. For instance, Boorana pastoralists rangelands was long been considered as the most sustainable and productive rangeland amongst pastoralist in East Africa (Homann et al., 2008). In addition, in Somali region rangeland conditions were excellent up to 1974, when range resources were abundant and favorable towards the production of cattle and sheep. Pastoralists were economically better off with only three-wealth class (Kassahun et al., 2008). Nevertheless, because of declining pastoral productivity in various areas, many of pastoralist community have been failing in poverty to the extent of food aid. For instance, the study by Tache and Oba (2010) revealed that, more than half of Boorana pastoralists households participated in their study were found in poor wealth category.

2.2.3.1 Impacts of Land Degradation on Household Poverty

Barbier and Hochard (2016) stated that, land degradation is a major problem of our world. Many parts of Africa were being affected by the problems of progressive land degradation. For instance, in the agriculture system of Nigeria, land degradation has affected the carrying capacity of available natural resources with many of the rapidly increasing population not able to meet their basic food needs (Oyekale, 2012). In addition, the study by Kirui (2016), tried to see the linkages between poverty and land degraadation in Malawi and Tanzania. They come up with the conclusion, that land degradation either directily or indirectly contributes to the worsening of livelihoods of poors. Other study also supports the finding indicating that, land degradation have indirect impacts on poverty (Barbier & Hochard, 2016).

Among many factors trapping Ethiopia in its current state of poverty, high rate of natural resource degradation is the dominant factor. Natural resource degradation together with

underlying factors impedes achievement of sustainable economic development and food security (Asefa & Zegeye, 2003). In addition, depletion of resources brings about the shortages and conflicts, which in addition threaten the sustainability of rural livelihoods (Malley, Taeb, Matsumoto, & Takeya, 2008). For instance, in the central rift valley of Ethiopia, expansion of land degradation over time has led to the deterioration of agricultural productivity and worsening of food insecurity (shortages) and poverty (Meshesha, Tsunekawa, & Tsubo, 2012). Furthermore, pastoral societies in the arid and semi-arid parts of Ethiopia are enduring a downward spiral of increasing poverty, food insecurity, and escalating instability. These problems are eventually triggered by factors that limit traditional patterns of resource use. Such factors include human population growth, degradation and fragmentation of traditional grazing areas (Desta, Berhanu, Gebru, & Amosha, 2008).

2.2.3.2 Understanding Community Perceptions of Rangeland Degradation

In the vast area of world rangelands, rangeland degradation has become the issue of concerns, because, rangeland provides ecosystem services including food, water, and livelihoods for many of the world poor. Factors contributing to rangeland degradation are multifaceted in time and space and linked with interaction between governance, pastoralists, policy and environmental factors (Bedunah & Angerer, 2012). Even though mostly researched, pastoralists are yet the least understood groups in the world. In spite of decennium of scientific research government, non-governmental organization, policy makers and wider public do not fully appreciate the importance of pastoralist expert perceptions (Ho & Azadi, 2010). Therefore, understanding and recognizing community perceptions of the issues to which they are the part, must be the concern of the researchers, policy makers, government and non-governmental organizations. Authors like Angassa and Oba (2008b) indicated that perceptions of the community have the most important methodological contributions. In Boorana area of southern Ethiopia, previous study mostly focused on the assessments of rangeland ecology. Even though, it is the highly researched system, the importance of relying of Gadaa timeline to integrate community perceptions and knowledge in Boorana lowland, were highly undermined by research, non-governmental organization, policy makers and government. Therefore, the current study wants to take into account the perceptions of community experts in understanding rangeland degradation in Boorana lowland using Gadaa timeline.

2.3 Conceptual Framework

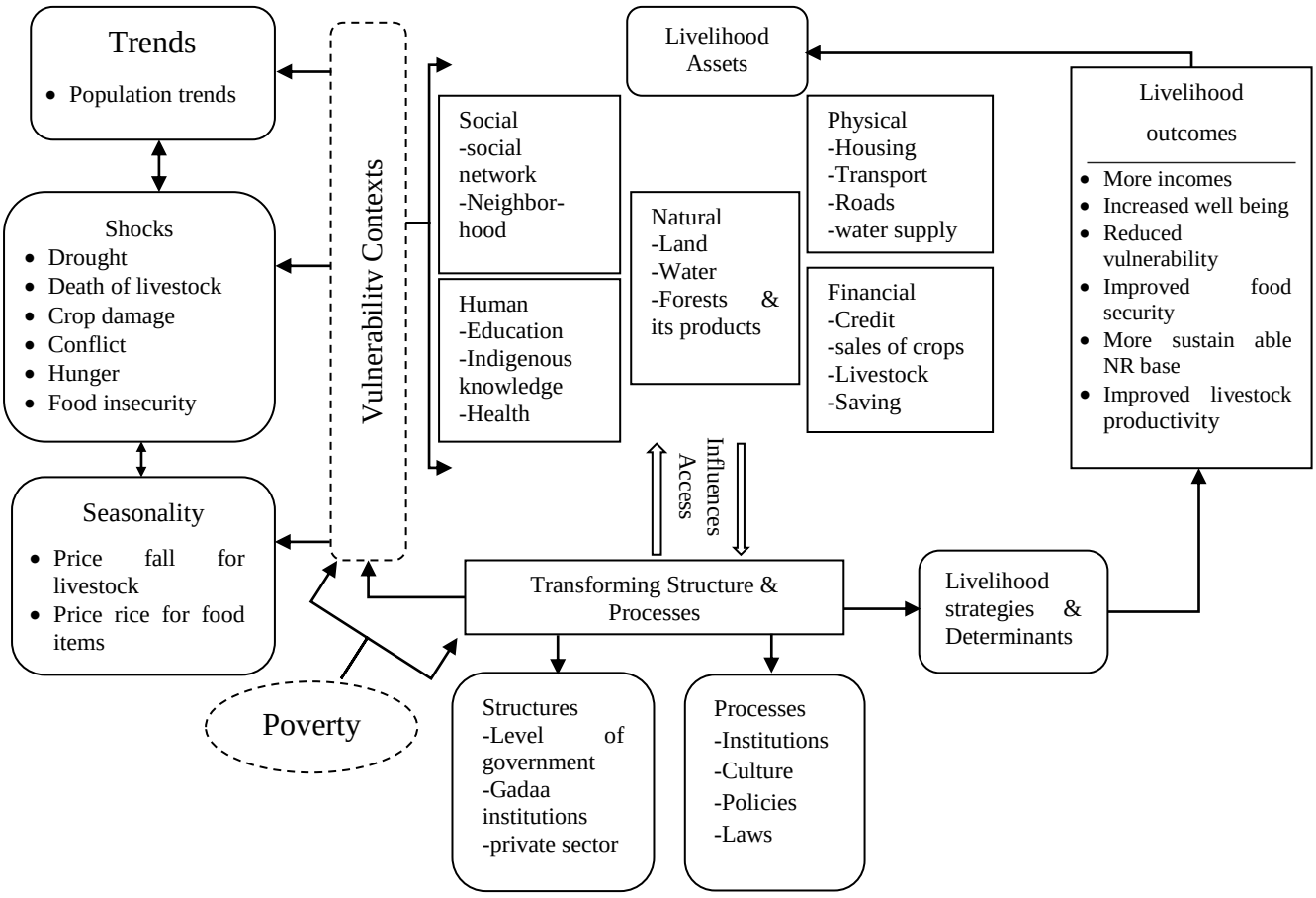
Understanding poverty, resource degradation and livelihood is crucial for policies and other interventions that targets pastoral communities in arid and semi-arid lands. The level of poverty in pastoralist areas has been increasing from time to time. Besides, rangeland degradation has been worsening than any time. Previously better rangelands have now severely degraded. Further pastoral livelihoods are now more diversifying to cope with hardship from different factors. Thus, studying pastoral poverty, rangeland degradation and pastoral livelihoods is priority concerns to put pastoralist issues on policy agendas. Using the framework (**Figure 2.2**) the study has tried to put how these issues are interlinked in the study area. There are different factors that contribute to poverty of rural households. For instance, demographic characteristics of households, climate change and variability, lack of education, land tenure insecurity and weak political and economic institutions are among the few factors holding rural household in destitution. Thus, understanding poverty from the perspectives of society is crucial to deepen societies understanding of root causes of poverty and coping mechanisms they suggests.

Degradation of resource base particularly rangeland is one of the major cause of pastoral poverty. Rangeland degradation itself can be caused by different factors associated with vegetation indicators, rangeland production indicators, human related factors and environment and climatic related factors. To escape consequences of both rangeland degradation and poverty pastoral households engages into different livelihood strategies. Household's choice of livelihoods and its determinants were also analyzed using SLF. Some of these livelihood choices were the usual activities already functional in the area or some other promising alternatives for living opted by households. It is also posited that the choices household makes can be determined by several factors. Pastoral livelihoods in the study areas are determined by several household demographic and asset characteristics.

Sustainable livelihood was incorporated into approaches for livelihood analysis and poverty reduction since late 1990s (Brocklesby & Fisher, 2003; Solesbury, 2003). It is mainly motivated by development agencies and international organizations as their efforts to reduce poverty (Solesbury, 2003). Many of international organizations and donor agencies started to use sustainable livelihood approach (SLA) since then (Brocklesby & Fisher, 2003; Solesbury, 2003) and it has become the dominant approach (Morse, McNamara, & Acholo, 2009) for

livelihood analysis. The concept of sustainable livelihoods is very important point of discussion in the development debates (Scoones, 1998). SLA is unique because it is based on the conventional view that "research informs policy and policy is implemented through practice" (Solesbury, 2003). But, whether the nexus between research, policy and practices is well established in developing countries is still not clear. In developing countries, many of academic researches remain only on shelves. In addition, sustainable livelihood researches can identifies the context of vulnerability, capitals, livelihood strategies, livelihood outcomes and institutional processes (Scoones, 1998). This kind of process can enable the researchers to fully understand the household's ways of living and the influences of external and internal shocks. Further, SLA is unique for that it is people centered, holistic, dynamic, builds on strength, macro-micro links, and sustainability (Kollmair & Gamper, 2002).

Figure 2.2: Sustainable Livelihood Framework



Source: Adapted from DFID (2001)

3 UNDERSTANDING POVERTY AND SURVIVAL STRATEGY AMONG ETHIOPIAN PASTORALISTS: THE BOORANA PASTORALIST PERSPECTIVES

Abstract

The paper assessed the understanding of poverty and its survival strategy from Boorana[3] pastoralist perspectives. Poverty is often assessed using rigorous economic methods in extant literature. Nonetheless, understanding pastoral poverty from supposedly rigorous economic methods per se is not sufficient. This study argued that pastoralists' knowledge of poverty and its survival strategy provides foundations to understand poverty. The study provides a unique data set on the understanding of poverty and its survival strategy from the perspectives of pastoralist in an African context (Ethiopia). By doing so, it adds new knowledge and insight in the study of pastoral poverty. The study was based on focus group discussions and interviews among different participatory poverty assessment methods. The data were analyzed by descriptions of responses and narrations of cases. The results showed that pastoralists perceive poverty as lack of livestock, low health, lack of money, lack of education and jobs. The findings also showed that climate change and variability, deteriorations of pasture and water resources, lack of education and over utilizations of resources were the main causes of poverty. Boorana pastoralist perceives that diversification of income sources, crop cultivation, improvements of pastoral education, destocking, and returning to forefathers' cultural practices were the main survival strategy of pastoralists against poverty. The study concluded that given environmental and sociopolitical dynamics in pastoral areas poverty would be tenacious in unprecedented way. Therefore, there is a need to understand the dynamics of pastoral poverty for appropriate policy interventions.

Keywords: Pastoralists, Pastoral poverty, Survival strategy, Boorana, Ethiopia

Paper I (3) Under review as Galgalo Dika, Degefa Tolossa & Shiferaw Muleta. Understanding Poverty and Survival Strategy among Ethiopian Pastoralists: The Boorana Pastoralist Perspectives. *International Journal of Rural Management.*

[3] The name *Boorana* has been spelled differently by different authors. For instance, some spell it as *Boran* (Schlee, 2007), *Borana* (Angassa & Oba, 2008b; Homann et al., 2008; Tolossa, 2018), *Booran* (G. Oba & Kotile, 2001), *Booranaa* (Ta'a, 2016). However, for this paper we preferred to spell it as community themselves pronounce as they call themselves using appropriate *Afaan Oromoo* spelling. Eg. Nu Boorana (we are *Boorana*). Therefore, throughout the paper we used Boorana.

3.1 Introduction

Poverty is an old and deep-rooted challenges of human being (Hayati & Karami, 2005). Large number of people live in poverty (Shoaf Kozak, Lombe, & Miller, 2012) and its effects are far-reaching (Chung & Maguire-Jack, 2019). Despite much efforts to reduce and eradicate it, poverty has yet prevailed among human beings in this 21st century (Hayati & Karami, 2005; Narayan & Petesch, 2002). Eradicating poverty in all its forms and dimension (United Nations, 2015b) has been an ambitious goal among many countries and global organizations even though there are still challenges in achieving it. Currently, the questions about why poverty exists, and what can be done to alleviate it has dominated scholarly discussions among many academic disciplines (Blocker et al., 2013). The basic questions surrounding poverty has to be investigated now and in the future until this dreadful problem of humanity is reduced and obviated. Therefore, As Ravallion (2016) indicated poverty should not be excused and thus, its root causes has to be identified stringently.

With respect to the way poverty should be analyzed and understood there is little unanimity among scholars (Stanovnik, 1992). Some scholars such as Booth, Leach and Tierney (1999) argued that understanding and analyzing poverty only from presumably rigorous economic methods per se is not enough by positing a number of arguments. First, it was believed that researches that grasps perceptions of poor, identifies their concerns and coping mechanisms is equally mandatory (Booth et al., 1999). Second, the study challenges supposedly accurate quantitative method (White, 2002) and underpins equal significance of both qualitative and quantitative methods for poverty analysis (Booth et al., 1999; Tache & Sjaastad, 2010). Third, there is an increased use of qualitative method for poverty analysis (Angemi, 2011). Whether seen in the lenses of the poor or seen through aggregate poverty statistics the problems of poverty are persistent. Therefore, understanding the nature of poor communities offer unique advantages for understanding why poverty persists across generations in different places (Duncan, 1996).

It is therefore imperative to take into account the voices of the poor themselves from around the world since poverty itself can be manifested through human experiences (Blocker et al., 2013). In other words, poverty can also be studied and reduced by building mechanisms around what could be learned from the poor and the reality they have experienced in their livelihood (Narayan & Petesch, 2002). In this regard, the study of Narayan, Patel, Schafft,

Rademacher and Koch-Schulte (1999) on voices of the poor provides a noble approaches. These authors concluded that poverty is a multidimensional phenomenon and households can experience multiple impacts of poverty due to limited and ineffective efforts to reach them. Therefore, poor people depend on their own social networks, which itself is unraveling (Narayan et al., 1999). Hence, through perspectives of the poor themselves, the way people perceive and define poverty and survival strategy they suggest can be identified. For instance, the study identified that people perceive poverty as dynamic problem (Tolossa, 2008) where people dive in and out of it depending on different determining factors.

Pastoralists are on perilous precipice due to immediate natural and human challenges facing them. In arid and semi-arid land pastoralists faces problems of land losses, stagnant livestock prices, conflicts and political marginalization (Little et al., 2008). In addition pastoralist are in daunting challenges of poor access to basic social services, weak institutions, poorly developed support, uneven markets and vulnerability to recurrent drought (World bank, 2016). Pervasive poverty, environmental degradation, social conflicts, displaced people, and climate change are common features of pastoralist in developing countries (Coppock et al., 2017). Pastoral poverty crisis had been proclaimed since the 1970s (Little et al., 2008) and pastoralists in East Africa are among the poorest. A good example is Ethiopian (Hanjra et al., 2009; Kassahun et al., 2008; Mohammed et al., 2014; Tache & Oba, 2010; World bank, 2016) and Kenyan pastoralist where they experienced highest destitution and marked as the poorest (Kristjanson, Mango, Krishna, Radeny, & Johnson, 2010).

Despite Ethiopia's rapid economic growth in recent years, subjective poverty remained high (Alem, Köhlin, & Stage, 2013). Pastoralists are among the poorest in Ethiopia. They have been economically, socially, and politically marginalized because they have been given inadequate attention by policy makers (World bank, 2016). As it has been attested by Gebeye (2016) the legal and policy interventions in Ethiopia were not pastoral sensitive, and accordingly, they have been unable to bring the desired result. In the face of protracted natural and anthropogenic problems, pastoralists are becoming increasingly vulnerable. Levels of destitution and food insecurity, and the impacts of drought have been worsening (African Union, 2010).

The causes of poverty, its alleviation and coping mechanisms have been a matter of serious concern (Hayati & Karami, 2005). This is also consistent with Ravallion (2016) suggestions of never forgive poverty. In Ethiopia, several intertwined factors contribute to the poverty.

Low agricultural production, low basic social services, high population growth and weak institutional structures (Enquobahrie, 2004) are highlighted as the basic causes of poverty in Ethiopia. In addition, Bersisa and Heshmati (2016) attested that demographic, regional, and household heads' characteristics are major factors in causing multidimensional poverty in Ethiopia. Furthermore, human capital, and socioeconomic characteristics are important determinants of poverty (Berisso, 2016). The study also revealed that poverty is determined by diversification of livestock holding (Mohammed et al., 2014), access to irrigated land (Hanjra et al., 2009; Mohammed et al., 2014), improved forage and market centers (Mohammed et al., 2014). In addition, family size (Alemu et al., 2011), land and livestock holdings (Alemu et al., 2011; Hanjra et al., 2009), diversification in crop production, engagement in non-farm activities and utilization of microfinance services are significant factors driving poverty (Alemu et al., 2011). The study attested that on-farm land and water conservation practices, literacy of the household head, and years of education of adults are all important determinants of household welfare (Hanjra et al., 2009).

So far, poverty research was mainly encircled around the aggregate statistical methods of poverty analysis. For instance, several authors (Alemu et al., 2011; Berisso, 2016; Bersisa & Heshmati, 2016; Mohammed et al., 2014) merely employed econometrics methods to identify root causes of poverty. Using supposedly rigorous quantitative methods alone would not capture the reality of poor. Thus, to fully understanding poverty, its causes and coping mechanisms contribution of community should have to be considered. Little et al (2008) congruously attested that understanding and alleviating poverty has been receiving remarkable attentions. In contexts of pastoralist understanding multifaceted causes of poverty is a mandatory first step toward the informed and effective policy making and project planning (Little et al., 2008).

There are many reasons to understand and analyze poverty from the perspectives of the community. First, there is much to be understood by analyzing poverty with community perceptions of who are poor, why they are poor and what needs to be done, in addition to conventional measure of poverty. Second, understanding causes of poverty is more rigorous if takes into account poor's own view of dynamics of poverty and factors driving to destitutions. Third, the design of policy interventions needs to consider and build upon poor people's own coping strategies (Booth et al., 1999). Forth, development towards poverty reduction strategies needs to take into account victims perspectives on understanding the root

causes of poverty (Maseko et al., 2015). Fifth, understanding the constraints and behavior of the marginalized poor is essential for effective program designs (Von Braun & Gatzweiler, 2014). Therefore, this study argues that recognizing the importance of community expert knowledge in defining and understanding poverty, identifying the causes of pastoral poverty and the role of community perceptions to obviate poverty provides the basic methodological foundations for researches and policy. The basic questions raised by this research are; how do pastoralists define and understand poverty? What are root causes of pastoral poverty? What do pastoralists suggest on poverty reduction and survival strategies employed by poor peoples?

3.2 Conceptual Framework

The literatures indicated that the majority of African countries are poor (Barrett, Carter, & Little, 2006). Above all poverty is dominantly concentrated in sub-Saharan Africa (Cruz, Foster, Quillin, & Schellekens, 2015; World Bank, 2016). Pastoralists are amongst the most vulnerable groups to changes and are in daunting challenges where poverty has become widespread particularly in East Africa. Poverty is very high in Ethiopian pastoralist areas (Berhanu, 2019). Pastoral poverty crisis had been proclaimed since the 1970s (Little et al., 2008). Since then the enormity of poverty has affected the livelihoods of many pastoralists' households. Thus, conceptions and alleviations of poverty have received the attentions of researchers and policy makers.

The theoretical and conceptual foundations of poverty had multiple origins (Bradshaw, 2006; Sameti, Esfahani, & Haghighi, 2012). Bradshaw (2006) stated that the theories of poverty has its origin from 1) individual deficiencies, 2) cultural belief systems that support subcultures in poverty, 3) political-economic distortions, 4) geographical disparities, or 5) cumulative and circumstantial origins. Sameti, Esfahani, and Haghighi (2012) also see individual factors, cultural and neighborhood factors, and structural factors as the three major factors of poverty.

Blaming the individual behaviors for the causes of own poverty is an old concepts. There are multifaceted behaviors of individuals that can lead to poverty of the individual (Bradshaw, 2006). These behaviors of individuals include attitude, human capital, and welfare participation (Sameti et al., 2012). We also believe that individual behaviors like bad work habits and over utilizations of resources can be a cause for the poverty of individuals. The second factor of poverty is cultural and neighborhood factors of poverty. The concepts of

culture of poverty and social isolation provide frameworks that explain how poverty is created and maintained in some neighborhoods or among some groups (Sameti et al., 2012). Oscar Lewis first used the term "culture of poverty" when he undertook a study on poverty in Mexico and Puerto Rico in 1961 and 1966. The concepts of culture of poverty and social isolation provide frameworks that explain how poverty is created and maintained in some neighborhoods or among some groups. The cultural and neighborhood elements related to the influence of people's residential environment tends to form poverty or success (Lewis, 1966). Lewis (1966) has identified many traits that characterize the culture of poverty. The major features may be described in four dimensions of the system: (1) the relationship between the subculture and the larger society; (2) the nature of the slum community; (3) the nature of the family, and the attitudes, values and (4) character structure of the individual. Generally, this theory suggests that poverty is created by the transmission over generations of a set of beliefs, values, and skills that are socially generated but individually held (Bradshaw, 2006).

In addition larger economic and social structures have been found to account for poverty (Sameti et al., 2012). In this sense, poverty is caused by economic, political, and social discriminations. Further the disparities between geographies as rural poverty, urban poverty, southern poverty, third-world poverty, and other framings of the problem represent a spatial characterization of poverty that exists separate from other theories (Bradshaw, 2006). Seen through these theoretical lenses the pastoral definitions and causes of poverty has its roots in the factors such as individual behaviors, cultural attachments and perceptions, social, economic, and political discriminations and geographic disparity and deficiency in resources and other natural calamities.

3.3 Research Methodology

3.3.1 Descriptions of the Study Area

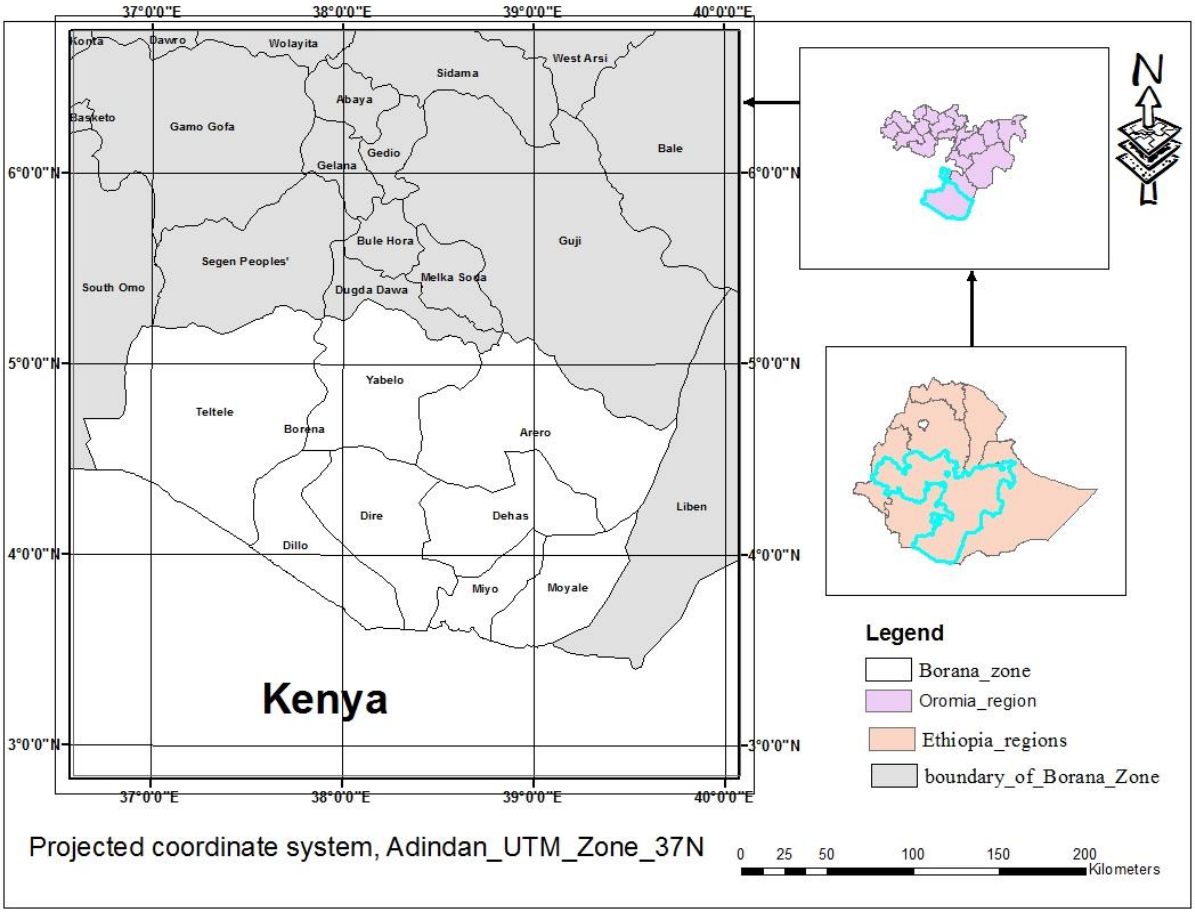
3.3.1.1 Biophysical Settings

The study was conducted in Boorana Zone (**Figure 3.1**), a zone which extends between 3^{o} 26' and 6^{o} 32' North latitudes, and between 36^{o} 43' and 40^{o} 46' East longitudes. In the south Boorana shares international boundary with Kenya, and is bordered with Somali region in the East and Southeast, Guji zone in the East and Northeast, and with SNNPR in the west, northwest and north. The study area is dominated by a semi-arid climate (Coppock, 1994) with an altitudinal range of 1000 to 1500 meter above sea level (m.a.s.l), and a mean annual

rainfall measuring below 600mm (Tache, 2008) and average mean annual rainfall from 1990 to 2017 measures nearly 520mm (**Figure 5.1**). Boorana area receives bimodal pattern of rainfall with the main rains (*gannaa*) falling between March and May, and the short rains (*hagayya*) between September and November (Angassa, 2007). The data for this research was gathered in March and continued to the months of *Adoolessa*. Though data collections were started during the month of *ganna*, the *ganna* was late and did not come on the expected time. Boorana zone falls under three agro-climate zones namely, *Kola* (tropical) 56%, *Weyna Dega* (sub-tropical) 31% and *dega* (warm temperate) 13% (Tolossa, 2018). Based on Boorana traditional ecological zonation, Boorana land is broadly categorized as Liiban and Dirree. Liiban grazing zone (*dheeda*) is divided into *Golbaa* and *Gubbaa*. Dirree encompasses *goomolee, Malbee, Golboo, Dirree* (Tula wells grazing zone) and *Wayaama* grazing zone (Dika, 2016; G. Oba & Kotile, 2001) and the badda sadeen (the three sub-humid zones).

Data from National Meteorological Agency 2019 indicates that temperature of the area ranges from 14.2 °C to 25.4 °C. Frequency of the drought has increased to every 1-2 years (Riché et al., 2009). Like in other pastoral rangelands of Ethiopia, the fauna in Boorana is mostly characterized by sparse vegetation composed of mainly grasses, bushes, shrubs, small trees and bare land. Plant communities on the flat and hilly plains of the central Boorana semi-arid area consist of diverse mixtures of woody and herbaceous vegetation (Coppock, 1994). In addition, the woodlands of Boorana rangelands are characterized by species from the genera Combretum and Terminalia, whereas the bush lands and thickets, which cover major parts of the Boorana lowlands, are dominated by Acacia and Commiphora species (Dalle et al., 2006a).

Figure 3.1: Location Map of the Study Area



Source: Own Construction 2019

3.3.1.2 Socioeconomic Setting

The Boorana are one of the major Oromo branches that are predominantly pastoralists living on both sides of the Ethiopian and Kenyan geo-political divide. Following the imperial conquest and boundary delimitation between Ethiopian and British-Kenyan jurisdictions, in 1907 the Boorana were placed in two separate territories (Bassi, 2010; Helland, 2001). This resulted in the categorization of the same stock of people into separate citizenships. In Ethiopia under current administrative structure, Boorana zone is one of the administrative jurisdictions of Oromia regional state in Ethiopia. Boorana zone occupy the southernmost tip of the country. Under boorana zone there are thirteen administrative districts. Districts are the middle administrative levels in Ethiopia.

In Boorana zone both the human and livestock population has been increasing, while the potentials of pastoral resources, notably rangelands and livestock productivity has been

declining from time to time. Livestock production is the main source of livelihood of the people, with increasing engagement in crop production and non-pastoral activities (Megersa, Markemann, Angassa, & Valle Zárate, 2014; Tilahun et al., 2017). People are now more diversifying sources of livelihood to cope with the multifaceted effects of different shocks. Livestock contributes a lot to national economy and foreign earnings. In Ethiopia livestock contributes 12 - 16 percent to total Ethiopia's GDP and 30 - 35 percent to its agricultural GDP (Esayas et al., 2019). In addition, livestock sectors also contribute 12.2 percent of the country's foreign exchange earnings (Berhanu, 2019). Though livestock sector contribute to countries development by large pastoralist are not enjoying their fair share from countries economic development.

3.3.1.3 Gadaa System: An Egalitarian Democratic System

The identity of Oromo people (culture, philosophy and civilizations) all are well grounded in the Gadaa system. *Gadaa* is certainly the very strong symbol of Oromo ethnic identity and an invaluable ancient civilization that the Oromo offered to the world as an intangible cultural heritage (Ta'a, 2016). The Gadaa system is the system of class (*luba*) that succeed each other every eight years in assuming military, economic, political and ritual responsibilities. Each Gadaa class remains in power during a specific term (Gadaa), which begins and ends with a formal power transfer ceremony (*Baallii*) (Legesse, 1973). Different scholars stated that Gadaa system represents one of the most complex systems of social organization ever devised by the human imagination and thus represents the totality of Oromoo civilization (Jalata, 2012). Gadaa has been an egalitarian and democratic socio-political and cultural system of governance (Ta'a, 2016). Many features make Gadaa a democratic system of governance. Among these features Gadaa has the principle of check and balance, peaceful power transfer (*Baallii*), accountability of leaders and the right to recall/impeach, law making, participations, and national assembly among others.

Boorana have preserved their egalitarian indigenous political system, *Gadaa* in its original form. *Gadaa* has becomes a conceptual abstraction, something in which all Oromo are supposed to identify themselves (Bassi, 1996). Customarily Oromo believed in a supreme divine, *Waaqa* (God), however, in due course most of them were turned to Christianity and Islam without giving up *Waaqeffannaa* practices since it is similar to both as a monotheistic religion. Nevertheless, the Boorana Oromo have strongly maintained the cultural heritage of the original *Gadaa* intact (Ta'a, 2016). A pan-Boorana assembly, called the *Gumii Gaayoo*

convenes once in every *Gadaa* period to make or amend customary laws, while the *Gadaa* institution takes the role of custodianship of the laws (Tache, 2008). The Gadaa system is divided into different age set, generational classes and Gadaa grades (Legesse, 1973).

In Boorana *Gadaa* period, there are three branches of Gadaa. These are *Gadaa Arbooraa*, *Gadaa Awaxxuu* and *Gadaa Koonnituu* (Dida & Woldemariam, 2014). Each branch has its own independent leader, the *Abbaa Gadaa*. Thus, there are three mobile ritual villages and three *Gadaa* leaders in one *Gadaa* period. Of these, *Gadaa Arbooraa* is the senior one and its leader is a leader of his class, as well as the leader of all Boorana during his office term. The indigenous *Gadaa* system organized and ordered society around political, economic, social, cultural, and religious institutions (Legesse, 1973). By these it can be understood that *Gadaa* as a system of governance embodies several institutions which manifest themselves in an overall socio-economic and political culture.

3.3.2 Research Method and Design

The study was guided by exploratory qualitative research design. This is because as there are growing need for recognition of integrating qualitative and quantitative method (Booth et al., 1999), there are also increased use of qualitative method for poverty analysis (Angemi, 2011). In addition, Tache and Sjaastad (2010) also indicated that assessing poverty based on income or expenditure leads to misidentification of the poor in pastoralist areas. Further, as a result of paradigm shifts (Tolossa, 2005) in researches qualitative methods of data analysis and mixing of both methods had gained the popularity in science. Thus, now dichotomy of hard and soft science works no more. Qualitative approaches have the strong qualities and can enable the researchers to construct the social reality and understand the feeling of society. The use of qualitative method was motivated by the fact that the perceptions of the participants can be best captured by in-depth analysis of the views of participants. Qualitative research involves finding out what people thinks and how they feel. Therefore, understanding poverty and survival strategy from the perspectives of pastoralists themselves is also suitable for a kind of methods that is built on understanding perceptions and meaning that ascribe social problem. Therefore, the study adopted constructivist paradigm to elucidate the pastoralists understanding of poverty and survival strategy. According to Creswell (2013) this philosophical underpinning is also described as interpretivism and helps individuals to seek the understanding of the world in which they live and work. In constructivism, the role of research is to understand the participants' views of the situation. Based on this philosophical

ground of the interactions between researchers and pastoralists, the researchers were able to understand and explain the reality of pastoral poverty and survival strategy in Boorana pastoral areas.

3.3.3 Sampling Techniques and Procedures

The research was based on the primary data directly collected from the participants. The paper was based on multi-stage purposive sampling where; in the first and second stages the study districts (*Yaabello* and *Eelwayyee*) and the study *kebeles* under each district were selected respectively using purposive sampling techniques based on homogeneity of the population and for efficient and timely data acquisition. From *Yaabello* district, the data was generated from *Harweeyyuu* and *Dharriito kebeles*, whereas from *Eelwayyee* district it was collected from *Aadee Galchat* and *Hiddii Aallee kebeles*. In the third stage the participants were selected purposely. Participatory poverty assessment (PPA) method was used to collect and analyze the data. PPA approach was developed during the early 1990s with the goal of increasing the contribution of poor people in the processes of formulating and implementing policy for poverty alleviation (Brock, 2000). It is an iterative, participatory research process that seeks to understand poverty from the perspective of a range of stakeholders in its local social, institutional and political contexts (Brock, 2000; Narayan & Nyamwaya, 1996). PPA uses a range of methods for poverty analysis but we used focus group discussions (FDG) and semi structured interview. Data were collected during the field days by the lead researcher from March to June 2019 at multiple scales.

Semi-structured interviews were conducted with 24 respondents. The interview was used to elucidate and capture the pastoralist understanding of poverty and its coping mechanism. In-depth interview is the main methods of data collection in qualitative research (Ritchie & Lewis, 2003). Interview was the basic tools by which we were able to comprehend the way participants define poverty, root causes of poverty and pastoralist perception on poverty reductions and its coping mechanisms. The selection of interviewees was based on participants' prior knowledge of problem under investigation, and the referral from the community about who is knowledgeable in the community. The case households were selected randomly from each study sites. Accordingly, we have conducted sixteen in-depth

interviews with local elders, village heads (*abbaa ollaa*), leader of *ganda*[4], four interviews with case households, and four with *jaarsa argaa-dhageettii*[5]. Local elders were those who have adequate knowledge of the area in which they dwell. Leader of *ganda* are the political leader of the area.

Further Focus Group Discussion (FGD) was conducted with four groups. The discussants were selected based on their knowledge of the problem under investigation, popularity and position in the community. Heterogeneous and homogenous groups of elders, women, village heads and other community members were contacted. The number of participants in each group ranges from 6-8 individuals. In addition, the discussions were made with leader of *ganda*, kebele manager and Development Agents (DAs). These discussions were made to understand pastoralist conceptions of poverty and survival strategies.

3.3.4 Data Analysis

Analyzing the nature of poor rural communities offer unique advantages for understanding why poverty persists across generations in the different places (Duncan, 1996). Therefore, to capture the reality of poor in Boorana pastoralist area, this research dominantly relays on qualitative data. The data were analyzed by systematic summarization of responses and narrations of cases. In addition, qualitative data were rephrased and others were put in verbatim form and were analyzed by explorative analysis, which includes descriptions of response, content analysis and narratives of case studies.

3.4 Results and Discussion

3.4.1 Definitions and Pastoral Understanding of Poverty

The efforts to address poverty have to give attentions to community experiences of poverty and the way poor look at poverty. This is because poverty can also be obviated by mechanisms built around what could be learned from the poor and the reality they experienced (Narayan & Petesch, 2002). The ways pastoralists perceive, define and understand poverty were assessed. Pastoralist reported that poverty is dynamic and multifaceted in its traits where people dive in and out of it depending on several determining

[4]***Ganda*** *is an Oromo term, equivalent to kebele, which is lower level administrative unit in Ethiopia. It is lower than districts and one ganda has several ollaa (village) under it.*

[5]***Jaarsa argaa-dhageettii*** *is the elders knowledgeable in what was seen and told. Borana believe a man can acquire knowledge through argaa and dhageettii. Argaa is what was seen, observed and experienced in person's lifetime, whereas dhageettii is knowledge acquired through hearing from elders and other sources.*

factors. This is consistent with Tolossa (2008) finding that states that poor people sees poverty from many dimensions. Respondents used several indicators in defining poverty. As basic characteristics, respondents related poverty with possessions of assets (livestock and others), dignity, physical well-beings, education and enabling environmental factors. Respondents frequently used "lack of livestock" as the main indicator in defining poverty in Boorana pastoralist area. Therefore, livestock holding is the main indicators for household's wealth status for Boorana pastoralists. Based on participants perceptions poverty is therefore generally defined as deficiency in wellbeing that overarches low wealth status and lack of livestock, low physical health, lack of education and bad enabling environment for sustainable pastoral livelihoods. Health and education are two main dimensions of human development indicators. Thus, pastoralists definitions of poverty are collectively consistent with multidimensional understanding of poverty.

Boorana pastoralists were once considered as one of the most sustainable rangeland production system in East Africa (Cossins & Upton, 1987). An interview with *Jaarsa argaa-dhageettii* (elders knowledgeable in what was seen and told) at *Wakoora Waaqoo*[6] age, at *Aade Galchat* revealed that before *Gadaa* of *Jiloo Aagaa* (1976–1984) Boorana had abundance of resources. "There were plenty of pastures for our livestock" he said. "However, currently poverty is pervasive" he added. The elder had an understanding that Boorana pastoralists had experienced a dynamic change through time. The elder also indicated that in late 1970s to 80s the resources available for their livestock were adequate. However, the elder was clear that dynamic changes in availability of resources are related to pastoral poverty. It is therefore imaginable that changes in the patterns of resources, through degradations triggered pastoral poverty. Coppock et al. (2017) consistently stated that poverty is among wide array of challenges that pastoralist endures. Therefore, as indicated by Blocker et al. (2013) defining poverty from perspectives of the poor and understanding their conceptualization of what is poverty is very important. Pastoralists define poverty with reference to livestock holding notably cattle, physical health, education and money. This is thus unanimous with Narayan and Petesch (2002) where the stories of poor people were considered as a testimony to their live experiences. Generally, participants have defined poverty as having nothing, low health, lack of money, lack of resources and livestock, lack of

[6] *Wakoora Waaqoo* is one of the age-set (*Harriyya*) in Boorana. In Boorana age of an individual is counted from the Gadaa period in which he was born. *Wakoora Waaqoo* was born in Gadaa of Aagaa Adii Dooyyoo (1936-1944). At time of interview *Wakoora Waaqoo* is an elder at of age of late 80s.

education and jobs. Some of Boorana pastoralist definitions of poverty are put in verbatim form as follows:

> "Poor is someone who do not have anything. When I say anything it also refers to someone who does not have an eye and legs (ilaa-miila)".
>
> A young woman from Harweeyyuu, Yaabello district

> "Poor is someone who have nothing, who do not have livestock and money".
>
> A poor woman from Hiddii Aalle, Eelwayyee district

The above definitions of poverty embrace traits like possessions, health and money and therefore define poverty as deficiency of possessions of assets, health and lack of money. By stating poverty as "having nothing" the participants had precise understanding of deprivation as inability of meeting basic needs needed for survival with dignity. A poor woman form *Hiddii Aallee* also stated that she has nothing, not livestock and money. A young woman from *Harweeyyuu* kebele was married and had six children. She stated that by "not having anything" she also refers to someone who does not have an eye and legs (*ilaa-miila*). She stressed that someone who can see and walk could work to move out of poverty. "However, those who have nothing and who cannot see and walk cannot move out of poverty" she said. In additions, the participants also noted that poor health and lack of money are the main indicators of poverty. Meanwhile it can also be comprehended that having assets (livestock), money and health is mandatory for life free of poverty. Participants also indicated that poverty can also be seen from perspectives of lacking resources, notably livestock.

> "Poverty is lack of resources to lead a successful live. It is lack of livestock and what to eat".
>
> A young man from Aade Galchat, Eelwayyee district and
>
> A woman from Dharriito, Yaabello district

> "Poor is someone who do not have livestock".
>
> An elder from Hiddii Aalle, Eelwayyee district and
>
> A young woman from Aade Galchat, Eelwayyee district

> "Someone who has no livestock is poor. If you have livestock you are relatively better-off".
>
> An old woman form Harweeyyuu, Yaabello district

> "Poverty is lacking of livestock. Those who do not have livestock are poor".
>
> An elder from Harweeyyuu, Yaabello district

> "Poverty occur when one lack a livestock. That is poverty. The main cause of pastoralist poverty is lack of rain".
>
> An elder from Dharriito, Yaabello district

The participants had clearly indicated the links between poverty and livelihood is determined by the resource household had. Livelihood is the means of earning a living that comprises capability, assets and activities needed for the living. Thus, participants reported that lack of sufficient resources particularly livestock and foods puts households in an unsuccessful life. Resource is very broad concepts that can affect livelihoods of pastoralist in many aspects. The availability of adequate pastures and water resources are the dominant factors that determine the productivity of livestock in Boorana pastoralist area, which in turn affects the livelihood of community in Boorana rangeland systems. The availability of water resources also contributes to the alternative crop productions in Boorana lowland. Therefore, participants clearly revealed that deficiency and/or deterioration of one or more of these resources directly or indirectly affects the livelihood of pastoralist, which thereby determines the poverty status of households.

Traditionally Boorana defines household's wealth status by number of livestock household had. Although the possession of other livestock species in addition to cattle contributes to definitions of pastoralist wealth status, number of cattle households possess takes a lion's share. Almost all participants involved in an interview and focus group discussions indicated lack of livestock as the main indicators in defining poverty in Boorana rangeland. Someone who had large number of livestock is considered as rich and those with few or no livestock is considered poor. Participants indicated that poverty occur when pastoralist lack livestock[7] and someone who do not have livestock is considered poor[8]. Almost all of discussant in *Harweeyyuu* focus group discussions were agreed on definitions of poverty as lacking livestock particularly cattle. Eight discussants were participated in focus group discussion on how do pastoralists understood and define poverty. Discussants were reached to the consensus that poor is someone who lack livestock. Half of discussants believed that even having cattle does not make one rich because, there are minimum number of livestock required to be counted as either poor or rich. At the end, all discussants reached to the consensus that poverty status in Boorana is defined by a number of livestock owned.

[7] An interview with an elder at Dharriito local area, Yaabello district
[8] An interview with an elder at Hiddii Aalle and a young woman at Aade Galchat local area, Eelwayyee district

Possessing significant amount of livestock is a dominant criterion that defines household's wealth status, however, other alternative livelihood activities and constraints to pastoralist productions, should not be overlooked. Boorana pastoralists are currently diversifying sources of livelihood income more than any time. Significant number of pastoralists engaged in crop cultivation, petty trade, some builds hotels in nearby towns and others have been engaging in more returning livelihood activities. Given the changing environmental and climatic conditions livestock sector by itself is on the perilous precipice. Among different factors that has been affecting livestock productivity and exacerbating herd die offs was climate change and underlying factors like recurrent drought, erratic rainfall, livestock epidemics, mobility restrictions, proliferations of bushes and constraints to indigenous knowledge of pastoralist in livestock and rangeland management. It is therefore understandable that wealth status of household is determined by other alternative means of living in addition to possession of livestock. The participants also viewed poverty from dimensions of literacy, access to jobs and bad conditions brought by poverty.

> "Poverty is bad. It brought other shocks. Poor are someone who do not have livestock and jobs".
>
> A young man from Harweeyyuu, Yaabello district

> "Poor is those who do not have knowledge or illiterate. A man is poor when he does not know anything".
>
> An elder from Harweeyyuu, Yaabello district

Poverty is a pain it makes you not only poor but it also prompts other harmful consequences[9]. It brought other shocks. Participants had better understanding that poverty is bad and thus once entrenched it makes victims suffers from health-related diseases, child malnutrition, loss of dignity and feeling of insecurity. Participants also reported that lack of education and good jobs also contributes to poverty in pastoralists areas. The participants in Focus Group Discussion at *Diida Goofoo*[10] area of *Harweeyyuu kebele* indicated that lack of jobs is another feature of poverty. "if you have job you may work hard to gain wealth" some of discussants confirmed. In addition, nearly half of participants underscored that illiteracy itself is poverty.

[9] An interview with old woman at *Dharriitoo*, March 2019.

[10] *Diida Goofo* is the plain grazing area in Harweeyyu kebele. However, the area is currently highly covered with encroaching species. We have met with a group of seven men returning from *motoorii* (water tanks) and discussed several issues.

3.4.2 Root Causes of Pastoral Poverty and its Consequences

Poverty is pervasive in Boorana rangeland system. The impact of poverty has now become more evident than any time in history. Based on the participants knowledge almost all of respondents perceived that poverty persists in Boorana area. Many of previously better-off households were being converted to pauper. In addition, the resources are not abundant and plenty to feed both human and livestock and the conditions of lack and destitutions dominates. Based on the perceptions of participants, it can be underscored that the level of poverty in Boorana rangeland system is very high. Participants had the fear that this level of poverty may not decline and thus, tenacious in unprecedented way. Largest proportion of participants believed that in the future the level of poverty would increase. In an interview, the development agent (DA) from *Harweeyyuu* said that "in the future the probability of failing into poverty is high specially this year if rain did not come on time". This reflects that among many factors that determine the poverty of households in Boorana rangeland system erratic rainfall is the dominant factor. Climate change and variability, deterioration of pasture and water resources, lack of education and over utilizations of resources were identified as the root causes of pastoral poverty based on the perceptions of respondents. Notwithstanding several proximate and underlying causes of deprivations trapping pastoralist in poverty, Boorana pastoralist are extremely keen to obviate and move out of poverty at any cost.

3.4.2.1 Climatic Changes and Variability

Climate change and underlying factors are the main factors that cause poverty of household in the pastoralist areas of Boorana. Boorana pastoralist lives in the arid and semi-arid area and such areas are highly vulnerable to the impacts of climate variability. The impacts of climate changes can reduce the resiliency of household by paralyzing pastoralist resource base and other alternative means of living. In Boorana pastoralist area livestock sector and other promising livelihood strategy like rain-fed crop cultivation is highly vulnerable to the impacts of climate change. Participants in Focus Group Discussion indicated that poverty is caused by climatic changes and variability. The discussants indicated that "the climatic conditions are related to lack of rainfall". Participants in an interview consistently indicated that given the environmental conditions of the area the cause of poverty is related to climate variability and associated dryness, lack of rain and prolonged drought that leads to death of

livestock. Teferi and Feyera (2019) stated that drought has become common features of climate variability and change in Boorana rangeland.

Based on the view of participants, it was found that recurrent drought is the main cause of pastoral poverty. In an interview, an elder from *Hiddii Aallee* confirmed that "the main cause of poverty is drought". Almost all of respondent perceived that frequent occurrence of drought is the major factors holding pastoralist in poverty. Consistent with our finding in pastoralist areas of Kenya it was indicated that drought is the main factors for household to fail into poverty (Kristjanson et al., 2010). In an interview at *Harweeyyuu,* an old woman narrated, "Since poverty is lack of livestock. The causes of poverty are related to the factors that lead to deterioration of livestock productivity. Thus, causes of poverty are drought and lacking livestock". From the narration it can be clearly understood that any factors that cause the decline in livestock numbers is the immediate causes of poverty. In this regard, drought is one of the main factors that cause severe emaciation of livestock and possible herd die-off. Utter emaciation and death of livestock therefore, traps pastoralist into destitutions. In Turkana area Little et al. (2008) congruously found that herders fails into poverty due loss of animals. The conditions of drought and how bad is it was described as follows by local young man.

> "…there is always erratic and insufficient rainfall and these conditions exacerbates drought. Drought is very bad catastrophe and that can take all our livestock and make us poor".
>
> An interview with young man, Aadee Galchat

Participants had compressive knowledge that drought is a disaster that bring with it many shocks. Boorana pastoralists usually referred to drought as *oolaa,* the protracted drought. *Oolaa* is known by its length in durations and severe impacts it brought on both human and livestock. World bank (2016) consistently indicated that vulnerability to recurrent drought is among the several challenges facing pastoralist communities. It was indicated that erratic rainfall is one of the main threats that aggravate the conditions of drought. Failure of *gannaa* or *hagayyaa* rain or late in time of rain in any case extends the drought nights for pastoralist. Since drought is bad catastrophe the narration also indicated that it would take all livestock and throw households to poverty. This is in line with African Union (2010) which indicates that the impacts of drought is worsening in pastoralist areas. The discussion with *Hiddii Aallee kebele* leader and manager witnessed that though the area is known for its poverty, the condition of poverty was heightened by frequent drought and insufficient rainfall.

Drought not only destroys livestock species, but also facilitates the occurrence of livestock epidemics and brought hunger and malnutrition to human. Moreover, it was indicated that during drought pasture are highly deteriorated, wells are dried-up and it cause decline in absolute livestock productivity. Since the economy of Boorana pastoralist depends on livestock, loss or decline in number puts households into poverty. Almost all of discussant in focus group discussion of women at *Dharriito* indicated that in the past there was abundance of milk from caws and it was nutritious. Even few cows give plenty of milk that could feed the whole family. "But now ten cows cannot fill a milk pot" they said. Participants indicated that it is because of drought, that these days pasture land is highly deteriorated and the prime grazing lands were lost to other land use types. Participants further indicated that "now instead of milk we consider grain as butter". Since butter is the most valuable livestock product, it is therefore imaginable how pastoralists have been suffering from reduction in production of livestock and consequent poverty. However, given the nature of rainfall, which is insufficient in amount dependency on rain-fed crop cultivation, is also not sustainable and could not bring self-sufficiency. "May God give us mercy we are overwhelmed by multifaceted problems" they said.

3.4.2.2 Deterioration of Pasture and Water Resources

Sustainable management of pastoral resources is everything for pastoralists and therefore poor management of pasture and water resources are associated with poverty of households. In Boorana pastoralist areas pasture and water resources are inextricably linked and are the also the base for pastoral economy. Access to wet season grazing is made available with the access to wet season temporary water points. Similarly access to dry season grazing make it possible for opening and usage of permanent water points like *tulaa*. Even sustainable management of rangeland is made through *seera marraa-bisaanii* (the law of pasture and water). In many instances, Boorana also swear in name of *marraa-bisaan*. It is because the productivity of livestock of Boorana pastoralist depends on the availability of adequate pasture and water besides other factors. Therefore, the deterioration of these resources from reference ecological state in any way reduces the productivity of livestock and thereby aggravates household's poverty.

Based on assessment of households' perceptions of causes of poverty large majority of participants indicated that poor resource management is the main cause of poverty. The situations of poverty of households are intensified not only by inappropriate management of

resources, but also by deterioration and lack of resources. The discussants participated in focus group discussion at *Harweeyyuu* unanimously stated that lack of pasture and water resources are the main causes of poverty. Water is life and is the basic and fundamental resources and thus "no one can survive without water" they said. The participants indicated that absence of water and pasture exacerbates the condition of drought and death of livestock, which is directly related to the condition of household poverty. During the discussion, the discussants indicated that even though death of livestock was not witnessed, however, several livestock were emaciated and are being fed at homestead. "Therefore, if it will not rain on time, we will fail into deep poverty" they said. Pastoralist in *Dharriito* also indicated that, insufficient amount of rainfall is the main factor that reduces their productivity. *Gannaa* rain did not come on time and their life become difficult and uncertain. "Women and donkey fetching water from far suffered a lot" they said. *Dharriito* is one of the areas where pastoralists engage in crop farming. However, erratic rainfall affected the productivity of the area and put the largest proportions of community in poverty.

3.4.2.3 Lack of Education

Participants stated that another cause of poverty is lack of education and illiteracy. Having the resources per se is not enough to lead life without poverty. However, knowing how to utilize the resources in a sustainable way is also very important. Participants indicated that education is very important that could enable households to sustainably use the resources they had particularly livestock. Based on the assessment of perceptions of participants on causes of poverty largest proportion of participants revealed that lack of education is the main cause of poverty. The results of focus group discussion with discussants also revealed that illiteracy is the root cause of poverty. "When you have livestock and do not know how to utilize them, then recurrent drought comes, took all your livestock and bring poverty to you" they said. Participants asserted that pastoralist have to diversify their livelihood more than any time. Participants in focus group discussion reached to the consensus on how lack of education leads to death of livestock during drought which in turn brings destitution. Narration from their discussion is presented as follows.

> "…in Boorana there are a people who even lost 200 cattle in one drought year, watching them die. You see 200 cattle could be sold to a lot of money. And this is because of lack of education. It is because of illiteracy, lack of experiences and adequate support from the government".

Participants clearly indicated that drought, livestock productivity and poverty are linked. Drought has become the cause of many ills in pastoralist areas in addition to decline of livestock productivity and consequent death of livestock. Participants indicated that it is particularly painful to watch livestock die due to recurrent drought. In addition efforts to reduce the death of livestock during drought through destocking and changing livestock to other asset were also challenging due to strong cultural attachments pastoralist have with their livestock. Pastoralist had the understanding that they would earn money form sell of livestock and to some extent are willing to change livestock to other assets during drought rather than watching them die. In many areas pastoralists had shown how distressful was losing the livestock to drought and unwillingly failing into chronic poverty. Despite the reluctance of pastoralist to destock and change livestock to other assets, there is also limited support from government.

3.4.2.4 Over Utilization of the Resources

On the other hand, participants observed the cause of poverty from consumption behavior of people. In an interview *jaarsa argaa-dhageettii*, revealed that in the past the consumption behavior of pastoralist is not such wasteful. Currently consumption behavior of people was changed, people consumes many foods and over utilizes the available pasture. “In the past, this area had a lot of livestock, but they were lost because of bad consumption behavior” he said. Thus, it is clear that over utilization of resource and resulting threats to the dominant economic sector of pastoralist, livestock traps pastoralist in unprecedented poverty. Participants see consumption behavior as misuse of resources. Resources in this sense include the household assets (livestock, crops, money, etc.) and natural resources (pasture and water, etc.). Over utilizations of household asset, for instance may include selling livestock and inappropriately wasting money. Participants believed that if this over utilization continuous thin-handed household may continue with their poverty. Participants also believed that inappropriate usage and mismanagement of natural resources particularly pasture and water could further degrade resources and affects livestock, which is the resource base for pastoralist.

Over utilizations of pasture leaves the grazing lands overgrazed, degraded and barren, which in turn reduce the productivity of livestock through emaciation and herd-die off due to shortage of feeds. Therefore, given deterioration of pastoralist resource base, poverty is unescapable and many households would be trapped into poverty. Participants in focus group

discussions at *Dharriito* clearly stated that "though a man may not fall into poverty by himself, however, there are also men who can be a cause for his own poverty by inappropriately wasting all what he has". In addition, of consumption behavior, the value people have for livestock is very low compared to livestock value in the past. Participants indicated that, "people are not holding tail of livestock tightly". Boorana pastoralists usually say *eegee horii qabadhu* (hold the tail of livestock) or *horiitti maxxani* (cling to livestock) to emphasize the need for care and management of livestock resources. This all saying indicates the commitment in the care and management of livestock resources. Thus, deterioration of values pastoralists have for their livestock reduces the care for livestock.

3.4.3 Perceptions of Pastoralist on Poverty Reduction and Survival Strategy

Understanding the perceptions of pastoralist on poverty reductions and survival strategies of pastoralist enables policy makers to comprehend the perspectives of the poor and contributes in designing appropriate policies and programs to arrest poverty. Little et al. (2008) consistently indicated that understanding and alleviating poverty had already captured the attentions of range of actors. In Boorana pastoralist area, poverty has become pervasive amid various threats from both natural and man-made factors. In Ethiopia, pastoralists are among the poor. Ethiopia's rapid economic growth was also not helping the households in moving out of poverty and poverty is very high in the country (Alem et al., 2013). Therefore, understanding how to reduce poverty from the perspectives of victims themselves is mandatory. Participants in Focus Group Discussions indicated that poverty is very severe and that "Only *Waaqaa* and *Lafa* (the almighty and land) can help. If we get adequate rain we can move out of poverty" they said. The rain, which pastoralists expect from Waaqaa, is very important for life of pastoralist. Pastoralist indicated that if it rains land grows pasture and livestock becomes fat and they could also obtain a good product from cultivation. The participants stressed that seeking aid from other organization and government may not bring lasting solution and thus they only pray for the rain.

The participants were asked to provide some suggestions on poverty reductions and responsible body to reduce poverty. Generally, the participants indicated that poverty could be reduced through empowerment of youth, destocking, shifting to drought resistant livestock species, improved access to basic services, and engagement in non-farm and farm activities. Based on the interview it was indicated that government, non-governmental organization (NGOs), community leaders and households have to take the initiatives in reducing pastoral

poverty. Based on the focus group discussions and interview with *jaarsa argaa-dhageettii*, case households and key informants it was found that the main coping mechanisms of Boorana pastoralist households were diversification of income sources, crop cultivation, improvements of pastoral education, destocking, and returning to forefathers' cultural practices.

3.4.3.1 Diversifying Sources of Income

Diversifications of sources of incomes are the main factors that helps household to move out of poverty. Pastoralist generates incomes from various sources like providing motorbike transport services, small business and petty trades (selling different beverages, chats, small shops) in and around villages, charcoal making and selling of woods, hay making, and building homes in town and renting them. In the same way engaging into small businesses as sources of incomes is important for pastoral communities in Kenya (Tana River, Wajir and Marsabit) (Kristjanson et al., 2010). In an interview with case household, a woman indicated that the culture of work is very important to move out of poverty even if household had nothing. She further stressed that "to move out of poverty you have to work hard". It is clearly indicated that pastoralist should not focus only on livestock for living, however, engaging into different returning livelihood activity and working hard is mandatory to move out of poverty. Participants indicated that livestock may die if kept inappropriately and drought occurs. Therefore, it was indicated that engaging in other activities, possibly small business, could help pastoralists in building resiliency and thereby reduces the impacts of poverty. The following are the views of participants on poverty obviations:

> "To move out of poverty we have to engage into different trade activities".
>
> An interview with old man at Hiddii Aallee, Eelwayyee District

> "Even if you do not have cattle you have to engage into different activities".
>
> An interview with old woman at Harweeyyuu, Yaabello district

Diversification of sources of income is the main means of escaping poverty for many households. Participants indicated that to avoid poverty and reduce its impacts engaging into different activities like small trade activity is the main way out. This is in line with the finding of Little et al. (2008), which argues that alternative income generating activities can support and complement pastoral production. These activities include selling of woods, charcoal making, and selling beverages at local markets. In addition, it was indicated that the

poor could survive by selling hay/grass to those who have livestock. Further, the participants indicated that there are varieties of opportunities for pastoralist, which include, collecting gums and resins, charcoal making and collecting woods. Diversification helps households to make use of advantages of other sources of income if the main source of income fails or its productivity is threated. Diversification alone is not enough, thus, in an interview an elder indicated that "to move out of poverty we have to save and build homes in the town and trade". Zewdie, Negalign and Argaw (2015) consistently indicated that pastoralist were building houses in nearby towns to generate income from rent. Income from the multiple sources may also be wasted if they are not successfully managed and saved. The following narrates the success and failure story of a woman from *Dharriito* who engage in selling local beverage.

> To support her family a woman from Dharriito sells *farsoo* (local beverage made from maize) at nearby by asphalt road. She sells it on market days, particularly on Tuesday, Saturday and Sunday. She also sells on the other non-market days. The benefits she has been obtaining from her sale can be seen in two ways: the getting and losing. Since her customers had also a financial problems loan was the biggest problem for her. People drink *farsoo* by loan and stays for long periods without paying her back. In the last year, she was registered to take a loan from credit and saving program. Though some people were registered to buy livestock and fatten it for market however, she was registered for petty trade. Somehow, she was benefited from this loan. Even though, unreturned load taken by others from her had weakened her profitability, she has been buying hay and water for her livestock during drought. She believed that to move out of poverty pastoralist have to work and save what they have.

3.4.3.2 Crop Cultivation

Crop cultivation is one of the promising alternative livelihood strategy in pastoralist areas of Boorana. Teferi and Feyera (2019) confirmed that to deal with sociopolitical problems, pastoral households have already initiated crop farming. Participants indicated that besides raising livestock, engaging in farming activities enable them to cope up with poverty. One of an interviewee at *Hiddii Aallee* said, "to move out of poverty we have to cultivate crops". The participants in Focus Group Discussions also revealed that to move out of the problems pastoralists has been facing including poverty crop cultivation and saving is an option. However, they emphasized that farming is only possible when it rains. In many area pastoralists has largely engaged in crop cultivation. Though high variability in rainfall has

significantly affected the productivity of crops, however, crop cultivation is one of the best opportunities that enables pastoralists feed themselves. This is consistent with the finding of Kristjanson et al. (2010) where crop farming is considered important and also fairly risky in agro-pastoral zones. Participants indicated that in Boorana area the productivity of crop farming is determined by the availability of rainfall, number of oxen and the size of farms. In an interview, an old man revealed that production from cultivation is not sufficient due to erratic rainfall.

3.4.3.3 Improvements of Pastoral Education

Participants indicated that pastoralist lost livestock to drought and fails into poverty due to illiteracy and lack of adequate formal education. Zewdie, Argaw, Negalign, Abraraw, & Kifle (2017) consistently indicated that Boorana land is lagging behind in education. In an interview, an elder from *Dharriito* indicated that Boorana pastoralists are not building homes in town and are not willing to save in banks because of illiteracy and lack of awareness. Since lack of education is the main cause of poverty, therefore, improvement of pastoral education is one of the survival strategies against poverty. Education have big role in improving the livelihoods of the pastoralists. It is believed that educated family could use the resources efficiently. Not only educated pastoralist use resources efficiently but they are also able to save livestock resources into different assets like saving into banks and buildings of homes in nearby towns. In addition, education can enables pastoralists to obtain diversified means of living. By this, it means those educated households are more likely to adapt drought resistant livestock species and engages into other small business. Further, the family with educated household member can enjoys benefits from money sent back from their educated members.

In pastoralist areas of Kenya it was indicated that having a family member with higher education and stable employment can improve household welfare (Little et al., 2008). It was indicated that besides lack of education pastoralists have unique love and care for livestock. Therefore, many of pastoralists are reluctant on destocking and changing of livestock to other assets. Therefore, to move out of poverty and raise awareness of pastoralist on destocking education is the best option. In an interview *jaarsa argaa-dhageettii* revealed that, education is best way to move out of poverty. Because there are people whose live was changed for good by educating their children" he said. Participants indicated that sending children to school has several advantages because upon graduation they would share their earning to their family by sending money back homes, building beautiful house in towns. "I know a

father whose children build a home for him in town" he said. An elder from *Hiddii Aallee* also emphasized that pastoralist has to send their children to school. In addition, government and other concerned body have to increase the opportunities for pastoralist education.

3.4.3.4 Destocking

Participants indicated that to reduce livestock death during drought the number of livestock has to be reduced to manageable herds and that are not above the carrying capacity of the land. Discussants in Focus group Discussion at *Harweeyyuu* indicated that though only *Waaqaa* (God) can reduce poverty, the government has to support pastoralist, "if they stand for people, if they are good for us" they said. Participants indicated that government has to provide different opportunities like widening opportunities for education, providing different support on destocking, saving and sharing them experiences. It was also indicated that destocking and saving has changed the life of many pastoralists. The study by Zewdie et al. (2017) also consistently indicated how pastoralist started to save money into banks from sells of livestock. Participants strongly believed that to reduce the impacts of the drought, which affects the livelihood base of pastoralists, and reduce the resultant poverty the support of government and concerned body is necessary. Discussion with Development Agent (DA) indicated that pastoralist has to destock and concerned body has to give awareness to the people on destocking. Therefore, it can be understood that priority has to be given to raising the awareness of pastoralist on destocking and bringing best practices and experiences of another pastoralist groups.

However, the willingness and interest of pastoralists on destocking and changing of livestock to other assets is very low. Participants indicated that ancestors of today's poor might be rich in the past. However, due to unique attachments pastoralist have for their livestock one drought year can put the whole livestock to death. Therefore, pastoralists believed that livestock has to be sold and replaced with other assets. Though there are challenges on destocking, raising awareness of pastoralists through pastoral education is very important. Concerning the challenges in destocking one of interviewee indicated that, "…pastoralist will not destock, because livestock is our world". Zewdie et al. (2017) consistently stated that pastoralist keeps cattle more for social value than for selling. Further participants indicated that pastoralist presents a lot of reason for not selling livestock, like this is *mana handhura* (descendants of *Handhura*) and that is *mana aabbaa* (descendants of *aabbaa*), and other may indicate my cattle have no other bull for breeding. Boorana gives special names for their

livestock based on events and someone who gave them the cattle. For instance, *aabbaa* is a name of cattle given by a father especially for his married daughter, *handhura* is the name given to cattle given by father to his sons. Participants indicated that notwithstanding these challenges "with current prices, even five to ten livestock could build a home". Therefore, raising awareness of pastoralists on destocking and improving the access to education is very important.

3.4.3.5 Returning to Forefathers' Cultural Practice

> "Since, poverty occurs because of our sins, to move out of poverty and lead successful life, Boorana has to keep Aadaa Boorana well and practices necessary rituals".
>
> Interview with Jaarsa argaa-dhageettii, Aadee Galchat

According to Leus (2006) *Aadaa* is a tradition and way of life. It has also a meaning of custom and incorporates the sense of binding, *Aadaa Boorana*: the *Boorana* way of life, tradition and costumes. Duncan (1996) indicated that from cultural perspective individuals are trapped into poverty because poor families pass on bad values and norms that prevent participations in social institutions. Based on the interview an elder had unique perception on poverty reduction and survival strategies. Undertaking different cultural practices and ritual was believed to cleanse participants from their sins. Thus, in an interview it was found that cleansing form sins through practice of rituals could help in getting out of poverty. An elder recommended returning to forefather's culture practices and rituals by recalling a story that a *Warday*[11] told Boorana. According to an elder there was a prophecy that a *Warday* told Boorana that in the future, Boorana would be unable to keep and conserve the land appropriately. Then, Boorana asked in what condition that they would be unable to conserve the land. "Then a *Warday* told Boorana that you will be unable to carry out all necessary cultural practices and rituals, then *Waaqaa* and *lafa* (the almighty and land) will leave you" he said. Therefore, as indicated in an interview to move out of poverty and lead a successful life, Boorana has to return to and keep the culture of *kormaa-korbeessaa*[12], *dhibaayyuu*[13], *uchuma*[14], *hulluuqqoo*[15] and *soori'oo*[16] of *abraasaa*. In this sense elder has a fear that

[11] *Warday* is Oromo community once lived in Boorana land. They were migrated from Boorana land during Gadaa of Abbayi Baabboo Horroo (1667-74). Their descendants, Orma still lives along the Tana river near the Kenyan cost (Leus, 2006).
[12] *Kormaa-korbeessaa* is a sacrifice where either bull or a male goat is sacrificed outside the village
[13] *Dhibaayyuu* is a ritual libation of milk and thanks giving ceremony as a prayer to be kept from problems, to bring rain and grass. Dhibaayyuu is equivalent to Irreecha
[14] *Uchuma* is a firestick which is often kindled for ritual ceremony to made fire

currently some people consider *buna qalaa*[17] and *uchuma* as an act of evil and bad things. Whatever the challenges "to move out of poverty Boorana has to fully return to the culture of his forefather" he said.

When informants stressed that returning to forefathers' cultural practice is mandatory it does not mean that Boorana are not keeping cultural practices and rituals. Boorana has preserved original Oromo cultures and transferred it to the generations. Boorana is home of Gadaa system, an indigenous Oromo democracy. Though Gadaa system has been reviving and being restored in different parts of Oromia, Boorana Oromo have strongly maintained the cultural heritage of the original Gadaa intact (Legesse, 1973; Ta'a, 2016). Thus, participants underscored about the commitment in undertaking cultural activities. Concerning associations of cultural practices and poverty, participants emphasized that poverty occurs because of sins and sins has to be cleansed through rituals. Thus, it is believed that undertaking necessary rituals and cultural practices through sacrifices of animals, thanks giving ceremony and passing between branches of various auspicious plants and other cultural practices could protect community from bad things including poverty.

3.5 Conclusions and Policy Recommendations

The study examined Boorana pastoralists understandings of poverty and its survival strategy with emphasis on how do pastoralist define poverty, the root causes of poverty and suggestions of pastoralists on poverty reduction and survival strategy. It was indicated that largest proportions of Boorana pastoralists were poor. Poverty is dynamic, painful and people moves in and out of it based on several determining factors. Pastoralists had the fear that current level of poverty may not decline, but tenacious in unprecedented way. Pastoralists defined poverty as lack of resources and livestock, low health, lack of money, lack of education and jobs. Health and education are two main dimensions of human development indicators. Thus, pastoralists definitions of poverty are collectively consistent with multidimensional understanding of poverty. Possession of livestock is the main indicator mostly used in defining pastoral poverty and household's wealth status. It is therefore suggested that in order to reduce pastoral poverty more emphasis should be given to factors that reduce livestock productivity.

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[15] Hulluuqqoo is a ritual formed by passing between branches of various auspicious plants placed to form a passageway

[16] *Sooriyoo* is a ritual made by sacrificing an animal (cattle, sheep, goat) in the month of Abraasa (January).

[17] *Buna qalaa* is a coffee ceremony made by frying coffee in coffee pot

The study underscored that though considered as the most sustainable pastoral production in East Africa, Boorana pastoralists had experienced a dynamic change through time and poverty has become pervasive. Thus, recognitions of environmental, social and political dynamics in pastoral areas and inclusion of pastoralist issues in national and international agendas is important. It was further indicated that though contributions of pastoralist to national economy is undisputed, there is little unanimity that pastoralist had benefited from the country's development. Thus, it can be concluded that, this continuous marginalization and negligence of pastoralists both at national and regional revel would pushes pastoralists further to the perilous precipice. It was consistently indicated that Ethiopian government policy is not pastoral sensitive (Gebeye, 2016) at best, they were insensitive to their needs and at worst, they were oppressive (Vadala, 2019). Pastoralists also have to enjoy fair and equitable shares from national economic development. Since livestock still plays the leading role in pastoral economy; thus, government has to takes its initiatives in minimizing the vulnerability of livestock and increasing the resilience of pastoralists by designing appropriates pastoral sensitive policies.

Climate changes and variability plays critical role in paralyzing pastoral economy and reducing the resiliency of pastoralist. It is evident that under current global climate changes Boorana pastoralists are going to be highly vulnerable and less resilient. Therefore, concerned organizations have to support and strengthen pastoralist indigenous climate adaptation strategies and other mitigation options. Institutions both at national and international levels should work on drought cycle management and raise the awareness of pastoralists on how to change livestock to other assets before onset of drought and post drought restocking where necessary. Pastoralists on their parts also have to be flexible and committed on reserving pasture for drought and other management options. Further, the study underscored that adequate utilization of *seera marraa-bisaanii* (the law of pasture and water) could help pastoralists sustainably manage grazing reserves. It is also clear that notwithstanding several proximate and underlying causes of deprivations trapping pastoralist in poverty, Boorana pastoralist are extremely keen to obviate and move out of poverty at any cost.

Finally, the study elucidated the survival strategy of pastoralist to reduce poverty in peripheral pastoralist. It is apparent that pastoralists were diversifying sources of income to reduce the vulnerability of livestock sectors and increase their resiliency. Diversification has become not only the alternative but also the promising means of survival for pastoralists.

Government and other national and international institutions have to support, facilitate and guide the motives of pastoralists to engage into different returning activities by supporting and strengthening of rural credit and saving. Particularly rural youth in pastoralist areas should have to be given adequate concerns. In addition, crop cultivation has also become the alternative livelihood strategy for pastoralist and can satisfy food needs of pastoralists. However, crop cultivation is highly risky given its dependence on highly erratic rainfall. It is therefore, suggested that extensive expansion of farms lands with very low outputs should be replaced with increasing of agricultural production through irrigation. To support this national and international institution should initiate establishment of various micro and macro dams in different parts of Boorana. Further education of pastoralist household member with stable employments is more likely to reduce pastoralist poverty as the member sends money back home from their earning. Therefore, to improve pastoralist's education government has to adopt the most flexible approaches and workable models of pastoral educations that are suitable and appropriate to the setting of the pastoralist.

4 MULTIDIMENSIONAL POVERTY OF PASTORALISTS AND IMPLICATIONS FOR POLICY IN BOORANA RANGELAND SYSTEM, SOUTHERN ETHIOPIA

Abstract

Poverty is pervasive in Ethiopia. Despite its experience of promising economic growth, the development process of Ethiopia has not equitably benefited pastoralists, where multidimensional deprivation[18] is deeply entrenched. This study argues that, pastoral poverty is the result of multifaceted indicators. This study has also practical implications to inform policymakers on how to reduce pastoralist poverty. The study was based on Alkire and Foster method to analyze households cross-sectional survey data (n = 332). Various descriptive statistics and logit model was used to analyze the data. The result showed that 87.3% of households were multidimensionally poor with 62.1% of intensity of poverty. Multidimensional poverty index (MPI) for Boorana pastoralist was high (54.2%). Majority of Boorana pastoralist households were deprived in cooking fuel, drinking water, electricity, ownership of durable assets, housing, child school attendance and years of schooling. Deprivation in education was the largest contributor to MPI followed by standard of living. Econometric results showed that multidimensional poverty is determined by household head gender and age, size of cultivated land, highest education level of household member, sanitation, home to center/town distance, and production per hectare of land. The result implied that much works is needed to obviate the factors associated with multidimensional poverty of household. The study proposes that improvement of pastoralist access to education and standard of living through improving pastoralist access to education, electricity, clean water and health facilities should be priority for policy on poverty alleviation.

Keywords: Poverty Extent, Multidimensional poverty, Logit model, Policy implications, Boorana, Ethiopian pastoralists

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[18] Deprivation is used synonymously with poverty throughout this study.

4.1 Introduction

Poverty is deficiency in well-being which includes low income and incapability to obtain basic goods and services needed for survival with dignity (Maier, 2015). It can also be defined as minimum levels of education, health, and living standards. This indicates shift in defining poverty from the one-dimensional perspectives to multidimensional perspectives (Tigre, 2018). Defining poverty as a multidimensional concepts has gained much popularity than a unidimensional notions of poverty (Bourguignon & Chakravarty, 2003). A reason for this is that unidimensional poverty measure provide a biased and incomplete guide for poverty interventions (Tigre, 2018). In addition, a unidimensional income and consumptions indicators could not be able to capture the multiple aspects that contribute to poverty. Accordingly, the 1997 Human Development Report (HDR) introduced new ways of poverty measurement that differs from the traditional measures. These poverty measures include Human Poverty Index (HPI) which was the first to be used in 1990 (Alkire et al., 2018) and a Multidimensional Poverty Index (MPI) which was introduced in 2010 (Alkire & Jahan, 2018; Alkire et al., 2018). MPI is an index designed to measure acute poverty (Alkire et al., 2018) and it has explicitly become the popular measure of poverty (Alkire, Apablaza, Chakravarty, & Yalonetzky, 2017).

Multidimensional deprivation is deeply entrenched, and in some cases it is difficult to be uplifted (Suppa, 2016). The dynamics of deprivation varies based on different settings. For instance, a disparity between rural and urban areas has increased. Multidimensional poverty has become mainly a rural phenomenon (Santos & Ura, 2008; Tigre, 2018). Scholars such as Mahoozi (2015) congruently attested that rural households are more disadvantaged compared to their urban counterpart. Disparity in multiple deprivations is not only limited to urban and rural divides. The degree, intensity and dimensions of poverty varies with gender (Mahoozi, 2015), region, social classes and resource endowment (Tigre, 2018). This study used Alkire and Foster (AF) method to measure multidimensional poverty levels among Boorana pastoralist because AF method is the most widely used and popular in counting deprivation percentages of the indicators. In AF method the global index has three dimensions (education, health and standard of living) and 10 indicators (Alkire et al., 2018). AF take into account distinct deprivations which are all part of the ingredients of poverty, far beyond a simple lack of economic resources (Hammock, Zavaleta, Samuel, Alkire, & Mills, 2017).

Multidimensional poverty is deeply rooted in many countries (Suppa, 2016). This is true particularly for people in developing countries such as South and East Asia, Pacific, Latin America, and Caribbean where the highest number of population is living in poverty. The countries living in the Sub-Saharan Africa have the highest incidence of poverty (Alkire, S. & Santos, 2010). Studies in different regions of developing world revealed the variations in level of poverty by indicators, genders and different household characteristics. For instance, in Bhutan poverty in education and standard of living contributes to overall multidimensional poverty (Santos & Ura, 2008). The study in Pakistan was in line with this (Padda & Hameed, 2018). Likewise, private assets and education contributes to multidimensional poverty in Sudan and South Sudan (Ballon & Duclos, 2015). Considering gender dimensions Mahoozi (2015) attested that female-headed households were heavily disadvantaged compared to their peers in male-head households. However, in Pakistan the contrary is true (Padda & Hameed, 2018). Thus, there are observable differences between regions, country, social class and genders in factors driving multiple destitutions (Mushongera, Zikhali, & Ngwenya, 2017; Pinilla-Roncancio, 2018).

Despite its experience of progresses in economic growth, the development process of Ethiopia has not equally benefited all groups, particularly the vulnerable (Centeral Statistical Agency & United Nations Children's Emergency Fund, 2018). Marginalized groups such as pastoralist in particular are not enjoying equitable shares of countries economic development. Thus, most part of the country is in urgent need of human development, as it is the second most populous country in Africa (next to Nigeria) with largest proportion of its population under the multidimensional poverty (Tigre, 2018). Deprivation in education, improved water sources and access to assets are high (Seff & Jolliffe, 2017). Tigre (2018) found the decreasing trends of deprivation in education over time and high deprivation in living standards (i.e. sanitation, cooking fuel, floor and electricity). The extent and levels of multidimensional poverty across regions have showed a marked disparity (Centeral Statistical Agency & United Nations Children's Emergency Fund, 2018; Tigre, 2018). Multiple deprivation was unexpectedly concentrated in rural areas (Centeral Statistical Agency & United Nations Children's Emergency Fund, 2018; Tigre, 2018; Tilman & Sindu, 2013) with paucity in improvement of dimensions of health, education and living standards (Ambel, Mehta, & Yigezu, 2015). Therefore, comprehensive analysis of dynamics and dimensions of multidimensional poverty is essential in Ethiopia to understand the history of poverty. In

addition, this is also important to evaluate the effectiveness of poverty reductions strategies and design appropriate policies in the future (Tigre, 2018).

Poverty, economic, social and political marginalization and negligence have been unique features of pastoralists in Ethiopia (World bank, 2016). Pastoralist in Somali and Afar regional states are poor from multiple dimensions (i.e. education, health and standard of living) (Jemal et al., 2017). This could be the case for pastoralist from the other parts of the country as well. Notwithstanding limited evidences for multidimensional poverty of Boorana pastoralist, studies that rely on traditional wealth rankings (Tache & Oba, 2010; Tache & Sjaastad, 2010; Tolossa, 2018), attests that destitutions is highest among Boorana pastoralists. However, many of the previous studies depended on either unidimensional or traditional measures or combination of both. This study argues that, in such dynamic and perilous environment of pastoralist, destitution is the result of multifaceted and intricate indicators, such that it cannot be appropriately addressed with unidimensional measures alone. Thus, comprehensive analysis of multiple deprivation of pastoralist would not only sheds light on the dimensions and levels of poverty, but it has also the practical implications to inform policymakers and help in designing appropriate policy, strategies and programs to obviate multidimensional poverty of pastoralist.

Multidimensional poverty measures helps in shedding light on intertwined causes of household poverty and help in design and improvements of policy, strategies and programs for poverty reductions. In order to understand the threats posed by poverty and target appropriate poverty alleviation interventions, it is important to know its dimension and the process through which it is deepened (Bourguignon & Chakravarty, 2003). Therefore, identification of who deemed poor and the extents of their poverty is mandatory. The argument of Sen (1982) consistently attested that measurement of poverty could be separated into two activities: (i) the identification of the poor, and (ii) the aggregation of their poverty characteristics into an overall measure. Thus, multidimensional poverty analysis would enable us understand deprivations in the three broad dimensions of deprivations. Therefore, this study has two fold objectives; (1) to assess the extent of multidimensional poverty in Boorana rangeland system and (2) to analyze the determinants of multidimensional poverty and its implications on policy formulation in Boorana rangeland system. By doing so, this study adds new knowledge and insights in the study of multidimensional aspects of poverty in an African context (Ethiopia) among pastoral communities.

4.2 Conceptual Framework

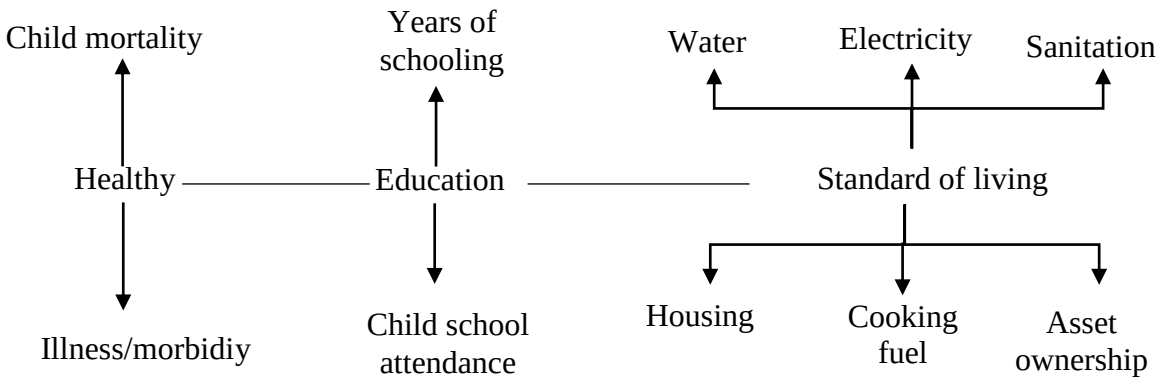
Defining poverty as multidimensional concept has dominated many academic research (Bourguignon & Chakravarty, 2003). Traditionally poverty has been measured as one dimensional using income or consumption expenditures as indicators (Alkire et al., 2018). In this sense those who do not have enough monetary resources to meet minimum requirements are deemed poor. Particularly in pastoralist community where the people can hardly tell their actual incomes uni-dimensional monetary measure is highly biased. Though monetary measure provides some useful information, however single indicators like income alone cannot capture the multiple aspects that contribute to poverty. Therefore, understanding poverty as a multidimensional concept is very important. The effectiveness of multidimensional measures lies in its properties that include aggregation through decomposition by subgroups and dimensional breakdown (Alkire & Foster, 2016). MPI is a highly intuitive and can be decomposed into ways that is relevant for policy (Alkire et al., 2018). Aligning MPI to sustainable development goals can also provide more credible and legitimate implication for policy (Alkire & Jahan, 2018). The studies that capture multiple dimensions of deprivations relies on Alkire and Foster method which is also the basis for evaluation of developments and policy measures aiming to reduce poverty (Suppa, 2016).

MPI was launched in 2010 to monitor poverty across many human development dimensions (United Nations Development Programme, 2018). Limitations of Foster Greer and Thorbeck indices (United Nations Statisitcs Division, 2005) and introduction of multiple deprivation indices had increased the popularity of MPI. The multidimensionality of poverty is not in dispute (Alkire et al., 2011). As a measure, the MPI is one member of a family of multidimensional poverty measures proposed by Alkire and Foster (Alkire, S. & Santos, 2010). It involves counting the different types of deprivation that individuals are experienced at the same time. It has been highly insisted that poverty should be defined as a multidimensional concept rather than relying on income or consumption expenditures per capita (Bourguignon & Chakravarty, 2003). Multidimensional poverty index (MPI) is an analytical tool for multidimensional poverty (Mamaru, 2017). Poverty can mean poor health, inadequate education, low income, squalid housing, difficult or insecure work, political disempowerment, food insecurity, and the scorn of the better off (Alkire et al., 2011; Mamaru, 2017). Multidimensional poverty looks into the dimensions that were not touched by one-dimensional measure. Mostly global MPI is composed of ten indicators corresponding

to three dimensions: Education, Health and Standard of Living (Alkire, S. & Santos, 2010; Alkire & Jahan, 2018). Generally multidimensional measures provide an alternative lens through which poverty may be viewed and understood (Alkire & Foster, 2011).

The status of multidimensional poverty has showed great disparity within and between countries. Some countries have high concentration of multiple deprivations while others have very low concentration. The study found that at the subnational level, there is huge differences within country and across regions (Alkire, Jindra, Robles-Aguilar, & Vaz, 2017). In latest global MPI report Oxford Poverty and Human Development Initiative and United Nations Development Programme (2019) indicated that two-thirds of multidimensionally poor people live in middle-income countries. The report also indicated that multidimensional poverty is highly concentrated in Sub Saharan Africa and South Asia. Multidimensional poverty is very high in Ethiopia. Out of Ethiopia's more than 100 million inhabitants 85.5 million are multidimensionally poor (Oxford Poverty and Human Development Initiative & United Nations Development Programme, 2019). In 2018, HDI in Ethiopia was 0.463 (United Nations Development Programme, 2018). This ranked Ethiopia 173 from world countries. Tigre (2018) indicated that Ethiopia is in urgent need of human development, as it is the second most populous country in the continent with largest proportion of its population under the multidimensional poverty. Deprivation in education, improved water sources and access to assets are high (Seff & Jolliffe, 2017). Tigre (2018) found the decreasing trends of deprivation in education over time and high deprivation in living standards (i.e. sanitation, cooking fuel, floor and electricity). The extent and levels of multidimensional poverty across regions have showed a marked disparity (Centeral Statistical Agency & United Nations Children's Emergency Fund, 2018; Tigre, 2018). Pastoralists are among the multidimensionally poor community in Ethiopia. Understanding pastoral poverty as a multidimensional concept is the basis for addressing the challenges of pastoral education, health and standard of living problems.

Figure 4.1: Dimensions and indicators of multidimensional Poverty



Source: Adapted from Alkire, S. & Santos, 2010

4.3 Research Methodology

4.3.1 Description of the Study Area[19]

The study was conducted in Boorana Zone (**Figure 3.1**), a zone which extends between 3^{o} 26' and 6 ^{o} 32' North latitudes, and between 36^{o} 43' and 40^{o} 46' East longitudes. In the south Boorana shares international boundary with Kenya, and is bordered with Somali region in the East and Southeast, Guji zone in the East and Northeast, and with SNNPR in the west, northwest and north. The study area is dominated by a semi-arid climate (Coppock, 1994) with an altitudinal range of 1000 to 1500 meter above sea level (m.a.s.l), and a mean annual rainfall measuring below 600mm (Tache, 2008) and average mean annual rainfall from 1990 to 2017 measures nearly 520mm (**Figure 5.1**). Boorana area receives bimodal pattern of rainfall with the main rains (*gannaa*) falling between March and May, and the short rains (*hagayya*) between September and November (Angassa, 2007). The data for this research was gathered in March and continued to the months of *Adoolessa*. Though data collections were started during the month of *ganna*, the *ganna* was late and did not come on the expected time. Boorana zone falls under three agro-climate zones namely, *Kola* (tropical) 56%, *Weyna Dega* (sub-tropical) 31% and *dega* (warm temperate) 13% (Tolossa, 2018). Based on Boorana traditional ecological zonation, Boorana land is broadly categorized as Liiban and Dirree. Liiban grazing zone (*dheeda*) is divided into *Golbaa* and *Gubbaa*. Dirree encompasses *goomolee, Malbee, Golboo, Dirree* (Tula wells grazing zone) and *Wayaama* grazing zone (Dika, 2016; G. Oba & Kotile, 2001) and the badda sadeen (the three sub-humid zones).

[19] For more details about the study area see section (**3.3.1**).

Data from National Meteorological Agency 2019 indicates that temperature of the area ranges from 14.2 °C to 25.4 °C. Frequency of the drought has increased to every 1-2 years (Riché et al., 2009). Like in other pastoral rangelands of Ethiopia, the fauna in Boorana is mostly characterized by sparse vegetation composed of mainly grasses, bushes, shrubs, small trees and bare land. Plant communities on the flat and hilly plains of the central Boorana semi-arid area consist of diverse mixtures of woody and herbaceous vegetation (Coppock, 1994). In addition, the woodlands of Boorana rangelands are characterized by species from the genera Combretum and Terminalia, whereas the bush lands and thickets, which cover major parts of the Boorana lowlands, are dominated by Acacia and Commiphora species (Dalle et al., 2006a).

4.3.2 Research Method and Design

Since there is increasing needs for integration of qualitative and quantitative methods, this study was guided by mixed research method approach. Mixed research method approach involve integrating qualitative and quantitative data in the design analysis through merging the data, connecting the data, or embedding (Creswell, 2014). Therefore, to analyze multidimensional deprivation of Boorana pastoralists and its implications for Policy, the method that involves mixing of both qualitative and quantitative data was preferred. Both methods complement each other by triangulation strategy. Both data were integrated in the analysis phases. Data were collected from pastoralists at one time and thus, a cross-sectional research design was employed in this study. This study adopted pragmatist paradigm as underpinning philosophy to elucidate the pastoralists multiple deprivation. Pragmatism has evolved into a set of procedures that researcher can use (Creswell, 2014) and involves the collection, analysis, and integration of quantitative and qualitative data in a single or multiphase study. Many of previous (Griensven et al., 2014; Tolossa, 2005) studies had pragmatism as philosophical foundations.

4.3.3 Sampling Techniques and Procedures

The paper was based on multi-stage purposive sampling where; in the first and second stages the study districts (*Yaabello* and *Eelwayyee*) and the study *kebeles* under each district were selected respectively using purposive sampling techniques based on homogeneity of population and for efficient and timely data acquisitions. From *Yaabello* district, the data was generated from *Harweeyyuu* and *Dharriito kebeles*, whereas from *Eelwayyee* district data was

collected from *Aadee Galchat* and *Hiddii Aallee kebeles*. In the third stage, the villages in each kebeles were selected using simple random sampling techniques. In the fourth stage, the participants were selected using systematic random sampling.

The data for this research was dominantly primary data directly collected from the participants using cross-sectional survey. A survey questionnaire was used as the main data gathering tool in this study. The survey was conducted to gather information related to background information of the households, demography and education attainment, household asset, household access to health services and standard of living. Data were collected from sampled households during the field survey conducted by the lead researcher from March to June 2019 at multiple scales. Household questionnaire survey was prepared in English and translated to Afaan Oromoo, the native language of Boorana pastoralists, to make it easier for enumerators to gather necessary information. The questionnaire includes both open-ended and close-ended questions. A pilot study was conducted before the actual administration of the survey questionnaire. Eight research assistants were hired to assist in the data collection and were trained by the lead researcher for two days on how the questionnaire survey would be administered, the way they can approach the respondents, and on research ethics. These research assistants were selected based on their academic level (i.e two MA degree and six Bachelor degree holders), research experience and exposure to the local area. The study used household as unit of analysis because decisions made at the household level can affect almost every member.

4.3.4 Sample Size Determination

According to raw data obtained from Boorana zone in 2017 the total households in the zone was 215,809. Boorana zone has 13 districts and the study districts Yaabello and Eelwayyee has 10,967 and the 8,462 households respectively. The total households in four study kebeles were 2,725. Determination of sample size is crucial issue in research because it is all about how of the research. The sample must be the representative of the population. Therefore considering the homogeneity and/or heterogeneity of population, 5% level of precision and 95% confidence level sample size (n) for the study was determined using the formula proposed by Yamane (1967).

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

Where: n= sample size, N=Household size

e=Level of precision

Since, N = 2,725 (total households of four kebeles) and e = 0.05, sample size was:

$$n = \left(\frac{2{,}725}{1 + 2{,}725\ (0.05)^2}\right) = 348.8 \sim 349$$

Therefore, sample size for the study was 349 households. Sample was distributed across four purposively selected kebeles, i.e., *Dharriito* and *Harweeyyuu* from Yaabello districts, *Aade Galchat* and *Hiddii Aalle* from Eelwayyee districts of Boorana zone by using proportional allocation techniques formula.

$$nx = Nx\frac{n}{N}$$

Where: nx= sample size for kebele x Nx= Total households in kebele x

n=Total sample size N= Total households in four kebeles

The number of household was 780 in *Dharriito* kebele, 645 in *Harweeyyuu,* 700 in *Aadee Galchat* and 600 in *Hiddii Aallee.* Therefore using proportional allocation techniques samples size in *Dharriito, Harweeyyuu, Aadee Galchat and Hiddii Aallee* was 100, 83, 89 and 77 households respectively. However due to challenges faced on the fields data was collected from only 332 households successfully. Survey data was generated from 93 households in *Dharriito,* 81 households in *Harweeyyuu,* 84 households in *Aadee Galchat and* 74 households in *Hiddii Aallee*. Some of the challenges we faced were constraints related with security, budget, transportation and unavailability of respondents.

4.3.5 Data Analysis

4.3.5.1 Dimensions, Indicators and Cutoffs

Multidimensional methods of poverty analysis have become more popular in understanding poverty than unidimensional method of poverty analysis. It is nearly two decades (Alkire & Jahan, 2018; Alkire et al., 2018) since introduction of multidimensional poverty index and since then different authors (Alkire & Jahan, 2018; Bourguignon & Chakravarty, 2003; Suppa, 2016; Tigre, 2018) have been using it in analyzing multiple dimensions of poverty. This study preferred analyzing poverty by multidimensional poverty index (MPI) than single dimensional measures. This is because as Tigre (2018) indicated various dimensions of poverty can be captured by MPI. MPI sees poverty form multiple dimensions and observes

high variations between society at different levels and locations. For instance, a disparity between rural and urban areas has been widened. Multidimensional poverty has become mainly a rural phenomenon (Santos & Ura, 2008; Tigre, 2018). Like other rural communities, in pastoralist areas multidimensional deprivations are also pervasive. Therefore, monetary poverty measures is insufficient in capturing the multiple and overlapping deprivations experienced by the poor (Alkire, 2018). In addition, multidimensional poverty analysis helps in identifying the poor who are deprived in many ways (Mamaru, 2017). More importantly, MPI is powerful in supporting policy coordination which is in line with the SDG emphasis (Alkire, 2018).

Choosing the dimensions of analysis is very important to elucidate several indicators under each dimension and know the extent and depth of our analysis to inform policy. The choice of dimensions can be based on some participatory exercises that can elicit the values and perspectives of the stakeholders, some list that achieved universal legitimacy through consensus, and empirical assumptions about what people do value. To select the dimensions and indicators for this study a range of methods was used. The study mainly depends on the dimensions where public consensus was reached. Thus, the study was based on the Millennium Development Goals (MDGs) used for Human Development Reports and the dimensions used by United Nation Development Programs (UNDP) and Oxford Poverty and Human Development Initiatives (OPHI) for 2019 global multidimensional poverty index. In line with this study Mamaru (2017) also used UNDPs human development reports to construct the dimensions and indicators for MPI. There are three most popular dimensions in constructing MPI; health, education and standard of livings. Several studies (Kuschminder, Andersson, & Seigel, 2018; Mamaru, 2017; Milliano & Plavgo, 2017) and international organizations reports (Oxford Poverty and Human Development Initiative & United Nations Development Programme, 2019; United Nations Development Programme, 2018) depends on this dimensions.

This study was also preferred to select the dimensions used mostly; health, education and standard of living. Each of these dimensions has several indicators under it. The number of indicators to be included under each dimension depends on the objective of the study. Considering the popular methods for selections of dimensions, this study identified two indicators for health and education dimension and six indicators for standard of living dimensions. The indicators used in constructing multidimensional poverty index in this study

was similar with those indicated by Oxford Poverty and Human Development Initiative and United Nations Development Programme (2019) in constructing global MPI. However, under the dimensions of health the study preferred to use the illness/morbidity/death of household members, particularly main bread earner instead of nutrition. This indicator was selected because the study believed that the wellbeing of household members, particularly the main bread earner determines the functioning of the family as whole and thus illness/morbidity/death of main bread earner indicates the failure of livelihood activity and it also affects the whole family.

To distinguish households as multidimensionally poor or not poor different weights were given to the dimensions and cut-offs to determine deprivations were set. All dimensions were given equal weights, as such, the weighted health was 0.33, the weighted education was 0.33 and the weighted standard of living was 0.33. The weighted indicators were obtained by dividing the dimension's weights equally between indicators. Accordingly, the weight for indicators of health and educations was 0.167 each and the weight for indicators of standard of living was 0.055 each. Households can be deprived in any of indicators, however, deprivations in one indicator does not signify the total deprivations and multidimensional poverty. To be counted as multidimensionally poor households has to be deprived in more than one indicator. Therefore, based on Alkire, S. and Santos (2010) household is multidimensionally poor if the weighted indicators in which the household is deprived sum up to 0.3 or 30 percent. Therefore k = 0.3. The detailed discussions of the dimensions and their indicators and cutoffs are discussed **Table 4.1** blow.

I) Health

Under dimension of health, two indicators were selected. These are child mortality and serious illness/morbidity/death of household member (main bread earner). Child mortality is the dominant indicator of health of household selected by many studies (Alkire & Jahan, 2018; Mamaru, 2017). In addition to child mortality, we believe that serious illness/morbidity/death of household member particularly the main bread earned determines the wellbeing of household. Therefore, these two indicators were selected as the main indicators of household health and wellness by current study. Concerning child mortality, household is deprived if any child has died in the family in 5 year preceding the survey. Whereas, for indicator of serious illness/morbidity/death of household member (main bread

earner), household is deprived if main bread earner or family member experienced serious illness/morbidity/death.

II) Education

Pastoralists are known by high dropout from schools and under enrollments. Thus, analyzing the education poverty is mandatory to inform policy about education deprivation in pastoralist areas. For this study, two indicators of educations were selected. These are years of schooling and child school attendance. A household is deprived in year of schooling if no household member aged 10 has completed 6 years of schooling. In addition, a household is also deprived in child school attendance if any of their school-age children are not attending grades 1 to 8 of school. This is consistent with (Alkire & Jahan, 2018).

III) Standard of Living

Under dimension of standard of living, six indicators were identified. Thus, deprivation in standard of living is determined by deprivations in few of these indicators; electricity, drinking water, sanitation, housing, cooking fuel and assets based on Sustainable Development Goals (SDGs) indicators, and MDGs (Alkire & Jahan, 2018).

Electricity: Access to electricity is the basic requirements for households whether they dwell in urban or rural areas. Boorana pastoralist has now become more settled and can be easily reached by electricity. The study considered this indicator due to the role electricity can play in connecting peoples to the world. Pastoralist as a community also has to enjoy equitable access to basic services like this. Therefore, household is deprived if they do not have electricity service or are not connected to electricity.

Drinking water: Access to safe water is a fundamental human need and a basic human right. Nevertheless, majority of population in Ethiopia lacks access to safe drinking water. Particularly in the rural areas of the country like southern pastoral lowlands of Boorana, almost all community lacks access to safe drinking water. The study included this indicator due to pressing needs for clean and safe drinking water for pastoralists. Therefore, household is deprived in drinking water if the area does not meet SDGs and MDGs definitions. Accordingly, household deprived if source of drinking water is unprotected well/spring, river/lake/pond and rainwater and it was not within the distance of 30 minutes (round trip) walk from home.

Sanitation: Households are considered to have improved access to sanitation if they have private pit latrine. Many studies (Mamaru, 2017) considered households with flush toilet to be considered as not deprived in sanitation. However, this study considered having private latrine for not being deprived. Households in the study districts are mainly pastoralist that lives in the rural areas where the access to health extension services is limited. Therefore, households are deprived in sanitation if they use the pit latrine that is shared, and went to field or forest for feces.

Housing: The materials that constitutes the roof, walls and floors of house provides significant input for the quality of life (Alkire & Jahan, 2018). This study used the standards followed by Alkire and Jahan (2018) to set households deprivation cutoff in housing. Accordingly, household is deprived in housing if material from which the house was built is not to standard i.e. are made of natural, rudimentary and mud/dung.

Cooking Fuel: Cooking area and the materials used for cooking is also very important to determine the standard of living. For this study, households are deprived if there is no kitchen, household cooks in traditional kitchen inside the house and if household cooks with cow dung, wood and charcoal.

Assets: Alkire and Jahan (2018) identified a household as deprived if they lack assets like radio, telephone, television, refrigerator, computer, and other. Since, the study area is mainly pastoralists this study considered assets that helps pastoralist gain access to information. These are mobile phone and radio. Therefore, in this study households are deprived in assets if they have no mobile phone and radio.

Table 4.1: Dimensions, Indicators, Deprivation Cutoffs and Weights

Dimensions of poverty	Indicator	Deprived if…	Weight
Health	child mortality	Any child has died in the family in the five-year period preceding the survey.	1/6
	Illness/morbidity/death of HH member	Main bread earner or family member experienced serious illness/morbidity/death.	1/6
Education	Years of schooling	No household member aged 10 years or older has completed six years of schooling.	1/6
	School attendance	Any of their school-age children are not attending grades 1 to 8 of school	1/6
Living Standards	Electricity	The household has no electricity.	1/18
	Drinking water	The household does not have access to improved drinking water (according to SDG guidelines) or safe drinking water is more than 30-minute walk from home, round trip.	1/18
	Sanitation	The household's sanitation facility is not improved (according to SDG guidelines) or they use the pit latrine that is shared and went to field or forest for faces.	1/18
	Housing	At least one of the three housing materials for roof, walls and floor are inadequate: the floor is of natural materials and/or the roof and/or walls are of natural or rudimentary materials.	1/18
	Cooking fuel	There is no kitchen, household cooks in traditional kitchen inside the house and if household cooks with cow dung, wood and charcoal.	1/18
	Assets	The household does not own more than one of these assets: mobile phone and radio.	1/18

Source: Adapted from (Alkire & Jahan, 2018; Alkire et al., 2018; Mamaru, 2017)

4.3.5.2 Aggregation of MPI

This study was based on Alkire and Foster (2011) method. Many of the previous (Mamaru, 2017; Mushongera et al., 2017; Tigre, 2018) study also employed this method. The dimensions used in this study were health, education and standard of living. Each of these dimensions has several indicators under it. To identify household as poor or not poor, indicators deprivation cutoff (Zj) and poverty cutoff (K) was identified. A household is deprived in indicator j if the weight of indicator j is below Zj. In other words, a household is deprived in indicator j if weight of indicator is below indicators cutoff. Thus, the deprivation cutoff for each indicator (Zj) was identified. If household was deprived in indicator j indicators cutoff was given and 0 was assigned if the household was not deprived in that

indicator. Deprivation score (ci) of the individual household was also identified. The deprivation score C_i of the household i can be expressed as the sum of the weights associated with each indicator j that is Ci = W1ji + W2j2 + ... + Wnjn. Ci represents the sum of weighted deprivation for household i. After determining the score of each household, poverty cutoff (K) for determining households as multidimensionally poor or not poor was set. There is no generally accepted standard to set value of K. The researchers can set the value of K based on the objective of the research. Therefore, based on Alkire, S. and Santos (2010) household is multidimensionally poor if the weighted indicators in which the household is deprived sum up to 0.3. Therefore, K = 0.3. Household is identified as poor if the score is greater than or equal to K and not poor if the score is less than K. In addition, we have assigned 0 for poor households and 1 for non-poor households.

Further aggregation of poverty was calculated by computing head count ratio (H), intensity of poverty (A) and multidimensional poverty index (MPI). MPI combines the proportions or incidence of poverty and intensity of the deprivation. Accordingly multidimensional head count ratio (H) was calculated by:

$$H = \frac{q}{n}$$

where ***q*** is the number of poor household and ***n*** is the total population (Alkire & Santos, 2011; Mamaru, 2017). This measure reflects the *incidence* of multidimensional poverty (the percentage of the population who are poor) (Mamaru, 2017). The second component of multidimensional poverty is called the intensity (or breadth) of poverty (A) (Alkire & Santos, 2011). It is the average deprivation score of the multidimensionally poor people and can be expressed as:

$$A = \frac{\sum_{i=1}^{n} C_i(k)}{q}$$

Where, $C_i(k)$ is the censored deprivation score of individual i and q is the number of people who are multidimensionally poor. The MPI is the product of both incidence (H) and intensity (A) of multidimensional poverty:

$$MPI = H \times A$$

A. Decomposition by Indicators

Decomposition of MPI by indicators is very important. As indicated by Tigre (2018) decomposing of MPI by indicators can be computed by calculating the censored headcount ratio in each indicator. The censored headcount ratio was obtained by adding up the number of people who are poor and deprived in that indicator and dividing by the total population. Therefore, the contribution of each indicator to overall poverty was obtained by:

$$\text{Contribution of Individual indicator i to MPI} = \frac{\text{wiCHi}}{\text{MPI}} \text{X } 100$$

Where *wi* is the weight of indicator *i* and *CHi* is censored headcount ratio of indicator *i*. If contribution of a given indicator exceeds its weight, it is an indication of relatively high deprivation in this indicator and this requires appropriate policy interventions.

B. Decomposition by Household Characteristics

MPI can also be decomposed by population sub-groups. Any characteristic that may imply a relevant difference across households such as gender and age group of the household head can also be a relevant variable (Alkire & Santos, 2011). The contribution of each household characteristic (head age, head sex, head literacy level and marital status) to overall poverty can easily compute using the following formula:

$$\text{Contribution of household Characteristics (ni) to MPI} = \frac{\frac{\text{ni}}{\text{N}} \text{MPI}_{\text{ni}}}{\text{MPI}} \text{X } 100$$

Where *ni* denotes household characteristics and *N* denotes total population. If contribution of household characteristics to poverty exceeds its population share, there is high unequal distribution of poverty in the study area with some area bearing a disproportionately high share of poverty.

4.3.5.3 Methods of Vulnerability Analysis

The severity and vulnerability of household to multidimensional poverty was determined based on the weight of indicator. Vulnerability measures the probability of non-poor households to become multidimensionally poor. Households were categorized as either vulnerable or not vulnerable to poverty. Household *i* was vulnerable to multidimensional poverty if the weighted sum of indicators is greater than or equal to 0.2 but less than K. That is household is vulnerable if $\sum W_1 j_i + W_2 j_2 + ... + W_{10} j_{10} = \geq 0.2$ but $< K$. In the same way the

household *i* is not vulnerable to poverty if sum of weight of indicators is less than 0.2. This can be also indicated as $\sum W_1 j_i + W_2 j_2 + ... + W_{10} j_{10} < 0.2$. Severity to multidimensional poverty was also categorized as less severe and severe poverty. Household is in less severe multidimensional poverty if $\sum W_1 j_i + W_2 j_2 + ... + W_{10} j_{10} = \geq 0.3$ but < 0.5. On the other hand, the household is in severe multidimensional poverty if $\sum W_1 j_i + W_2 j_2 + ... + W_{10} j_{10} = > 0.5$. OPHI (2019) in the current report identified a person as vulnerable to poverty if they are deprived in 20–33.33% of the weighted indicators and as living in a severe poverty if they are deprived in more than 50% of weighted indicators.

4.3.5.4 Econometric Model

The study also identified the factors that determine multidimensional poverty of households using logit model. Identifying the factors that determines the multidimensional poverty of household is essential for reducing multidimensional poverty. Multidimensional poverty is the dummy dependent variable that categorize household as multidimensionally poor or not poor. Therefore, it is binary in nature and takes 0 if household is poor and 1 if not poor.

$$Y = \begin{cases} 0 \text{ if sum of weighted deprivation} \geq K \\ 1 \text{ if sum of weighted deprivation} < K \end{cases}$$

The binary variable (Y) occurs with probability pi, which is conditional on the explanatory variables (xi) and is represented as:

$$P_i = E(Y = 1|X_i) = \beta_0 + \beta_1 X_i$$

Logit model for determinants of multidimensional poverty was specified as follows based on (Gujarati & Porter, 2009; Wooldridge, 2013):

$$P_i = E(Y = 1|X_i) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_i)}}$$

$$P_i = \frac{1}{1 + e^{-Z_i}} \quad \text{where } Z_i = \beta_0 + \beta_1 X_i$$

Where: Pi is the probability that a household is poor, Zi= the function of a vector of explanatory variables), e- represents the base of natural logarithms and the above equation represent the cumulative distribution function. If Pi is the probability of households being multidimensionally poor, then 1- Pi represents the probability that the household is not multidimensionally poor and is expressed as:

$$1 - P_i = \frac{1}{1+e^{Z_i}}$$

$$\frac{P_i}{1-P_i} = \frac{1+e^{Zi}}{1+e^{-Z_i}} = e^{Z_i}$$

In the above equation $\frac{p_i}{1-p_i}$ simply is the odds ratio; the ratio of the probability that a household is multidimensionally poor to the probability that household is not multidimensionally poor. Taking the natural log of odd ratio we obtain.

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = Zi = \beta_0 + \beta_1 X_i$$

Where: L_i is the log of the odd ratio which is not only linear in the explanatory variables but in the parameters also. Thus, introducing the stochastic error term (u_i), the logit model can be written as:

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 X_i + U_i$$

4.3.5.5 Definitions of Explanatory Variables

The explanatory variables included in this model were described in the **Table 4.2** below. The choice of these variables was based on the review of literature. The study hypothesized that these explanatory variables would potentially determine the dependent variable, multidimensional poverty status of household.

Table 4.2: Definitions of Explanatory Variables

Explanatory Variable	Description	Mean	Std. Dev.	Sign
Head sex	Dummy (0= male headed and 1=female headed)	0.1837349	0.3878524	+
Head Age	Continuous variable in years	42.0994	15.18285	+/-
R/ship to the head	Categorical (0=head, 1=spouse, 2=son/daughter, 3=grandchild, 4=father/mother, 5=sister/brother, 6=niece/nephew, 7=uncle/aunt, 8=son/daughter in law, 9=father/mother in law, 10=brother/sister in law, 11=grandparents and 12 = non relative)	1.292169	1.256595	+
Marital status	Categorical (0=single, 1=married/monogamous, 2=married/polygamous, 3=Widowed and 4=Divorced)	0.9457831	0.3769174	+/-
HH size	Continues variable in number	5.915663	2.163721	+/-
HH member age < 15	Continues variable in number	2.948795	1.687102	+
HH member age 15 – 65	Continues variable in umber	2.78012	1.494146	-
HH member age > 65	Continues variable in number	0.1536145	0.4082446	+
Head Literacy	Dummy (0=non-literate, 1=read and write)	0.1746988	0.3802824	-
Highest Educ level of HH member	Categorical (0=No HH member educated, 1= grade 1-4, 2= grade 5-8, 3=grade 9-12, 4=College Diploma and 5= University graduate and above	1.243976	1.290493	-
Years of schooling	Continues variable in number	0.2891566	0.6462557	-
School attendance	Continues variable in number	0.592145	1.01793	-
Skill training for LS	Dummy (0=Yes, 1=No)	0.6686747	0.4714002	-
Microfinance	Dummy (0=Yes, 1=No)	0.3915663	0.4888373	-
Access to credit	Dummy (0=Yes, 1=No)	0.7319277	0.4436241	-
Member of cooperative	Dummy (0=Yes, 1=No)	0.8343373	0.3723387	-

Institution for mutual assistance	Dummy (0=Yes, 1=No)	0.0240964	0.1535799	-
Habit of purifying water	Categorical (0=No habit, 1=Boiling, 2=Chemicals and 3=Rely on bottled water)	1.153614	0.9726869	-
Sanitation of toilet	Categorical (0=Pit latrine private, 1=Pit latrine shared and 2=Field/Forest)	0.4578313	0.6830039	-
Floor of dwell	Categorical (0=Natural/Earth, 1=Mud/dung and 2=Cement)	0.2409639	0.5177306	-
Cooking fuel	Categorical (0=Dung, 1=Wood and 2= Charcoal/coal)	0.8343373	0.3723387	-
Receiving food aid	Dummy (0=Yes, 1=No)	0.1957831	0.3974013	+
Participate in PSNP	Dummy (0=Yes, 1=No)	0.7230769	1.748965	+
Home to center distance	Continuous variable in number (km)	20.26807	11.3216	+
Home to road distance	Continuous variable in number (km)	8.807229	6.480662	+
Home to market distance	Continuous variable in number (km)	20.20482	11.49728	+
Land size in ha	Continuous variable in number (ha)	1.16988	0.759191	+
Production/Hec/crop	Continuous variable in number (quintals)	7.614458	11.22647	-
TLU	Continuous variable in number (TLU)	7.991476	19.09437	-
Own mobile	Continuous variable in number	0.6144578	0.6330538	-
Own radio	Continuous variable in number	0.060241	0.2382919	+

4.4 Results and Discussion

4.4.1 The Extent of Multidimensional Poverty

The study revealed that head count ratio for pastoralist community of study area was 87.3 percent (**Table 4.3**). This indicates that largest proportions of pastoralists in study area were deprived in multiple indicators at the same time and therefore, 87.3 percent of households were multidimensionally poor. This finding is astonishingly consistent with the study that indicated that multidimensional poverty in Oromia region was 87.2% (Oxford Poverty and Human Development Initiative, 2019; Oxford Poverty and Human Development Initiative & United Nations Development Programme, 2019). Oxford Poverty and Human Development Initiative (2019) further indicated that in Ethiopia 83.5% of people were multidimensionally poor. The level of multidimensional poverty in study area was above both national and regional levels. The possible reasons for this are that access to basic services, standard of living and educational infrastructures are very low in Boorana pastoralist areas. In addition the finding is in agreement with the study of Jemal, Legesse, Haji and Ketema (2017) which indicated that in Somali and Afar region of Ethiopia 89 percent of pastoral and agro pastoral households were in multidimensional poverty. Esayas, Solomon and Girma (2019) also argued that pastoralist region of Afar and Somali regions were the most impoverished, where 78.7 and 80.1 percent of households were in multidimensional poverty respectively. This is the possible indication that multiple deprivations are particularly persistent in pastoralist areas of the country.

Boorana pastoralists also share the various environmental and social characteristics with other pastoralists groups of Ethiopia. Thus, vulnerability of pastoralists to sociopolitical and environmental dynamics made them deprived in multiple indicators. Little et al. (2008) indicated that political marginalization is one of the main pressures to pastoralists in arid and semi-arid land (ASAL). Almost half (50.9%) of respondents clearly indicated they were marginalized, pushed to the perilous precipice and were not participating in socio-political activities that have been affecting their daily life. The multidimensional deprivations are higher in the rural areas of the country and pastoralists are among the poor in multiple indicators at the same time. Oxford Poverty and Human Development Initiative (2019) consistently revealed that 91.8% of multidimensionally poor people in Ethiopia live in rural areas. The comparison of multidimensional deprivation in the study sites showed that all sites

were in the acute multidimensional poverty. Head count ratio for *Harweeyyuu* was 90 percent and it was 89.2 percent for *Dharriito,* 83.3 percent for *Aade Galchat* and 86.5 percent for *Hiddii Aallee.* This indicated that head count ratio was highest for *Harweeyyuu* followed by *Dharriito, Hiddii Aallee* and *Aadee Galchat.*

Table 4.3: Multidimensional Poverty Indices

Indices	Harweeyyuu	Dharriito	Aade Galchat	Hiddii Aallee	Total
Head count ratio (H)	0.901	0.892	0.833	0.865	0.873
Intensity of poverty (A)	0.591	0.631	0.663	0.596	0.621
Multidimensional poverty index (MPI)	0.532	0.563	0.552	0.516	0.542

Source: Calculated Based on Survey Data, 2019

A closer look at the intensity of multidimensional poverty revealed that multidimensionally poor pastoralists were deprived 62.1 percent of weighted indicators. Intensity of multidimensional poverty indicates the average deprivation of the poor (Mamaru, 2017). Thus, the study indicated that on average poor pastoralists were deprived in more than half of weighted indicators. This result is highly consistent with Oxford Poverty and Human Development Initiative (2019) which showed that poor in Oromia region were deprived 60.5% of weighted indicators. In Ethiopia intensity of poverty is 58.5% (Oxford Poverty and Human Development Initiative, 2019). The intensity of poverty for Boorana pastoralist was well above both national and regional percentages. The intensity of multidimensional poverty in town of Ethiopia was relatively lower. Mamaru (2017) found that poor in study towns were deprived in less than 50% of weighted indicators. The intensity of multidimensional poverty showed very little difference between the four sites. It can be seen from **Table 4.3** that the intensity of multidimensional poverty for poor pastoralist living in study area was 59.1 percent for *Harweeyyuu*, 63.1 percent for *Dharriito,* 66.3 percent for *Aade Galchat* and 59.6 percent for *Hiddii Aallee.* This indicates that multidimensionally poor pastoralists in *Harweeyyuu, Dharriito, Aadee Galchat* and *Hiddii Aallee* were on average deprived 59.1, 63.1, 66.3 and 59.6 percent of weighted indicators respectively. The intensity of poverty in rural areas of Ethiopia is 59.6% (Oxford Poverty and Human Development Initiative, 2019). The study consistently indicated that the poverty intensity in study sites were relatively equal to the intensity of poverty for rural areas of Ethiopia. In all study sites, the percentages of deprivation of weighted indicators suffered by poor are more than fifty per cent. The intensity

of multidimensional poverty was highest for *Aade Galchat.* This shows that on average the poor in *Aade Galchat* were deprived by largest share of weighted indicators as compared to the others. Communities in *Aade Galchat* are mainly agro-pastoralist with more diversified income sources.

The study found that multidimensional poverty index (MPI) for Boorana pastoralist was high (54.2%). This indicates on average the study population was deprived by about 54.2% of the total potential deprivations. MPI is highest for Ethiopia, at national (48.9%), Oromia region (52.7%) and rural (54.7%) level (Oxford Poverty and Human Development Initiative, 2019). Based on this figure, MPI of Boorana pastoralist was almost equal to MPI of rural areas of Ethiopia and higher than both national and regional percentages. A closer look at the MPI of the study sites revealed that MPI was 53.2% for *Harweeyyuu*, 56.3% for *Dharriito*, 55.2% for *Aade Galchat* and 51.6% for *Hiddii Aallee*. This implies that pastoralist community in *Harweeyyuu, Dharriito, Aadee Galchat* and *Hiddii Aallee* were deprived in 53.2, 56.3, 55.2 and 51.6 percent of the total potential deprivation respectively. MPI was higher in *Dharriito* followed by *Aadee Galchat*, *Harweeyyuu* and *Hiddii Aallee*. Multidimensional poverty index in study sites were significantly higher than MPI at both Oromia and national levels. This is mainly because pastoralists were deprived in multiple indicators, particularly in standard of living and education.

4.4.2 Raw Headcount Ratios

The raw headcount ratios by indicators indicate the deprivation of status of households by each indicator. Analysis of raw headcount ratio by indicators tells us the degrees of deprivation by indicators and it also indicates where policy interventions are needed. The study showed that majority of Boorana pastoralist households were deprived in cooking fuel, drinking water, electricity, ownership of assets, housing, child school attendance and years of schooling (**Table 4.4**). The deprivation percentage is 100 percent for cooking fuel, 91.27 percent for drinking water, 90.36 percent for electricity, 89.16 percent for ownership of assets, 88.25 percent for housing, 74.4 percent for child school attendance and 69.58 percent for years of schooling. Oxford Poverty and Human Development Initiative (2019) indicated that deprivation percentages for housing, cooking fuel, sanitation and electricity were highest for Ethiopia. The deprivation percentages for cooking fuel is high because 89.46 percent of kitchen type for the majority of household was traditional and 10.54 percent of household had

no kitchen at all. The study also indicated that majority (83.13 %) of household cooks with wood. Studies also congruously indicated that a deprivation percentage was highest for cooking fuel (Mamaru, 2017; Tigre, 2018).

The study also indicated that the largest proportions of households in study area were deprived of drinking water. However, on the contrary, OPHI and UNDP (2019) indicated that Ethiopia has made substantial improvement in drinking water. This study saw no any kinds of improvement in drinking water in Boorana pastoralist areas. The report was not consistent with the finding of the study and the reality on the ground for Boorana pastoralist. This is mainly due to the fact that the sources and average walking distances for water was not within the standard limit for which popular consensus was reached. The study showed that main sources of water during the rainy season were pond water (71.39 %) and rainwater (17.17 %). However, during dry season households relied on unprotected well (44.58 %). An interview results also revealed there were limited water tanks constructed by development projects. The study also showed that Boorana pastoralist travel long distance to get access to water sources. The mean of single trip waking distance from home to water source is 131 minutes during dry season and 40 minutes during rainy season. This is not within the limit of sustainable development goals (SDGs).

Table 4.4: Raw Headcount Ratio of Households by Indicators

Dimensions and indicators		Harweeyyuu	Dharriito	Aadee Galchat	Hiddii Aallee	Total
		Count (%)	Count (%)	Count (%)	Count (%)	Count (%)
Health	Child mortality	6 (1.81)	6 (1.81)	8 (2.41)	3 (0.90)	23 (6.93)
	Illness/morbidity/death of HH member	5 (1.51)	9 (2.71)	10 (3.01)	13 (3.92)	37 (11.14)
Education	Year of schooling	54 (16.27)	68 (20.48)	59 (17.77)	50 (15.06)	231 (69.58)
	Child school attendance	64 (19.28)	72 (21.69)	64 (19.28)	47 (14.16)	247 (74.40)
Livening	Electricity	73 (21.99)	85 (25.60)	75 (22.59)	67 (20.18)	300 (90.36)
	Drinking Water	73 (21.99)	86 (25.90)	77 (23.19)	67 (20.18)	303 (91.27)
	Improved sanitation	22 (6.63)	50 (15.06)	29 (8.73)	15 (4.52)	116 (34.94)
	Housing	69 (20.78)	84 (25.30)	76 (22.89)	64 (18.28)	293 (88.25)

Cooking fuel	81 (24.40)	93 (28.01)	84 (25.30)	74 (22.29)	332 (100)
Assets ownership	75 (22.59)	83 (25.00)	75 (22.59)	63 (18.98)	296 (89.16)

Source: Calculated Based on Survey Data, 2019

On the other hand, the study also showed that largest proportions of households in Boorana pastoralist areas were deprived in access to electricity. This is in line with the finding of Tigre (2018) which indicated deprivation for electricity was high in Ethiopia. We have witnessed this as we move in the study area for data collection. The major sources of light for pastoralist households were firewood (85.5 %) and kerosene light lamp (13.9 %). The study also revealed that there was high deprivation in access to assets. Alkire and Jahan (2018) identified a household as deprived if they lack assets like radio, telephone, television, refrigerator, computer, and other. Pastoralists have no access to some of these assets due to problem of connectivity to electricity, mobile nature of pastoralist and lack of experiences and knowhow in the technologies. However, the study considered the ownership of radio and mobile phone for this indicator. The study in small towns of Ethiopia by Mamaru (2017) also revealed that deprivation of household in durable asset was high.

Deprivation percentages in housing were also very high. The majority of Boorana pastoralists live in *mana buuyyoo* (a house where roof is covered with thatch and grass). This finding is consistent with Tolossa (2018) which stated that this kinds of house is so poor, crowded and difficult to lead healthy life. Almost all of respondents (93.98 %) indicated that the material the wall of main dwelling was made of was composed of wood and mud. In addition, the study also found that 77.71% of participants indicated that the roof of main dwelling was made of wood and grass. Furthermore, majority of participants (74.10 %) indicated that the floor of main dwelling was made of natural/earth and few of them (14.16 %) indicated that the floor of housing was made of mud/dung. It can also be seen that deprivation percentages for child mortality (6.93%) and serious illness/morbidity/death of household member (11.14%) was very low. With respect to dimensional deprivations, largest proportions of households were deprived in education and standard of living. This finding is consistent with Seff and Jolliffe (2017) which indicated that deprivation in education and improved water sources were high.

4.4.3 The Contribution of Indicators and Dimensions to Multidimensional Poverty Index

Decomposition is one of the most important features of MPI. The study has decomposed MPI into its components censored indicators and analyzed the contributions of each indicator to MPI. Alkire and Foster (2011) indicated that in order not to lose some properties of unidimensional measures decomposability is essential and it put forward that the overall poverty is a population share weighted average of subgroup poverty levels. Therefore, as can be seen from **Table 4.5** below the contribution of child school attendance, year of schooling, illness/morbidity, cooking fuel, access to electricity and water was high. The highest contributor, child school attendance and year of schooling contributed 38.28 and 35.8 percent respectively above their respective weight. In Mamaru (2017) year of schooling was also the highest contributor to MPI. The contributions of illness/morbidity, cooking fuel, access to electricity and drinking water to MPI was nearly equal, each contributed almost 5 percent. Access to improved sanitation and child mortality were the least contributor to MPI. Considering the contribution of each indicator by study sites, child school attendance and year of schooling was the major contributor in all study sites. This implies that deprivation in education is highest for Boorana pastoralist. In addition to this cooking fuel, water and electricity also contributes to MPI in *Harweeyyuu* and *Dharriito*. In *Harweeyyuu* and *Dharriito* child mortality and illness/morbidity and improved sanitation are the least contributor. This indicates that there is very low child mortality rate is these areas. In *Aadee Galchat* and *Hiddii Aallee*, beside indicators of education illness/morbidity, electricity, water and cooking fuel contributed to MPI. Overall, the indicator of child mortality and improved sanitation were the least contributor to MPI.

Concerning contribution of dimensions to MPI, education dimension was the largest contributor to MPI followed by standard of living and health dimension. This makes health dimension the least contributor to MPI. Contrary to this study Mamaru (2017) found that standard of living was the largest contributor to MPI. Perhaps for the study conducted in small towns of the country where access to basic services are the pressing issues, standard of living could be the largest contributor. Our finding is also different from study of Tigre (2018) which stated that living standard was the highest contributor to multidimensional poverty. In pastoralist areas though standard of living was the major issue, however, contribution of dimension of education to MPI was very high. The study also revealed that in

all study sites the dimension of education was the largest contributor and dimension of health was the least contributor to multidimensional poverty. There are many possible reasons for dimension of education to contribute high for pastoralist multidimensional poverty. In Boorana pastoralist area, educational infrastructures are underdeveloped. In addition, an education policy of the country is not consistent with the contexts of the pastoralist. For instance, one can consider an adult education program. The intention of the program was to educate the adults at the night. This is very good opportunity for adults, however, in pastoralist areas education programs has to be specially designed for children and youngsters that may not get the opportunity for education due to their responsibility to look after livestock during the days. In Boorana pastoralist areas large number of school-aged children misses the school to look after livestock at different camps (homestead, *foora*/mobile herds). This is an indication for the urgent and immediate interventions to achieve SDG for universal education for all.

Table 4.5: Contributions of Indicators and Dimensions to MPI

Dimensions and indicators		Harweeyyuu			Dharriito			Aadee Galchat			Hiddii Aallee			Total		
		Chi	Wchi	Count (%)	Chi	Wchi	Count (%)	Chi	wchi	Count (%)	Chi	Wchi	Count (%)	Chi	wchi	Count (%)
Health	Child mortality	0.030	0.005	0.930	0.030	0.005	0.930	0.040	0.007	1.240	0.015	0.003	0.465	0.116	0.019	3.565
	Illness/morbidity/death HH	0.025	0.004	0.775	0.045	0.008	1.395	0.050	0.008	1.550	0.065	0.011	2.015	0.186	0.031	5.734
Education	Year of schooling	0.272	0.045	8.369	0.342	0.057	10.539	0.297	0.050	9.144	0.252	0.042	9.292	1.162	0.194	35.802
	Child school attendance	0.322	0.054	9.919	0.362	0.060	11.159	0.322	0.054	9.919	0.236	0.039	8.735	1.242	0.207	38.282
Standard of living	Electricity	0.121	0.007	1.227	0.141	0.008	1.429	0.124	0.007	1.261	0.111	0.006	1.126	0.497	0.027	5.043
	Drinking Water	0.121	0.007	1.227	0.142	0.008	1.446	0.128	0.007	1.294	0.111	0.006	1.126	0.502	0.028	5.094
	Improved sanitation	0.036	0.002	0.370	0.083	0.005	0.841	0.048	0.003	0.488	0.025	0.001	0.252	0.192	0.011	1.950
	Housing	0.114	0.006	1.160	0.139	0.008	1.412	0.126	0.007	1.278	0.106	0.006	1.076	0.485	0.027	4.925
	Cooking fuel	0.134	0.007	1.362	0.154	0.008	1.563	0.139	0.008	1.412	0.123	0.007	1.244	0.550	0.030	5.581
	Assets ownership	0.124	0.007	1.261	0.137	0.008	1.395	0.124	0.007	1.261	0.104	0.006	1.059	0.490	0.027	4.976

Source: Calculated based on survey data, 2019

4.4.4 Households Vulnerability and Severity of Multidimensional Poverty

Analysis of vulnerability to multidimensional poverty is more than current status and incidence of poverty. It is forward looking that enabled us understood the probability of non-poor households to fail into multidimensional poverty. The severity and vulnerability to multidimensional poverty was shown in the **Table 4.6** below. Concerning severity of households to multidimensional poverty, the households were categorized as in less severe and severe poverty. The households were categorized as less severe if weighted depravation percentage was more than 30 but less than 50 percent and in severe poverty if a weighted depravation percentage was greater than 50 percent. The severity of poverty indicates the households deprived in more than 30 percent of weighted indicators. The study revealed that 58.43 percent of households were in severe multidimensional poverty. By this, it is understandable that more than half of Boorana pastoralists participated in the study were deprived over 50 percent of weighted indicators.

Oxford Poverty and Human Development Initiative (2019) indicated that 61.5% of Ethiopian populations were in severe poverty and severity of poverty was highest (70.5%) for rural areas. In Oromia regional state where study area is located, 67.3% of populations were in severe poverty. The study found that severity of poverty in Boorana rangeland is nearly equal to national figure. A closer look at the severity of multidimensional poverty by study sites revealed that the proportion of households in severe multidimensional poverty were higher in *Dharriito* (17.77%) followed by *Aade Galchat* (15.66%), *Harweeyyuu* (14.76%) and *Hiddii Aallee* (10.24%). With regards to less severe poverty the study found that 28.92 percent of households were in less severe category and were deprived in more that 30 percent of the weighted indicator. Pearson chi2(9) = 14.5191, Pr = 0.105 test showed there is statistically significant evidence to accept hypothesis of no difference and thus the test showed that there is no difference in proportion of severity and vulnerability to multidimensional poverty by study sites.

Table 4.6: Severity and Vulnerability to Multidimensional Poverty

Vulnerability and severity	Harweeyyuu		Dharriito		Aade Galchat		Hiddii Aallee		Total	
	Count	%	Count	%	Count	%	Count	%	Count	%
Less severe	24	7.23	24	7.23	18	5.42	30	9.04	96	28.92
Severe poverty	49	14.76	59	17.77	52	15.66	34	10.24	194	58.43

Not vulnerable	1	0.30	2	0.60	0	0	0	0	3	0.90
Vulnerable	7	2.11	8	2.41	14	4.22	10	3.01	39	11.75
Total	81	24.4	93	28.01	84	25.3	74	22.29	332	100

Source: Calculated based on survey data, 2019

There were only few non-poor households in the study area. Surprisingly, the most pressing issue was that almost all (11.75%) of multidimensionally non-poor households were vulnerable to multidimensional deprivation. At the national level, 8.9% of multidimensionally poor peoples were vulnerable to poverty in Ethiopia. Vulnerability level was 7.2% for rural areas of Ethiopia and 6.9% for Oromia region (Oxford Poverty and Human Development Initiative, 2019). The level of vulnerability in study areas was higher than the level of vulnerability to poverty at national, regional and rural area levels. This foresees that there is the high probability of widespread poverty in the area and Boorana pastoralists needs urgent interventions to reduce the level and incidence of multidimensional poverty. The interventions are needed not only to reduce ex post level of poverty but also to prevent ex ante risk of failing into multidimensional poverty. The study also indicated that vulnerability was higher in *Aadee Galchat*, followed by *Hiddii Aallee*, *Dharriito* and *Harweeyyuu*.

The severity and vulnerability to multidimensional poverty were decomposed by sex of household head, marital status and literacy level of household head. The study found that both severity and vulnerability to multidimensional poverty was higher for male-headed households. With regards to severity to multidimensional poverty 47.59 percent of male headed households were in severe poverty while 23.49 percent were in less severe poverty. The percentages of households in less severe (5.42%) and severe poverty (10.84%) poverty category were very few for households headed by female. The study found that nearly half of household headed by male were deprived over 50 percent of weighted indicator. In addition, vulnerability to multidimensional poverty was also higher for male-headed households (9.64%) than female-headed households (2.11%). The possible reason for largest proportions of severity and vulnerability of households to multidimensional poverty by male-headed households was mainly due to largest (81.63%) participation of male-headed households in the study.

Breaking down severity and vulnerability to multidimensional poverty by literacy level of household head the study found that non-literate households were in severe poverty and were vulnerable to multidimensional poverty. Largest proportions of households headed by non-literates were in severe poverty (48.8%) while only few of them (22.89%) were in less severe poverty. Only few of households headed by the head that can read and write were in severe (9.64%) and less severe (6.02%) poverty category. This also signifies that nearly half of household headed by non-literate were deprived over 50 percent of weighted indicator. In the same way vulnerability to multidimensional poverty were also higher for households headed by non-literate (9.94%) as compared to the households whose head can read and write (1.81%).

The decomposition of the severity and vulnerability of households to multidimensional poverty by marital status revealed that married households were in severe poverty and at the same time vulnerable to multidimensional poverty. Considering severity category, largest proportions of married households were in less severe (25.6%) and severe (53.92%) multidimensional poverty. This means that almost 80 percent of married households were in severe multidimensional poverty. It also implies that from the total severity more than half of married households were deprived over 50 percent of weighted indicator. Vulnerability to multidimensional poverty was also higher (10.24%) for married household. The difference in severity and vulnerability by marital status is mainly due to the fact that more than 90 percent of households participated in the study were married. Pearson chi2(9) = 41.9867, Pr = 0.000 test showed the absence of statistically significant evidence to accept hypothesis of no difference and thus the test showed that there is difference in proportion of severity and vulnerability to multidimensional poverty by marital status of household.

4.4.5 The Multidimensional Poverty Profiles

4.4.5.1 Multidimensional Poverty by Household Demography (Sex, Age and size)

One of the key features of MPI is that it can be decomposed into population sub-groups (Alkire & Santos, 2011). MPI can be decomposed by population sub-groups like rural or urban or by geographic regions. This study decomposed MPI by different demographic characteristics of households which includes the sex and age of household head, and household size. **Table 4.7** below depicts MPI by population characteristic. Considering multidimensional poverty by sex of household head the study revealed that 71.08 percent of

male head households were multidimensionally poor while only few (16.27%) of multidimensionally poor households were headed by female. In all study sites multidimensional poverty is higher for male headed households as compared to female headed household. For instances, in *Harweeyyuu* 72.84 percent of male headed households were multidimensionally poor. In the someway, for *Dharriito* (77.42%), *Aadee Galchat* (69.05%) and *Hiddii Aallee* (63.21%) multidimensional poverty was very high for male headed households.

The proportions of male-headed multidimensionally poor households were high in *Dharriito* followed by *Harweeyyuu*, *Aade Galchat* and *Hiddii Aallee*. Though proportions of multidimensionally poor female-headed households were few in all study sites, however, in *Hiddii Aallee* the proportion of multidimensionally poor households headed by female was higher (22.97%). In this study, male-headed households were the most multidimensionally poor households. The study of Mamaru (2017) consistently found that multidimensional poverty were higher for male headed households than female headed households. It was believed that persistence of multidimensional poverty for male-headed households was attributed to largest proportions of male-headed households in the samples and culturally held truth that gave male the role of leading the family in Boorana pastoralist. In Boorana area, the role of family custodianship dominantly rests upon males. Unless a husband dies or retires family headships would not be given to either a wife or elder son.

Table 4.7: Multidimensional Poverty by Household demography (Sex, Age and size)

Head sex	Harweeyyuu				Dharriito				Aadee Galchat				Hiddii Aallee				Total			
	Poor		Not poor		Poor		Not poor		Poor		Not poor		Poor		Not poor		Poor		Not poor	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Male	59	72.84	7	8.64	72	77.42	10	10.75	58	69.05	12	14.29	47	63.21	6	8.11	236	71.08	35	10.54
Female	14	17.28	1	1.23	11	11.83	0	0	12	14.29	2	2.38	17	22.97	4	5.41	54	16.27	7	2.11
Total	**73**	**90.12**	**8**	**9.87**	**83**	**89.25**	**10**	**10.75**	**70**	**83.34**	**14**	**16.67**	**64**	**86.18**	**10**	**13.52**	**290**	**87.35**	**42**	**12.65**
Age																				
Early working age (14-25)	5	6.17	0	0	8	8.60	0	0	1	1.19	1	1.19	0	0	0	0	14	4.22	1	0.30
Prime working age [25-55)	51	62.96	4	4.94	60	64.52	8	8.60	50	59.52	10	11.90	53	71.62	9	12.16	214	64.46	31	9.34
Mature working age [55-65)	9	11.11	3	3.70	7	7.53	0	0	7	8.33	3	3.57	3	4.05	0	0	26	7.83	6	1.81
Elderly [>65)	8	9.88	1	1.23	8	8.60	2	2.15	12	14.29	0	0	8	10.81	1	1.35	36	10.84	4	1.20
Total	**73**	**90.12**	**8**	**9.87**	**83**	**89.25**	**10**	**10.75**	**70**	**83.33**	**14**	**16.66**	**64**	**86.48**	**10**	**13.51**	**290**	**87.35**	**42**	**12.65**
Mean age	**44.89**		**53.62**		**39.69**		**41.1**		**42.1**		**39.07**		**41.60**		**40.8**		**42.00**		**42.73**	
HH size																				
Less than 5	13	16.05	2	2.47	28	30.11	3	3.23	14	16.67	2	2.38	20	27.03	0	0	75	22.59	7	2.11
[5-10)	56	69.14	4	4.94	50	53.76	7	7.53	50	59.52	11	13.10	39	52.70	9	12.16	195	58.73	31	9.34
[10-15)	4	4.94	2	2.47	4	4.30	0	0	6	7.14	1	1.19	5	6.76	1	1.35	19	5.72	4	1.20
[15-20)	0	0	0	0	1	1.08	0	0	0	0	0	0	0	0	0	0	1	0.30	0	0
Total	**73**	**90.13**	**8**	**9.88**	**83**	**89.25**	**10**	**10.76**	**70**	**83.33**	**14**	**16.67**	**64**	**86.49**	**10**	**13.51**	**290**	**87.34**	**42**	**12.65**
Mean size	**6.05**		**6.62**		**5.57**		**6.1**		**6.24**		**6.35**		**5.54**		**6.4**		**5.85**		**6.35**	

Source: Calculated Based on Survey Data, 2019

The age category of household head was categorized into four groups as early working age (14-25), prime working age (25-55), mature working age (55-65) and elderly (above 65) (**Table 4.7**). Looking into multiple deprivation status by age of household heads the study revealed that largest proportions (64.46%) of households whose head age was in prime working age (25-55) were in multidimensional poverty. Out of total deprivation, 10.84 percent of households headed by elderly and 7.83 percent of households headed by the mature working age were in multidimensional deprivation. This makes elderly and mature working age the second and third most multidimensionally poor age group respectively following prime working age. In all study sites it was true that households whose head age was in prime working age were the most multidimensionally poor. In *Dharriito, Aadee Galchat* and *Hiddii Aallee* multidimensional deprivation was highest for prime working age followed by elderly and mature working age. Nevertheless, for *Harweeyyuu* multiple deprivation was higher for prime working age similar to other sites, but the mature working age was the second most multidimensionally poor followed by elderly. The mean age of poor and non-poor households head was 42 and 42.73 years respectively.

As can be seen from **Table 4.7** above out of total multidimensionally poor household 58.73 percent of households had family size between 5 and 10 and 22.59 percent had family size less than five. This indicates that households with family size greater than five had largest proportion of multidimensional poverty. Decomposition of MPI by study sites also revealed that in all study sites multidimensional deprivation was higher for households whose family size is between 5 and 10 followed by households with family size is less than five. The study also identified average family size for poor and non-poor households. Accordingly, the mean household size for multidimensionally poor and non-poor households was 5.85 and 6.35 respectively. Thus, it can be imaginable that the household with large family size had largest proportions of multidimensional poverty than small sized households.

4.4.5.2 Multidimensional Poverty by Literacy Level and Marital Status of Households

Multidimensional poverty was also disaggregated by literacy level of household heads. The study revealed that out of total multidimensionally poor households 71.69 percent had non-literate head. Only few (15.66%) household whose head can read and write were in multidimensional poverty. A closer look at the multiple deprivations by literacy level of household head in study sites revealed that in all sites households headed by non-literate head were in more multidimensional poverty. Out of multidimensionally poor household 71.60 percent of non-literate households were poor in *Harweeyyuu.* The poverty status of households with non-literate heads in *Dharriito, Aadee Galchat* and *Hiddii Aallee* were 75.27, 76.19 and 62.16 percent respectively out of total multidimensionally poor households. *Aadee Galchat* had highest multidimensional poor households with non-literate heads followed by *Dharriito, Harweeyyuu* and *Hiddii Aallee.* As depicted in **Table 4.8** below, disaggregation of multidimensional poverty by marital status of household revealed that married household with monogamous wife had high (79.52%) multidimensional poverty status. Participants with marital status of single were the second (6.63%) most multidimensionally poor. In addition, disaggregation by study sites indicated that in all sites multidimensional poverty was high for households with monogamous wife.

Table 4.8: Multidimensional Poverty by Literacy Level and Marital Status

Head Literacy	Harweeyyuu				Dharriito				Aadee Galchat				Hiddii Aallee				Total			
	Poor		Not poor		Poor		Not poor		Poor		Not poor		Poor		Not poor		Poor		Not poor	
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Non-literate	58	71.60	7	8.64	70	75.27	7	7.53	64	76.19	13	15.48	46	62.16	9	12.16	238	71.69	36	10.84
Read and write	15	18.52	1	1.23	13	13.98	3	3.23	6	7.14	1	1.19	18	24.32	1	1.35	52	15.66	6	1.81
Total	**73**	**90.12**	**8**	**9.87**	**83**	**89.25**	**10**	**10.76**	**70**	**83.33**	**14**	**16.67**	**64**	**86.48**	**10**	**13.51**	**290**	**87.35**	**42**	**12.65**
Marital status																				
Single	9	11.11	1	1.23	5	5.38	3	3.23	5	5.95	1	1.19	3	4.05	0	0	22	6.63	5	1.51
Married/monogamous	64	79.01	6	7.41	75	80.65	7	7.53	64	76.19	13	15.48	61	82.43	10	13.51	264	79.52	36	10.84
Married/polygamous	0	0	1	1.23	2	2.15	0	0	0	0	0	0	0	0	0	0	2	0.60	1	0.30
Divorced	0	0	0	0	1	1.08	0	0	1	1.19	0	0	0	0	0		2	0.60	0	0
Total	**73**	**90.12**	**8**	**9.87**	**83**	**89.26**	**10**	**10.76**	**70**	**83.33**	**14**	**16.67**	**64**	**86.48**	**10**	**718.49**	**290**	**87.35**	**42**	**12.65**

Source: Calculated Based on Survey Data, 2019

4.4.6 Determinants of Multidimensional Poverty

To identify the determinants of multidimensional poverty of households, logistic regression model was used. Though logit model do not make several assumptions that linear models made, certain assumptions need to be met to undertake logit regression model. In this model, we have tested the assumptions of appropriate outcome structure, observation independence, goodness of fit, model specification and multicollinearity. Concerning the structure of the outcome variable, the model used multidimensional poverty as predicted which is dummy and the observations were independent of each other. Multicollinearity test revealed that there is no problem of multicollinearity (see *Appendix B*). In addition, goodness-of-fit test was conducted to test model specification and whether data fitting was made (see *Appendix A*). The test results (Hosmer-Lemeshow chi2 (8) = 0.68, prob > Chi2 = 0.99) showed that the model is significant. The likelihood ratio test also revealed that there are no specification problems (see *Appendix C*). Therefore since $p = 0.68 > \alpha = 0.05$ our model fitted the data reasonably well.

In this model, various household demographic characteristics and other indicators were used as predictor. A test of the full model against a constant only model was statistically significant. The result (pseudo R2 = 0.6756, Prob > chi2 = 0.0000) revealed that the model as a whole is statistically significant, as compared to the empty model with no predictors. The pseudo R squared of 0.6756 indicates that 67.56 % of variability in multidimensional poverty was explained by the predictors. The explanatory variables determine the explained very well and the model is reasonably fitted well. Though the study hypothesized that; all predictor determines household multidimensional poverty status, only ten variables turned out significant at different significance levels. Accordingly, participation in Productive Safety Net Program (PSNP) and distance from home to center provided very strong evidence and significantly determined household multidimensional poverty at 1% significance level. In addition, age of household head, relationship to the head, size of cultivated land and production per hectare of land were significant at 5% significance level. Further sex of household head, highest education level of household member, sanitation and Tropical

Livestock Unit (TLU)[20] marginally determined the multidimensional poverty at 10% significant level.

Table 4.9: Logistic Regression Result of Determinants of Multidimensional Poverty

Multidimensional poverty	Log Coefficients	Marginal Effects
Head sex	1.6665 (0.9462)*	0.0675 (0.0374)
Head Age	0.0814 (0.0351)**	0.0033 (0.0014)
R/ship to the head	-0.4871 (0.2363)**	-0.0197 (0.0091)
Marital status	-0.5062 (0.5410)	-0.0205 (0.0215)
HH member age < 15	0.0042 (0.2256)	0.0001 (0.0091)
HHagegret65	-0.7548 (0.8155)	-0.0306 (0.0332)
Head Literacy	-0.1024 (0.8115)	-0.0041 (0.0328)
Highest Educ level of HH member	-0.7674 (0.4578)*	-0.0311 (0.0186)
Years of schooling	-1.1008 (0.7943)	-0.0446 (0.0321)
School attendance	-0.4138 (0.4412)	-0.0167 (0.0179)
Skill training for LS	0.2702 (1.3857)	0.0109 (0.0563)
Microfinance	0.2926 (0.8934)	0.0118 (0.0360)
Access to credit	0.2832 (1.2819)	0.0114 (0.0519)
Member of cooperative	1.3742 (1.5498)	0.0557 (0.0628)
Institution for mutual assistance	-0.4285 (1.7974)	-0.0173 (0.0728)
Habit of purifying water	-0.1669 (0.4303)	-0.0067 (0.0175)
Sanitation of toilet	-1.6465 (0.8929)*	-0.0667 (0.0357)
Floor of dwell	-0.9475 (1.0254)	-0.0384 (0.0409)
Cooking fuel	1.7220 (1.3735)	0.0698 (0.0567)
Receiving food aid	1.2560 (0.8580)	0.0509 (0.0331)
Participate in PSNP	-0.5158 (0.1971)***	-0.0209 (0.0082)
Home to center distance	-1.1490 (0.1771)***	-0.0465 (0.0061)
Land size in ha	1.3312 (0.6753)**	0.0539 (0.0279)
Production/Hec/crop	-0.1000 (0.0401)**	-0.0040 (0.0016)
TLU	0.0435 (0.0227)*	0.0017 (0.0009)
Own mobile	-0.2792 (0.7939)	-0.0113 (0.0322)
Own radio	2.1115 (1.4345)	0.0856 (0.0580)
_cons	7.0462 (2.7053)	
		Number of obs = 324

[20] The conversion factors for TLU used in this study are: Ox = 1.10, Bull = 0.60, Cow = 1.00, Heifer = 0.50, Calves = 0.20, Goat = 0.09, Sheep = 0.01, Camel = 1.1, Horse/mule = 0.80, donkey = 0.50, Chicken/poultry = 0.01 (Jahnke, Tacher, Keil, & Rojat, 1986; Naseri, 2005).

Wald chi2 (27)	=	89.71
Prob > chi2	=	0.0000
Pseudo R2	=	0.6756

*** Statistically significant at 1% (p<0.01), ** statistically significant at 5% (p<0.05), * statistically significant at 10% (p<0.1). Robust standard errors in parenthesis

Source: Calculated Based on Survey Data, 2019

Generally, multidimensional poverty of Boorana pastoralist household was associated with various household demographic characteristics and variables related to standard of living. Age of household head was strongly and positively associated with multidimensional poverty of household. An additional increase in age of household head increases multidimensional poverty of household. It can therefore be understood that for every year of increase in age of head, the probability of failing in multidimensional poverty is higher for household lead by elderly. Similarly, sex of household head was statistically significant and positively affects multidimensional poverty of households. The study found that male-headed households were more multidimensionally poor than female-headed households. However, the results of econometric model showed that one unit change in sex of household head, i.e., changing from male headed to female-headed increases the probability of multidimensional poverty. In addition, respondents' relationship to the head is negatively associated with multidimensional poverty of households.

Pastoralist areas are among the least educated in Ethiopia. Education of household member would have positive contribution on the wellbeing of the family. The result found that highest education level of household member was significant and negatively associated with multidimensional poverty status of household. This finding is consistent with Tigre (2018) which indicated that more education resulted in more productivity and earning which in turn makes people less likely to be poor. This implies that households whose member had highest level of education are less likely to become multidimensionally poor. In addition, this also indicates that for one unit increase in the education level of household member the probability of household to become multidimensionally poor decreases. This suggests that completion of one more level of primary, secondary, preparatory and tertiary schooling of household member improves household wellbeing and thereby lowers overall multidimensional poverty.

With regards to household asset characteristics, size of cultivated land, production per hectare of land and tropical livestock units (TLU) are statistically significant. The size of cultivated

land in hectare was strongly and positively associated to multidimensional poverty status of households. This implies that for a small increase in the size of cultivated land the probability of households to fail in multidimensional poverty increase. This denotes that in the pastoralist areas of Boorana extensive farming with large farm size would not help in reducing the overall multidimensional poverty. A probable reason for this is that extensive expansions of farm land results in the fragmentations of grazing land, which in turn affects the productivity of livestock sector, which is the potential resource base for Boorana pastoralist. The result of hypothesis testing with Pearson chi2(1) = 3.4012, Pr = 0.065 test showed there is statistically significant evidence to reject hypothesis of no relationship and thus the test result showed that since 1992 (from Gadaa of Boruu Madhaa), the increase in the levels of poverty of pastoralist household is related to rangeland degradation. Currently people are enclosing the *kaloo* by the name of farmlands. The establishment of private *kaloo* and ranches with many objectives fragments the rangelands and affects the indigenous knowledge of the pastoralists. Tache (2011) consistently indicated that the existence of enclosures with many forms, objectives and motives implies land fragmentation and decline in common property resource tenure.

Contrary to size of cultivated land, production per hectare of land was strongly and negatively associated with multidimensional poverty of household. An additional increase in production of main crops from hectare of land decreases the probability of multidimensional poverty. Teferi and Feyera (2019) also indicated that alternative crop farming could supplement household food needs. This result is however contrary to Berhanu (2019) which indicated that crop cultivation generally increases the risk of vulnerability to poverty. In an interview participants indicated that crop production is one of the alternative means of living besides livestock production. Therefore, though having larger farm size increases the probability of multidimensional poverty; however, increase of production from the available land contributes in minimizing multidimensional poverty. TLU was also significantly and positively associated with multidimensional poverty status of household. The result showed that for one unit increase of TLU the probability of household to become multidimensionally poor somehow increases. This implies that possession of one or more of livestock species that individually or together add up 1 TLU somewhat contributes to multidimensional poverty. This infers that having large number of livestock alone cannot define household wellbeing.

The study also revealed that variables related to standard of living like distance from home to the center and sanitation was associated with multidimensional poverty of household. The

center in this case is the district town. Distance from home to center had a strong and negative significant association with poverty, which shows lower multidimensional poverty for households with longer distances from the center. The result showed that one unit increase in distance from home to the center decrease multidimensional poverty. This finding is in line with Berhanu (2019) which also indicated the negative relationship between distance and vulnerability to poverty. On the other hand, sanitation had negative significant effects on multidimensional poverty. A unit change in the features of household sanitation decreases multidimensional poverty. Livelihood improvement programs like participation in productive safety net program (PSNP) are also negatively associated with multidimensional poverty. The results indicated that for one unit of change for participation in PSNP the probability of household to become multidimensionally poor decreases. This implies that the program is targeting the poor.

4.4.7 Multidimensional Deprivations and Implications for Policy

Multidimensional poverty indices and indicators had significant implications for human development and thus, aligning it to sustainable development goals (SDGs) and millennium development goals (MDGs) is very important. Though United Nations (2015) indicated that MDGs have improved the conditions of many poor, yet poverty is persistent in unprecedented ways. UNDP goal of ending poverty in all its forms was ambitious (United Nations Development Programme, 2015b). Alkire and Jahan (2018) indicated that the advent of SDGs provided an occasion to realign MPI. The study has related multiple deprivation of household by indicators to the global development goals. Poverty reduction is the foremost, imperative objective of sustainable development goals (Padda & Hameed, 2018). Aligning deprivations of a single indicator to the internationally defined standard gives more meaningful implications for policy by indicating where appropriate interventions are needed. The study believed that relating deprivation of indicators to these goals provides big input for policies, programs and strategies to be enacted both at national and regional level. This is in line with Ballon and Duclos (2015) which indicated that policy intended to reduce poverty should recognize the poverty profiles by dimensions. As can be seen from **Table 4.10** below, for each indicators of multidimensional poverty related SDGs and MDGs were indicated. The paper has identified the deprivation percentages of each indicator (**Figure 4.2**). It is very important to analyze and interpret deprivation of single indicators in line with internationally

and nationally accepted standards. The level of deprivation in indicators indicates the severity of poverty in that indicator and it is the indication for necessity of appropriate interventions.

Table 4.10: Alignment of the indicators of Multidimensional Poverty to SDG and GDG

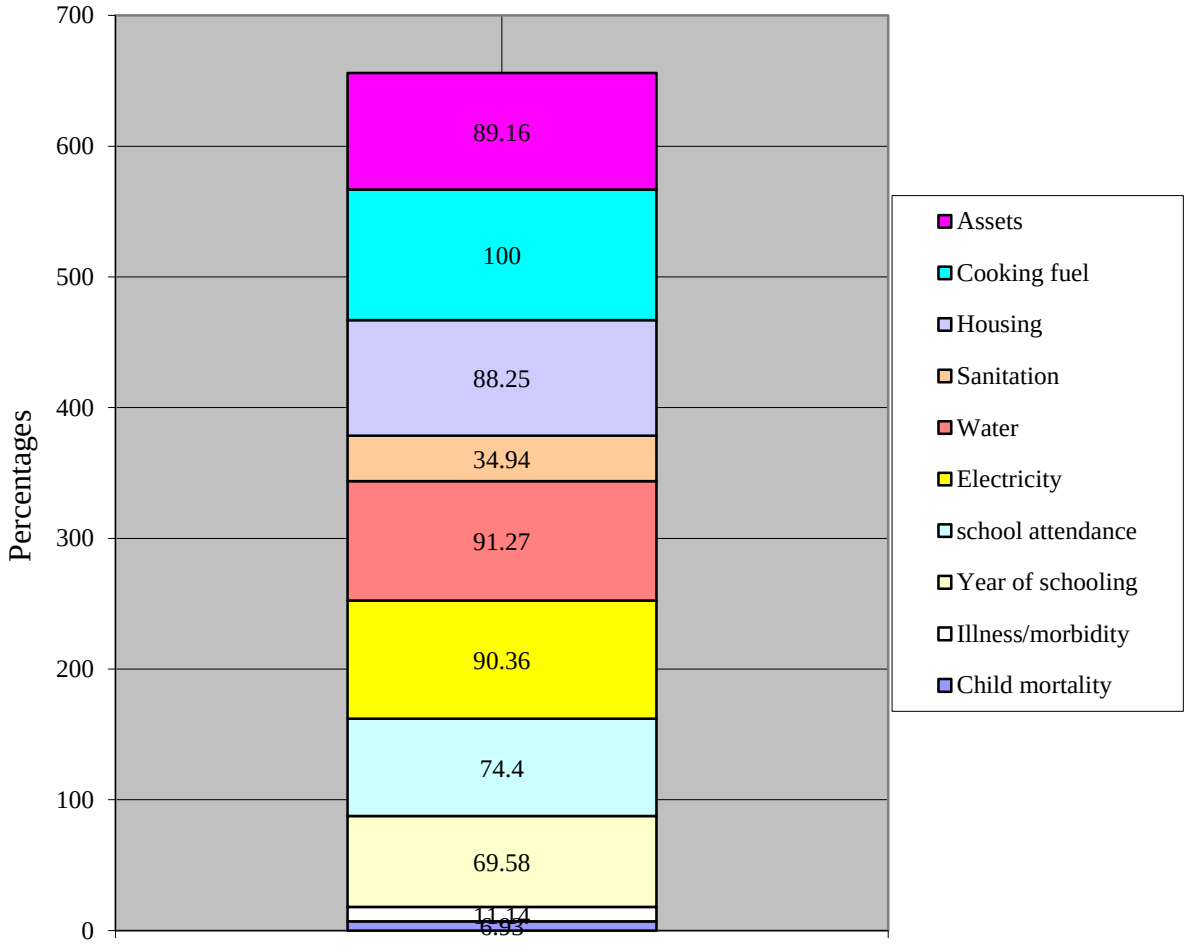
Dimensions	Indicators	SDG indicator	MDG indicator	References
Health	Child mortality	SGD 3	MDG4	(United Nations Development Programme, 2015b) & (United Nations, 2015a)
	Illness/morbidity/death of HH member	SGD 3	MDG4	
Education	Year of schooling	SGD 4	MDG2	
	Child school attendance	SGD 4	MDG2	
Living Standard	Electricity	SGD 7	MDG7	
	Drinking Water	SGD 6	MDG7	
	Improved sanitation	SGD 6	MDG7	
	Housing	SGD 11	MDG7	
	Cooking fuel	SGD 7	MDG7	
	Assets ownership	SGD 1	MDG7	

Source: Own Synthesis

As portrayed on (**Figure 4.2**) the deprivation percentage of dimension of health was very low. The study indicated that a deprivation percentage for illness/morbidity/death of household member who was the main bread earner was 11.14% and it was 6.93% for child mortality. Though the percentage of deprivation in dimension of health was very low it does not mean that there was no health problem in the study area. Minimum defects in health of families affect the whole community. Boorana pastoralists were indifferent to respond when asked about the death of family members particularly children. Participants often said '*nu nagaa qabna'* (we have peace) when asked whether children under five died in the family. Therefore, we believe that indifference of participants to respond on issues had made the deprivation percentages of indicators of health low. The study witnessed that the area had no sufficient health infrastructure and extension services. UNDP (2015) has set an ambitious SDG of ensuring healthy lives and promote well-being for all at all ages. Ending the death of newborns and under five children was the main target of both SGD and MDG (United Nations, 2015a; United Nations Development Programme, 2015b). In addition, both SDG and MDG have set a goal to reduce different types of diseases that had been cutting the lives

of peoples at different ages. Therefore, since health affects every aspects of life of human being, the issues of reducing different types of diseases, building of adequate health infrastructure and strengthening of extension services should be the concerns of policy makers at national and regional levels and actors at local level.

Figure 4.2: Deprivation Percentages of Indicators of Multidimensional Poverty



Source: Calculated Based on Survey Data, 2019

Deprivation in education was high for Boorana pastoralist. Prominent freedom fighter and leader Nelson Mandela once said that, "education is the most powerful weapon to change the world". The study also believed that education is worthy for pastoralist community of Boorana. Notwithstanding the importance of education for humanity, Boorana pastoralists are still at the bottom of the ladder with respect to education. The deprivation percentages for indicators of education were very high. Deprivation status of Boorana pastoralist households in year of schooling and child school attendance was 69.58 % and 74.4 % respectively (**Figure 4.2**). In addition to these indicators, the study found that the schools were not

adequately distributed and there is very low education infrastructure development. It seems that the education model is not suitable for the contexts of nature of pastoralists. The study by Anís (2008) congruently indicated that schools in pastoral areas of Boorana were not well distributed and the facilities for the schools were not fulfilled.

The prevalence of persistent deprivation in education of pastoralist would be a biggest hurdle for achieving SDG (United Nations Development Programme, 2015b) of 'ensuring inclusive and equitable quality education and promote life-long learning opportunities for all'. In the someway, was MDG (United Nations, 2015a) of 'achieving universal primary education' approached, let alone achievement? This is the biggest question with regards to education of rural community in general and Boorana pastoralists in particular. In Boorana pastoralist areas, there was high disparity between boys and girls, between men and women in access to education. Since deprivation in education was very high, pastoralist education should be the issue of concern for policymakers at all levels. Thus, revising pastoralist education policies, delivery approaches, development of education infrastructures, investment on adult education and mobile schools has to be the priority concerns for policymakers and stakeholders at international, national, regional and local levels.

The study also found that the deprivation percentages for indicators of standard of living were very high (**Figure 4.2**). Deprivation percentage was highest for cooking fuel (100%) followed by water (91.27%) and electricity (90.36%). All of the participants use wood for cooking. Boorana pastoralist had no access to both water and electricity. In addition, deprivation of single indicator in standard of living was also very high for asset ownership (89.16%), housing (88.25%) and sanitation (34.94%). This implies that Boorana pastoralists had very low standard of living. Thus, to ensure global goal of 'ensuring environmental sustainability' rising the pastoralist standard of living in general and ensuring that Boorana pastoralist had adequate access to safe drinking water, affordable and reliable energy, environmentally feasible and sustainable standard of living has to be the issues of concern.

Though Boorana pastoralist production was once considered as the most sustainable production system in East Africa, with regards to standard of living, meeting SDGs and targets (United Nations Development Programme, 2015b) can be very difficult given current challenges. Thus, minimizing the main hurdles of pastoralist is the most pressing issue. Boorana pastoralist had no access to electricity. They depend on firewood for both cooking

and lighting. Though the country has been tirelessly working on hydroelectric power energy and building of sustainable energy in East Africa Boorana pastoralist were not benefited from the past efforts. We have observed the electric poles connecting towns pass through rural villages, however still villagers depend on firewood. It is not clear that the future initiatives will connect Boorana to electricity. It is therefore understandable that connecting pastoralist to electricity and affordable and reliable energy is the most critical issue. In addition, ensuring pastoralists access to basic services and control over land and other forms of property has to be assured.

In addition, access to safe and affordable drinking water is an ambitious SDG. However, for Boorana pastoralist water is the biggest problem. During rainy season pastoralist depend on unprotected pond, lake and natural pools. During dry season, the main sources of water are shallow and deep wells (*Tulaas*) where available. Pastoralists usually travel long distance to have access to any of these water sources. Since there is insufficient surface water and erratic rainfall pastoralists have not been caring for safety and quality of water. Both animals and peoples drink from the same sources. There was a proverb, which says '*bishaan haraamuu hin qaban'* (the water has no evil). It is believed that this saying was emanated from the scarcity of water and it is an indication of having no choice rather than enduring the problems experienced. Notwithstanding the problems of scarcity of water Boorana pastoralist were amazing architects of well excavation and management. Boorana pastoralist had development comprehensive knowledge of well maintenance and management through well-established customary institutions. Therefore, it is implied that policymakers have to work on ensuring pastoralists equitable access to clean water not only to meet SDG and targets, but because safe water is the fundamental human necessity.

Further, the study indicated that different household demographic characteristics and the variables related to standard of living determine multidimensional poverty of Boorana pastoralists (**Table 4.9**). Thus, policies intending to reduce poverty have to recognize factors associated with multidimensional poverty. This is consistent with Ballon and Duclos (2015) which indicated that policies intended to reduce poverty should recognize poverty profiles across demographic characteristics. However, Vadala (2019) indicated that in Ethiopia government introduces policies that were not well grounded in the realities of poor pastoralists. The study found that multidimensional poverty was highest for households headed by elderly. This indicates that households headed by elderly require immediate

interventions. In addition, since education level of household member lowers multidimensional poverty of households, policymakers has to work on improving pastoralist education. Further the study found that extensive cultivation of farmland do not reduce multidimensional poverty, therefore pastoralist has to engage in irrigated farming activity. To support this initiative stakeholder at the national and regional levels has to invest on building of several micro and macro dams in Boorana lowlands. In addition, much work has to be done on maximizing the production per hectare of lands. The study also found that to reduce multidimensional poverty pastoralist has to have access to different basic services like electricity, water, roads and health services.

4.5 Conclusions and Policy Recommendations

This paper has examined the extents and determinants of multidimensional poverty and its policy implications in Boorana pastoralist area. The study was based on Alkire and Foster methods to analyze the data. MPI was aggregated and decomposed by indicators and household demographic characteristics. In addition, the logistic regression model was used to identify the determinants of multidimensional poverty. The study found that largest proportions of Boorana pastoralist households were multidimensionally poor. The level of multidimensional poverty in the study area was well above both national and regional levels. In addition there was highest intensity of multidimensional poverty. Highest concentration of multidimensional poverty of pastoralists was associated with socioeconomic and environmental dynamics. Given the dynamics of socioeconomic and environmental system Boorana pastoralist are going to be deprived in multiple indicators. It is therefore suggested that much works has to be done on obviating the factors associated with deprivations in each indicators.

The study underscored that majority of Boorana pastoralist households were deprived in cooking fuel, drinking water and electricity, ownership of durable assets, housing, child school attendance and years of schooling. Overall, the child school attendance and years of schooling made the largest contribution to MPI, while indicator of child mortality and sanitation made the least contribution. This implies that education dimension was the largest contributor to MPI followed by standard of living and health dimension. If these trends persist, pastoralists continue to have the lowest level of education and standard of living. Therefore, it is suggested that policymakers and concerned stakeholder should give more emphasis on the improvements of education infrastructures and pastoralists standards of

living. The study also revealed that largest proportions of household were in severe multidimensional poverty. Surprisingly, the most pressing issue was that almost all of multidimensionally non-poor households were vulnerable to multidimensional deprivation. With this, it can be concluded that there is high probability of falling into unforeseen risks of poverty for Boorana pastoralists. The study also found that both severity and vulnerability to multidimensional poverty was higher for households headed by non-literate. Thus, strengthening education opportunities for pastoralists through adult education and pastoralist alternative basic education could help. Therefore, governments and stakeholders at national and international level should work on tackling the root causes of multidimensional poverty and vulnerability.

Multidimensional poverty of pastoralists was associated with different factors. The study underscored that multidimensional poverty was associated with various household demographic characteristics and variables related to standard of living. Age of household head was strongly and positively associated with multidimensional poverty of household. This implies that the probability of falling in poverty was higher for elderly. Similarly econometric results indicated that one unit change in sex of household head from male headed to female-headed increases the probability of multidimensional poverty. Therefore, poverty reduction policies and strategies should take into account the disparity between ages and gender of household head. In addition, the result found that highest education level of household member was negatively associated with multidimensional poverty status of household. It can therefore be concluded that households whose member had highest level of education were less likely to become multidimensionally poor. Thus, policymakers should understand the importance of education in reducing poverty in pastoralist areas. Building more schools in pastoralist areas and adopting more flexible and workable models should be given high priority.

Further, the study implied that a small increase in the size of cultivated land increase the probability of households to fail in multidimensional poverty. This is consistent with widely held view that extensive expansions of farm land results in the fragmentations of grazing land, which in turn affects the productivity of livestock sector, which is the potential resource base for Boorana pastoralist. Therefore, it is clear that uncontrolled expansion of cultivation land could progressively fragment and degrade the grazing land. However, since an additional increase in production of main crops decrease the probability of multidimensional

poverty, poverty reduction efforts should invest on activities that can increase the production from small lands, particularly through irrigation. To support this initiative stakeholder at the national and regional levels has to invest on building of several micro and macro dams in Boorana lowlands. In addition, participation in PSNP is negatively associated with multidimensional poverty, which implies that the program helps in reduction of poverty for household's participation in PSNP. Therefore, PSNP should be initiated in the pastoralist areas.

5 RANGELAND DEGRADATION IN BOORANA RANGELAND SYSTEM AND ITS IMPACTS POST-1992: CONSTRUCTING THE PERCEPTIONS OF PASTORALIST

Abstracts

Rangelands of Africa have been undergoing substantial changes. The changes in the savanna rangelands ecology are often assessed from different points of views. This study constructs the perceptions of Boorana pastoralists on historic changes in rangelands post-1992 based on the Gadaa timelines. The construction of pastoralist perceptions can make immense contribution in comprehending the rate, trends, indicators and impacts of rangeland degradation in Boorana rangelands. This study thus points that pastoralists can better understand and describe rangeland conditions and factors associated with such changes by Gadaa periods. The study was based on the data collected from 332 pastoralists using survey questionnaire and qualitative data, and analyzed the results using descriptions of responses, and narrations of cases. The study revealed that the conditions of Boorana rangelands has been deteriorating over time and rangeland degradation showed increasing trends unprecedentedly, mainly attributed to vegetation, rangeland production, human, and environmental and climate change related features. The study also shows that the progressive degradation of rangeland resources has jeopardized rangeland production, livestock productivity and human wellbeing in Boorana rangeland system. The study suggests that recognitions and promotions of indigenous ecological knowledge of pastoralists could sustain pastoralist community in arid and semi-arid rangelands. It is therefore, imperative to understand pastoralists' knowledge of rangeland ecology for sustainable management of rangeland resources.

Keywords: Perceptions, Rangeland degradation, Pastoralists, Gadaa, Indigenous knowledge, Boorana, Ethiopia

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Paper III (5) Manuscript prepared as Galgalo Dika, Degefa Tolossa & Shiferaw Muleta. Rangeland Degradation in Boorana Rangeland System and Its Impacts Post-1992: Constructing the Perceptions of Pastoralist.

5.1 Introduction

Rangeland covers world's largest proportions of landscapes and provides several benefits for world pastoralists. Rangeland shelters millions of pastoralist often poor, politically marginalized, and dependent on livestock for survival in developing countries (Coppock et al., 2017). This is particularly true for African and sub Saharan African pastoralists. In Africa destitutions of pastoralists have now become very common and previously better-off pastoralists have been failed into chronic poverty (Coppock et al., 2017; Kassahun et al., 2008; Tolossa, 2018). In addition, the political system in many African countries had neglected and marginalized pastoralist groups in the past. Even there was a period where pastoralism as way of living was questioned in Africa (Hogg, 1991). However several authors (Gebeye, 2016; Hogg, 1991) indicated that pastoralism is one of the most environmentally sustainable and viable systems. The rangelands of developing countries have endured a wide array of challenges including poverty, environmental degradation, social conflicts, displaced people, and climate change (Coppock et al., 2017). Among these challenges, degradation of rangeland is the major problem that begs the concern of research, policy and practice. In the current study, rangeland degradation implies for sequential process of progressive departure from a reference ecological state for a given ecological site (climate, landform, and soil complex), accounting for natural fluctuations in reference conditions (Jamsranjav et al., 2018). Once it happened, reversing degradation or restoring it to its original state could be difficult and costly at some stages of degradation (Milton, Dean, Plessis, & Siegfried, 1994). Therefore, studying the main drivers of changes in rangelands and its impacts and identification of rehabilitation methods of degraded rangeland through indigenous community knowledge and ecological techniques is imperative. This study therefore raises the basic question of the rate, trends, indicators and impacts of rangeland degradation.

Similar to its other African counterpart Ethiopian pastoralists are in the perilous precipice due to climate change and associate environmental ills. Several scholars have researched on this theme in an Ethiopian context. These prior studies focused on the two regions predominated by pastoralists, namely Afar and Somali and some parts of Oromia region. Tsegaye (2010) conducted a study among Afar pastoralist and reported that rangelands in northern Afar had changed noticeably during the past 35-years. In another study conducted by Behnke and Kerven (2011), pastoralists along the awash valley rapidly lost their riverine grazing land in early 1970, the main driver surprisingly been development interventions particularly the

introduction of large scale farming (Hailu, 2018; Hundie & Padmanabhan, 2008; Tilahun et al., 2016). In Somali region of Ethiopia, the existence of severe rangeland degradation that occurred since 1944 and which was aggravated after the 1974 drought was documented in the study of Gezahegn (2006). This study revealed that rangeland degradation in Somali region had been severe after the 1974 drought, which had changed the rangeland conditions. Another study conducted in *Rayitu* district of Bale zone in Oromia region, revealed poor rangelands conditions resulted from feed and water shortages and drought (Abate et al., 2010). Drought, aridity and rangeland degradation has increased over time due to environmental degradation and mismanagement of rangeland resources (Kassahun et al., 2008).

Boorana rangeland resources had also experienced extensive changes (Abate & Angassa, 2016). Boorana rangeland systems were once considered one of the most typical and sustainable production system in East Africa (Cossins & Upton, 1987). Rangeland conditions and traditional land use patterns of Boorana had changed since the 1960s (Angassa & Oba, 2008b; Homann et al., 2008). Gemedo, Maass and Isselstein(2006) indicated that overall rangeland condition appeared to be in a transitional state from good to poor with a downward trend. Angassa (2007) also indicated that Boorana rangeland was dramatically changed and application of state and transition model applies in analysis of rangeland ecosystem. Overall, the productivity of Boorana rangeland had been dwindling over time (Dika, 2013; Doyo, 2011). The comparison of functional land use units of rangelands indicated that rangeland conditions were better in *Kaloo* and Ranches than in *Warra* and *Foora* (Dalle et al., 2006b). This is probably due to difference in managements between functional land use units in rangeland, where *kaloo* and ranches are enclosed and the grazing are limited to certain seasons, but grazing within the vicinity of *warra* and at *foora* are mostly communal. It was indicated that external interventions and the rapid growth of human population affected the pastoral land use system and have reduced the available grazing resources dramatically (Homann et al., 2008). This is mainly due to the fact that the development interventions of 1970s were designed with misguided objective of increasing rangeland productivity to exploit pastoral production for the national economy. These development programs and strategies were however, neglected pastoral rangeland management strategies and guided by the profits the country could gain from livestock sectors. Such kinds of ill-mentioned development interventions did not bring the desired results, rather reduced mobility, triggered conflicts,

reduced cooperation, reduced grazing reserves and leads to rangeland degradation (Demissie, 2016).

The study on conversion of savanna rangeland of Boorana indicated that rangelands had undergone substantial changes and fragmented (Teshome Abate & Angassa, 2016; Elias et al., 2015; McCarthy, Kamara, & Kirk, 2001; G. Oba & Kotile, 2001). Among many factors contributing to the changes in rangeland system of Boorana, encroachment and proliferation of bushes were the dominant factors (Teshome Abate & Angassa, 2016; Asongu & Roux, 2019; Dika, 2016; Elias et al., 2015). The changes in rangeland conditions and degradations of prime rangelands leads to decline in the productive capacity of livestock (Solomon et al., 2007). So far there were many studies undertaken in Boorana rangeland system on several issues of concerns. Many of previous studies treated rangeland ecology (Teshome Abate & Angassa, 2016; Angassa, 2005, 2007; Dalle et al., 2006a) and indigenous resource management (Dika, 2016; Homann, 2004; Homann et al., 2008) extensively. However, even though construction of community perceptions is the main tools for evaluating impacts of environmental change and can make crucial methodological contributions (Angassa & Oba, 2008) the literatures were of little help with regard to the study in this respect. Current study argued that construction of pastoralist perceptions based on Gadaa timelines can make immense contribution in comprehending the rate, trends, indicators, and impacts of rangeland degradation in Boorana rangelands. In addition, the study believed that pastoralist could better narrate rangeland conditions and factors responsible for changes by Gadaa timelines. Therefore, the study constructed the perceptions of Boorana pastoralist towards rangeland degradation and its impacts post- 1992 (from Gadaa of Boruu Madhaa to Kuraa Jaarsoo).

5.2 Ecological Models of Rangeland Degradation

5.2.1 Stepwise Degradation Model

It was indicated that rangeland degradation proceed in steps (Milton et al., 1994). Milton et al. (1994) have developed the idea of state of rangeland degradation further into a stepwise model of rangeland degradation. Since then different authors (Jamsranjav et al., 2018; King & Hobbs, 2006) have tried to test the applicability of stepwise degradation model to arid and semiarid rangelands. The main assumption behind this model of degradation was that rangeland degradation occurs through process of changes in ecosystem components. King and Hobbs (2006) stated that this model shows the fundamental ecological dynamics of

degradation in rangelands. Therefore, the potential for rehabilitation of rangelands is associated with the other affected components. In other words livestock may not graze unpalatable species and thus continuous consumption of forage species by livestock and ignorance of other plant species provides a competitive advantage for undesirable species to grow and little opportunity for grasses to flourish (Milton et al., 1994). Stepwise degradation model provides a clear framework of linkages between separate ecosystem components with causal steps indicating that changes in one component evoke changes in a subsequent component (King & Hobbs, 2006). Generally stepwise degradation model underscores that rangeland degradation is increasingly difficult and costly to reverse at the certain steps of degradation (Milton et al., 1994).

This study envisage that the rate and trends of degradation of rangeland in Boorana rangeland is a stepwise process (Jamsranjav et al., 2018; King & Hobbs, 2006; Milton et al., 1994) where each step may lead to a number of states, and within each of the state various cyclic successions may occur. Therefore, this study used stepwise degradation model to describe the rate and trends of rangeland degradation and its indicators post- 1992 (from Gadaa of Boruu Madhaa to Kuraa Jaarsoo). Including step zero, where there is no degradation (Jamsranjav et al., 2018) there are five steps of degradation in stepwise degradation model. At zero step rangeland have diverse vegetation compositions that functions at ecological potential and varies in response to climatic variability (Jamsranjav et al., 2018; Milton et al., 1994). The first step in the degradation of rangeland is characterized by change in the age structure of plant population, seed setting of defoliated species, seed setting and increase in density of undesirable and toxic species and little seedling recruitment among forage species (Milton et al., 1994). However this step is reversible biotic degradation (Jamsranjav et al., 2018).

At the second step the potentials of rangelands to provide good and services is reduced (Milton et al., 1994) and degradation is potentially irreversible and costly in arid regions (Jamsranjav et al., 2018). The reduction of perennial plant, vegetation and litter cover, accelerated erosion and extreme temperature are the main features of rangeland degradation in third step (Milton et al., 1994). Various features of degradation under step two and three of rangeland degradation applies to current status of rangeland degradation in Boorana rangeland. Under the third step restoration may be technically feasible but prohibitively costly or practically impossible to achieve in a management timeframe (Jamsranjav et al., 2018). The final step of degradation is the complete loss of vegetation where soil erosion is

accelerated and human made desert formed (Milton et al., 1994). At this step degradation is irreversible (Jamsranjav et al., 2018). Thus, stepwise model of rangeland degradation provides the indicators of changes (Jamsranjav et al., 2018) in which moving a step down makes restoration more costly (Milton et al., 1994).

5.2.2 State and Transition Model

Application of the state and transition model in study of dynamics of savanna ecosystem by Angassa (2007) was based on non-equilibrium model, a model developed after equilibrium view of ecological system was largely challenged (Angassa, 2007; DeAngelis & Waterhouse, 1987). The non-equilibrium theory represents the dynamism and unpredictability of ecological features of arid and semiarid environment determined by climatic and abiotic factors (Angassa, 2007; Ho, 2001; Vetter, 2005). Since non-equilibrium ecological system is related to the disturbance in a system this study applied state and transition model for describing the indicators of rangeland degradation in Boorana rangelands. State and transition model has great potential to assess natural and manmade disturbances of rangeland ecosystem (Stringham, Krueger, & Shaver, 2003). There can be different state of degradation at different threshold levels. Disturbances that can be triggered by multiple natural and management actions can put rangeland into transition from reference threshold levels. This transition can be either transient or persistent. The study applied state and transition model to assess how different disturbances related to vegetation, rangeland productivity, environmental and human related factors can further affects and degrade rangelands.

5.3 Research Methodology

5.3.1 Description of the Study Area[21]

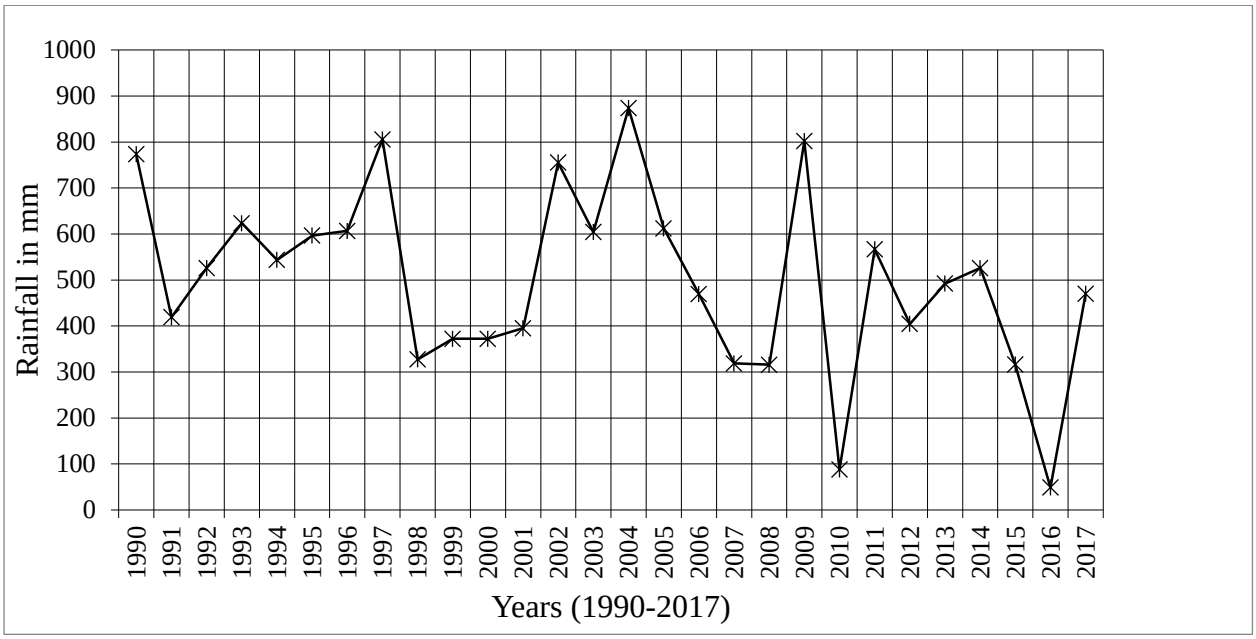
The current study was conducted in Boorana Zone (**Figure 3.1**) of Oromia region in Ethiopia. Geographically, Boorana zone is found between 3^{o} 26' and 6^{o} 32' North latitudes, and 36^{o} 43' and 40^{o} 46' East longitudes. The Boorana zone shares boundaries with other zones in the same region or another region and even marks an international boundary, which makes the zone unique in many regards. In the south, Boorana shares international boundary with Kenya, and is bordered with Somali region in the East and Southeast, also Guji zone boarders it in the East and Northeast, and the SNNPR in the west, northwest and north. The study area

[21] For more details about the study area see section (**3.3.1**).

is dominated by a semi-arid climate (Coppock, 1994) with an altitudinal range of 1000 to 1500 meter above sea level (m.a.s.l) (Tache, 2008) and average mean annual rainfall from 1990 to 2017 measures nearly 520mm (**Figure 5.1**). Boorana area receives bimodal pattern of rainfall with the main rains (ganna) falling between March and May, and the short rains (hagayya) between September and November (Angassa, 2007). The data for this research was gathered in March and continued to the months of *Adoolessa*. Though data collections were started during the month of *ganna*, the *ganna* was late and did not come on the expected time. Boorana zone comprises three traditional agro-climate zones namely, *Kola* (tropical) 56%, *Weyna Dega* (sub-tropical) 31% and *dega* (warm temperate) 13% (Tolossa, 2018). Based on Boorana traditional ecological zonations, Boorana land is broadly categorized as Liiban and Dirree. Liiban grazing zone (*dheeda*) is divided into *Golbaa* and *Gubbaa*. Dirree encompasses *goomolee, Malbee, Golboo, Dirree* (Tula wells grazing zone) and *Wayaama* grazing zone (Dika, 2016; G. Oba & Kotile, 2001) and the badda sadeen (the three sub-humid zones).

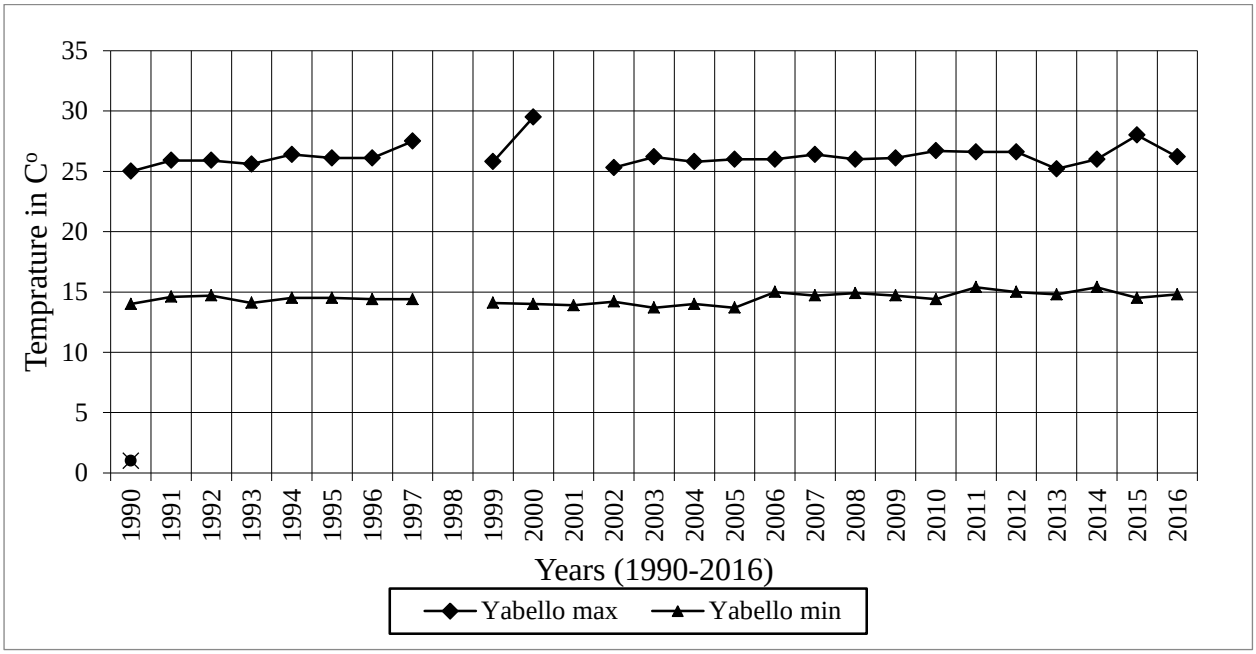
Computation of temperature data from 1990 to 2016 indicated that average mean minimum and maximum temperature of the area ranges from 14.2 °C to 25.4 °C (**Figure 5.2**). Frequency of the drought has increased to every 1-2 years (Riché et al., 2009). Like in other pastoral rangelands of Ethiopia, the fauna in Boorana is mostly characterized by sparse vegetation composed of mainly grasses, bushes, shrubs, small trees and bare land. Plant communities on the flat and hilly plains of the central Boorana semi-arid area consist of diverse mixtures of woody and herbaceous vegetation (Coppock, 1994). In addition, the woodlands of Boorana rangelands are characterized by species from the genera Combretum and Terminalia, whereas the bush lands and thickets, which cover major parts of the Boorana lowlands, are dominated by Acacia and Commiphora species (Dalle et al., 2006a).

Figure 5.1: Annual Rainfall at Yaabello stations.



Sources: Calculated based on climate data obtained from NMA for years between 1990 and 2017 for Yaaballo stations in Boorana zone.

Figure 5.2: Annual Max and Min Temperature at Yaaballo Stations.



Sources: Calculated based on climate data obtained from NMA for years between 1990 and 2017 for Yaaballo in Boorana zone.

5.3.2 Research Method and Design

This study was based on a mixed research method approach to construct the perceptions of pastoralist on the degree, trends, indicators and impacts of rangeland degradation. Mixed

method was preferred because beside historical narrations of perceptions of pastoralist description of the rates and trends of rangeland degradation overtime is also decisive. The qualitative method was based on the historical narrations of perceptions of participants; whereas quantitative method was used to systematical summarize the responses. Both methods complement each other by triangulation strategy. Both data were integrated in the analysis phases. Data were collected from pastoralists at one time and thus, a cross-sectional research design was employed in this study. The study analyzed the conditions of rangeland degradation based on Gadaa time line, from the Gadaa of Boruu Madhaa (1992-2000) to Gadaa of Kuraa Jaarsoo (2016-2024) as narrated by pastoralist. The conception of time and history is very important in Gadaa system. In this regards Boorana Oromos time reckoning and the calendar which is permutation based on lunar rather than solar cycle is unique in East Africa (Legesse, 1973). This study took the year Boruu Madhaa took office (1992) as a reference point and analyzed the conditions of rangeland for over 28 years. This study was guided by a pragmatism philosophical underpinning to illuminate pastoralist perceptions of rangeland degradation and its impacts in post- 1992. Pragmatism involves the collection, analysis, and integration of quantitative and qualitative data in a single or multiphase study (Creswell, 2014). Many of previous (Griensven et al., 2014; Tolossa, 2005) studies had pragmatism as philosophical foundations.

5.3.3 Sampling Techniques and Procedures

This study was conducted in the in Boorana zone of Oromia regional state in Ethiopia. Boorana zone is further divided into districts, the middle level administrative unit. Therefore, this study employed multi-stage purposive sampling where; in the first and second stages the study districts (*Yaabello* and *Eelwayyee*) and the study *kebeles* under each districts were selected respectively using purposive sampling techniques based on homogeneity of population and for efficient and timely data acquisition. From *Yaabello* district, the data was generated from *Harweeyyuu* and *Dharriito kebeles*, whereas from *Eelwayyee* district data was collected from *Aadee Galchat* and *Hiddii Aallee kebeles*. In the third stage, the villages in each kebeles were selected using simple random sampling techniques. In the fourth stage, the participants were selected using systematic random sampling.

A survey questionnaire was used as the main data gathering tool in this study. The survey was conducted to gather information related to the rate and trends of rangeland degradation, indicators and severity of degradation and impacts of rangeland degradation during the

periods of four Abbaa Gadaas. The questionnaire was also used to address the indigenous knowledge of Boorana pastoralist in rangeland management. Data were collected from sampled households during the field survey conducted by the lead researcher from March to June 2019 at multiple scales. A total of 332[22] households were participated in this study. Household questionnaire survey was prepared in English and translated to Afaan Oromoo, the native language of Boorana pastoralists, to make it easier for enumerators to gather necessary information. The questionnaire includes both open-ended and close-ended questions. A pilot study was conducted before the actual administration of the survey questionnaire. Eight research assistants were hired to assist in the data collection and were trained by the lead researcher for two days on how the questionnaire survey would be administered, the way they can approach the respondents, and on research ethics. These research assistants were selected based on their academic level (i.e. two MA degree and six Bachelor degree holders), research experience and exposure to the local area.

In addition semi-structured interview, focus group discussions and observation were also used as tools for gathering data. Observation was also the basic tool used to see the indicators of rangeland degradation in its biophysical settings. Observation enabled the researchers understand the vegetation structure, forage species and environmental conditions of the study area. The researcher used the checklist for field observation to observe changes in the rangeland ecology.

Semi-structured interview was conducted with local elders, village heads, case households, *jaarsa argaa-dhageettii*, development agents and leader of *ganda* to apprehend and illuminate pastoralist understanding of conditions of rangeland post- 1992. The interviewees were selected based on their knowledge of the problem under investigation, referral from the community about who is a knowledgeable and traditional role in resource managements. The case households were selected randomly from each study sites. This study conducted 26 semi-structured interviews with respondents. A total of 18 semi-structured interviews were conducted with local elders, village heads, development agents and leader of *ganda.* In addition, interviews were also conducted with 4 case households and 4 *jaarsa argaa-dhageettii*. Through the interviews, the researchers were able to understand how rangelands were changed over time. The participants were encouraged to narrate the main changes they have observed in the rangeland conditions by referring to their traditional Gadaa timelines

[22] The sample size determination technique was presented before under section 4.3.4.

and its impacts and how changes in climatic conditions affected the potentials of rangeland resources under each Gadaa periods.

Further focus group discussions were conducted with four groups to corroborate the degree and trends of rangeland degradation. FGD also enabled the researchers to comprehend how climatic conditions have been affecting rangeland resources and how pastoralist indigenous ecological knowledge is functioning. The discussants were selected based on their knowledge of the problem under investigation, popularity and position in the community. Heterogeneous and homogenous groups of elders, women, village heads and other community members were contacted. The number of participants in each group rages from 6-8 individuals.

5.3.4 Data Analysis

The study employed the Gadaa timeline to elucidate pastoralist perceptions of rangeland degradation. Status and trends of rangeland post- 1992 (the year Boruu Madhaa took office) was analyzed through qualitative exploratory analysis and systematic descriptions of data obtained from cross-sectional survey. In addition indicators and impacts of rangeland degradation, impacts of climate change on rangeland conditions and indigenous knowledge of pastoralits in rangeland managements were analyzed through narration of cases and summarization of quantitative data. Data were descriptively analyzed and presented in percentages, tables and graphs. Qualitative data were rephrased and put in verbatim form and were analyzed by explorative analysis, which includes descriptions of response, content analysis and narratives of case studies.

5.4 Results and Discussion

5.4.1 The Rates and Trends of Rangeland Degradation

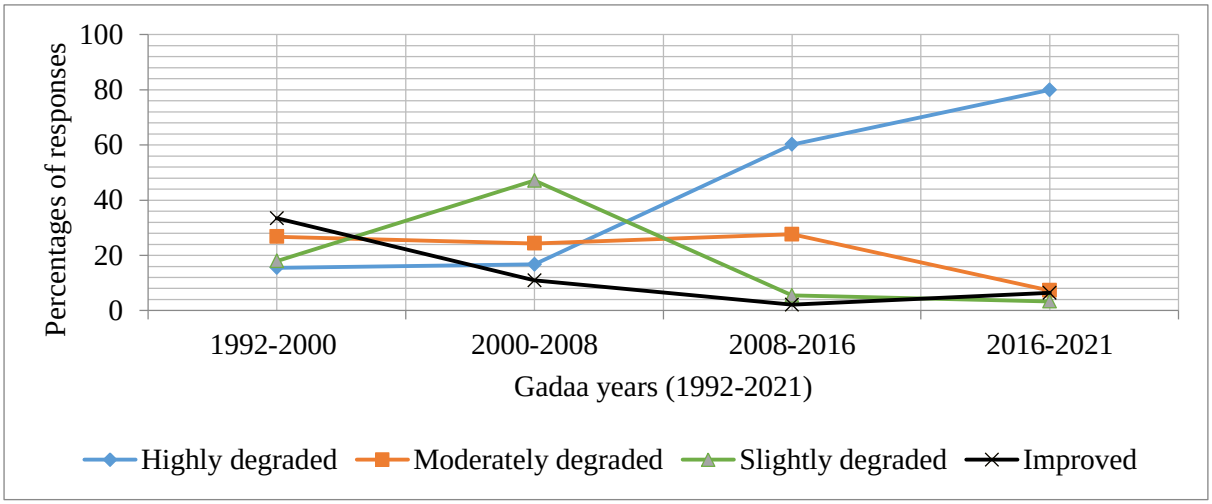
> "Let alone by Gadaa period, deterioration of rangeland occurs yearly. This year is not equal to last year and the coming year will also not be equal to this year" (Discussant in FGD).

Based on community expert knowledge the study found that rangelands were degraded. Angassa and Oba (2008) attested that the perception of the community makes the most crucial methodological contributions. Almost all of the respondents (98.19%) noticed rangeland degradation in Boorana rangeland system. In the discussion, the respondents reached to the consensus that rangeland degradation was very severe in Boorana rangelands. Participants indicated that people usually wonder the abundances during Gadaa Gobbaa

Bulee (1968-1976); however, the conditions of rangeland resources have been decreasing from time to time. Similar studies also attested that rangeland of Afar (Behnke & Kerven, 2011; Tilahun et al., 2016; D. Tsegaye, 2010) and Somali (Gezahegn, 2006) regions of Ethiopia were degraded severely.

The study revealed that across time, during the 30 years trends the conditions of rangeland is deteriorating. Discussants added that from 2000 to 2016, for nearly two decades, the conditions of grasses were deteriorated. “In Gadaa of Guyyoo Gobbaa even though *oolaa* (severe drought) affected livestock, there was a patch of grass remained for livestock” said one of the discussants. Participants further indicated that from 2016 (the year current Kuraa Jaarsoo assumed office), there was no grass reserves due to failure of *haggayya* (short rainy season) rain and late coming of *gannaa* (long rainy season). Participants further stressed that “let alone by Gadaa period, deterioration of rangeland occurs yearly”. “This year is not equal to last year and the coming year will also not be equal to this year” they said. This is consistent with the study of Jamsranjav, et al. (2018) which sees rangeland degradation as a sequential process of departure from ecological states. Many of previous studies (Angassa, 2007; Angassa & Oba, 2008b; Dalle et al., 2006a; Elias et al., 2015) also confirmed that Boorana rangeland has experienced extensive changes. **Figure 5.3** below presents the rate or degree of rangeland degradation.

Figure 5.3: Rate or Degree of Rangeland Degradation in Boorana Rangeland



Source: Own Survey Data, 2019

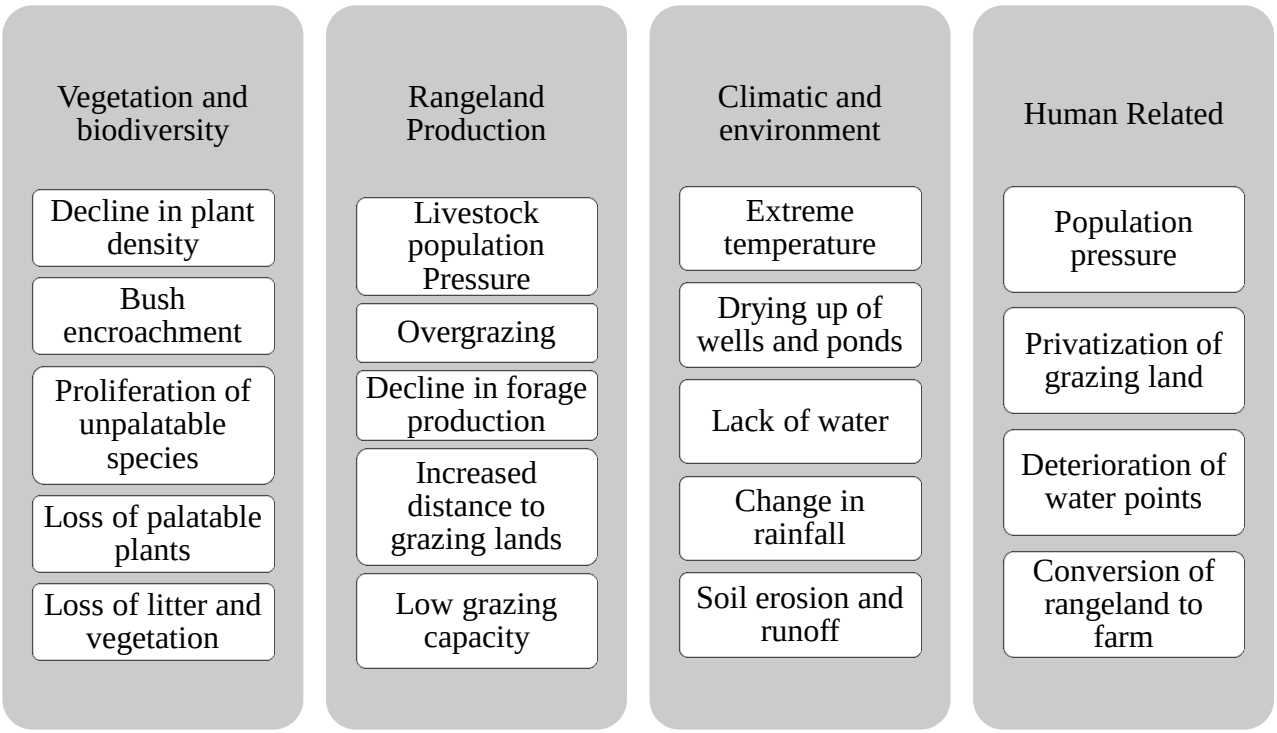
The study revealed that from 1992, nearly for a decade the condition of rangeland was improved (33.43%). This indicates good rangeland conditions during Gadaa of Boruu Madhaa. Later on from 2000-2008, rangelands were slightly degraded (47.11%). Further, for more than a decade, the conditions of rangelands showed high degradation particularly during Gadaa of Guyyoo Gobbaa (60.18%) and Kuraa Jaarsoo (79.94%). This is consistent with the view of the respondents in interview and discussions that indicated that the conditions of rangeland were dwindling from time to time. During early 1990s, the conditions of rangeland were relatively good. The study indicated that the improvement in conditions of rangeland decreases from Gadaa of Boruu Madhaa to Kuraa Jaarsoo (**Figure 5.3**). The majority of respondents indicated that post-1992 Boorana rangelands were highly degraded under each consecutive Gadaa period. Only 15.5% of respondents indicated that rangelands were highly degraded during Boruu Madhaa. However, during Gadaa of Liiban Jaldeessaa, Guyyoo Gobbaa and Kuraa Jaarsoo 16.72%, 60.18%, 79.94% of respondents indicated that rangelands were highly degraded respectively. Similar study (Ho & Azadi, 2010) in northern china's rangeland also indicated that the rangelands were highly degraded. This indicates that rangeland degradation increases from time to time.

In the past 30-year period, rangeland degradation showed an increasing trends in Boorana rangeland systems. Respondents indicated that trends of rangeland degradation in Boorana rangelands were increased after 1992, the year Gadaa of Boruu Madhaa assumed Gadaa power. This is also consistent with view of *jaarsa-argaa-dhageettii* (elders knowledgeable in what was seen and told), who indicated that the trends of degradation had been increasing from time to time since Gadaa of Jiloo Aagaa (1976-1984). However, before Gadaa of Jiloo Aagaa Boorana had also experienced rangeland degradation. The rate and trends of rangeland degradation have been worsening than any time. This is to mean that Boorana rangelands were highly degraded at an increasing trend. This dynamic change in potential resource base of pastoralists and resultant degradation is related to socio-political dynamics, climate change and underlying factors. An elder indicated that since 1970s pastoralists were in overwhelming threats of rangeland degradation, droughts and conflict. "These days the condition of rangeland has been severely changing. You are asking the right things" he said. In the past, rangeland conditions were relatively good. However, respondents indicated that currently the rate and trends of rangeland degradation had increased than ever.

5.4.2 Indicators and Severity of Rangeland Degradation

The study found that Boorana rangelands were highly degraded with increasing trends of degradation. To understand the rate and trends of degradation we need to understand the indicators of rangeland degradation. The study assessed the indicators of rangeland degradation based on the pastoralist expert knowledge. Understanding how pastoralists know whether rangeland is degraded or not is very important to target the appropriate intervention for either the management or rehabilitation of degraded rangelands. Pastoralists have their own mechanisms of assessing the health of rangeland resources. Relying only on ecological methods is not enough for assessment of the conditions of rangelands. Oba and Kotile (2001) consistently argued that traditional rangeland scouts is equally important as ecologist methods in evaluating the conditions of rangeland. As underscored by (Angassa & Oba, 2008b; Ho & Azadi, 2010) the study also believes that pastoralist expert knowledge makes crucial methodological contribution in identification of indicators of rangeland degradation. The study found that generally indicators of rangeland degradation were categorized as vegetation and biodiversity indicators, rangeland production indicators, human related indicators and environmental and climatic condition indicators (**Figure 5.4**).

Figure 5.4: Indicators of Rangeland Degradation



Source: Own Construction

5.4.2.1 Vegetation and Biodiversity Related Indicators

In an interview an elder said “let alone grass, even trees are thinned in our area”. There were highly sparse trees and severe encroachment of thorny bushes in the area. It can be understood that loss of grass species and vegetation were severe in the area. Pastoralist perceived that loss of palatable plants, proliferation of unpalatable species, loss of vegetation, loss of litter, decline in plant density, and bush encroachment were the main indicators of rangeland degradation in Boorana rangelands. Previous studies (Teshome Abate & Angassa, 2016; Angassa & Oba, 2008b; Birhanu et al., 2017; Dalle et al., 2006a; Solomon et al., 2007; Tilahun et al., 2016) congruently indicated that vegetation indicators, particularly bush encroachment was the main indicator of rangeland degradation.

As portrayed in **Table 5.1** below, respondents perceive that from 1992, during Gadaa of Boruu Madhaa the main indicators of rangeland degradation were loss of palatable plants (60.84%) followed by decline in plant density (57.53%), and bush encroachment (54.22%). During Gadaa of Liiban Jaldeessaa loss of palatable plant (92.17%), bush encroachment (90.36%), and decline in plant density (87.65%) were the three main indicators of rangeland degradation related with vegetation and biodiversity. Similarly, during Gadaa of Guyyoo Gobbaa loss of palatable species (96.08%), bush encroachment (95.78%), and proliferation of unpalatable species (94.88%) were the main indicators of rangeland degradation. From 2016 (from Gadaa of Kuraa Jaarsoo) bush encroachment (91.87%) has become the main indicators of rangeland degradation followed by proliferation of unpalatable species (90.96%) and loss of palatable plants (90.66%). The study indicated that for more than two decades (from 1992-2016), loss of palatable plant species were the main indicators of rangeland degradation, whereas after 2016, bush encroachments were the main indicators of rangeland degradation. This study is therefore different from study of Elias et al. (2015) which observed decreased in bush land cover.

Table 5.1: Vegetation and Biodiversity Indicators of Rangeland Degradation

Indicators	Boruu Madhaa	Liiban Jaldeessaa	Guyyoo Gobbaa	Kuraa Jaarsoo
	Freq.(per)	Freq.(per)	Freq.(per)	Freq.(per)
Loss of palatable plant	202 (60.84)	306 (92.17)	319 (96.08)	301 (90.66)
Proliferation of unpalatable	179 (53.92)	290 (87.35)	315 (94.88)	302 (90.96)

species				
Loss of vegetation	165 (49.70)	288 (86.75)	295 (88.86)	290 (87.35)
Loss of litter	172 (51.81)	285 (85.84)	297 (89.46)	290 (87.35)
Decline in plant density	191 (57.53)	291 (87.65)	289 (87.05)	270 (81.33)
Bush encroachment	180 (54.22)	300 (90.36)	318 (95.78)	305 (91.87)

Source: Own Survey Data, 2019

As was depicted in **Table 5.1**, during the period of 2000-2016, there was high loss of palatable plants. There were also high proliferations of unpalatable species during Gadaa of Guyyoo Gobbaa and Kuraa Jaarsoo. Participants perceived that both loss of vegetation and litter were higher during Gadaa of Guyyoo Gobbaa and Kuraa Jaarsoo. In an interview, an elder consistently stated that, "even the trees had dropped the leaf with exception of *Canaa* (haplocoelum foliolosum)". There was high decline in plant density during Gadaa of Liiban Jaldeessaa. During Gadaa of Boruu Madhaa, there were lowest percentages for all indicators compared to other Gadaa periods. This indicates degradation proceeds overtime. It is also imaginable that loss of palatable species and resultants proliferation of unpalatable species has created conducive environments for widespread bush encroachments. In the discussions participants also attested that currently the area grows more exotic species, forbs and shrubs. The respondents indicated that there are many *fulleensa* (Acacia drepanolobium), *saphansa* (acacia milliphera), *Dhaddacha* (acacia tortils), *gurbii* (Abutilon hirtum) and *adaa* (aspilia mossambicensis) species in the area. "These bushes and shrubs suppress the growth of grasses" they said. However, these are not the only encroachers there are too many encroaching plant species in the area. The percentages of responses for vegetation indicators were higher for Gadaa of Guyyoo Gobbaa than current Gadaa (Kuraa Jaarsoo). These differences in the responses were attributed to and affected by severe drought that was observed during Gadaa of Guyyoo Gobbaa.

Figure 5.5: Encroachment Conditions of Different Bushes

a) Growth of sansevieria robusta and other bushes

b) Densely grown bushes

C) Growth forms of new acacia tortils

d) Grass suppressed under acacia tortils

Source: Photo by the Researcher, 2019

The study area is covered with highly invasive species (**Figure 5.5**). Figure 5.5 (a) above depicts the growth of *cakkee* (*sansevieria robusta*) under other bushes. *Sansevieria robusta* grow very close to each other. It has large stiff leaves, which has needle like sharp hard point. Since it grows very close to each other the passages of both livestock and human is very limited. In addition, *sansevieria robusta* suppresses the growth of grasses. Figure 5.5 (b) also depicts the densely grown bushes particularity *acacia milliphera* and other bush species. In such densely and thickly gown bushes let alone the growth of grass, livestock and human cannot pass through it. Figure 5.5 (c) portrays the growth of new acacia tortils in a very thick and dense manner. Whereas, in figure 5.5 (d) it can be observed that the growth of bushes suppressed the grasses. In the study, area there was widespread encroachment of different species of bushes. Zewdie et al. (2017) consistently indicated that bush encroachment contributes to the degradation of pastoral environment. The proliferation of these bushes has become very severe than ever. In some cases, even clearing by hand may not be possible.

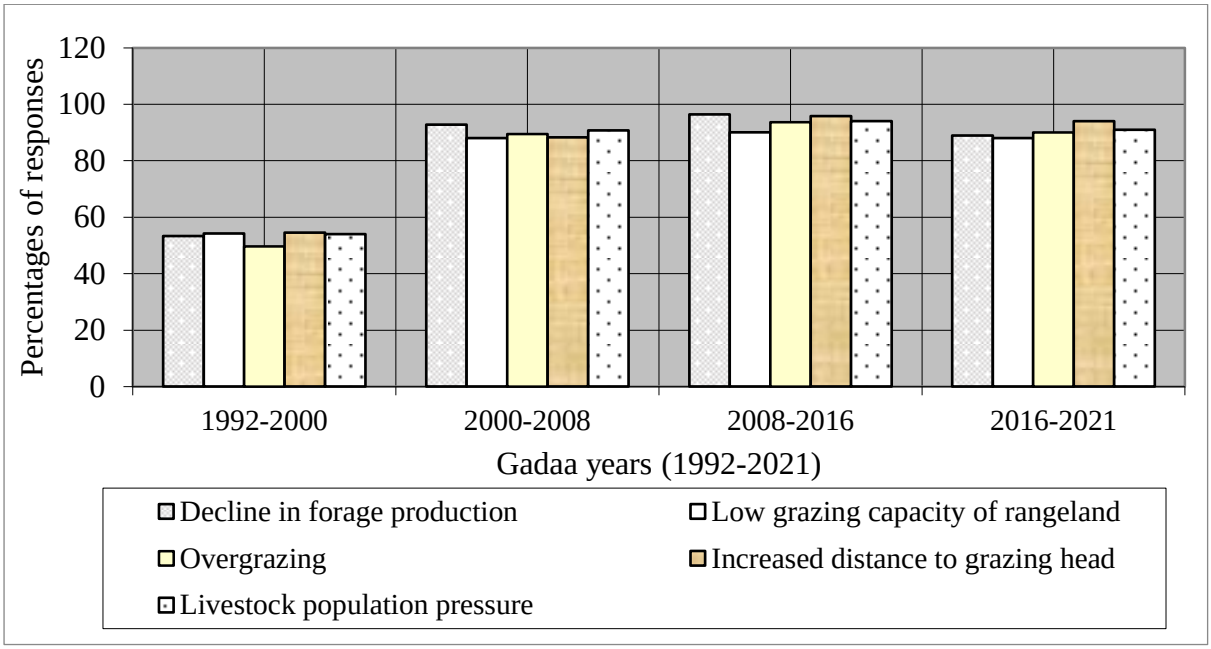
The study observed increase in the severity of vegetation and biodiversity indicators of rangeland degradation during the past 30 year. Respondents indicated that from 1992-2000, the severity of loss of palatable species was decreased (45.48%). Other than decrease in severity of palatable species respondents indicated that the severity of proliferation of unpalatable species, loss of vegetation, loss of litter, decline in plant density and bush encroachment were increased. The largest increase was observed for bush encroachment and loss of litter both accounting for 52.71%. During 2000-2008, respondents perceived that the level of severity for all indicators was increased. There was largest increase in bush encroachment (86.45%), loss of litter (85.84%), and proliferation of unpalatable species (85.54%). In addition, from 2008, the severities of all indicators were increased. Largest proportion of respondents indicated that severity of loss of palatable species (91.27%) and proliferation of unpalatable species (90.06%) where increased during Gadaa of Guyyoo Gobbaa. In Gadaa of Kuraa Jaarsoo, there was increased severity of loss of vegetation (91.54%) and decline in plant density (91.57%).

5.4.2.2 Rangeland Production Related Indicators

The losses and decline in rangeland production capacity was the main indicator of rangeland degradation. This finding is in line with Tilahun et al. (2016) which found decline in production capacity of rangelands. The study found that decline in forage production, low grazing capacity of rangeland, overgrazing, increased distance to grazing lands and livestock population pressure were the main indicators of rangeland production, which in turn affects the overall productivity of rangeland. Other studies also consistently showed that overgrazing (Birhanu et al., 2017), forage scarcity (Angassa & Beyene, 2003; Angassa & Oba, 2008b) and livestock population pressure (Angassa & Beyene, 2003; Homann et al., 2008) as the main features of rangeland degradation. As depicted on **Figure 5.6** from 1992, for nearly a decade, low grazing capacity of rangeland (54.22%) was the main indicator of rangeland degradation followed by increased distance to the grazing lands (54.5%) and livestock population pressure (53.92%). From 2000-2008, there were high decline in forage production (92.77%), high livestock population pressure (90.66%) and overgrazing (89.46%). Whereas during Gadaa of Guyyoo Gobbaa decline in forage production (96.39%) and livestock population pressure (93.98%) were increased with increased distance to grazing land (95.78%) from previous Gadaa period. Further, during Gadaa of Kuraa Jaarsoo overgrazing (90.06%), increased distance to grazing land (93.98%) and livestock population pressure

(90.96%) were the main indicators of rangeland degradation related to rangeland production. The result also indicated that during rainy and dry seasons mean of walking distance from home to grazing land was 53.6 and 118.08 minutes respectively.

Figure 5.6: Rangeland Production Related indicators of Rangeland Degradation



Source: Own Survey Data, 2019

The study indicated that declining of forage base for livestock was highest during Gadaa of Guyyoo Gobbaa followed by Liiban Jaldeessaa. However, participants percieved that other indicators were more visible in Gadaa of Guyyoo Gobbaa and Kuraa Jaarsoo. During Gadaa of Boruu Madhaa, smallest percentages of respondents observed those indicators as compared to other Gadaa periods. During last 30 years, the severity of the indicators of rangeland degradation related to rangeland production was increased. Respondents indicated that from 1992, for a decade, the largest increase was observed for increased distance to grazing land (55.12%) and livestock population pressure (53.61%). From 2000-2008, respondents perceived that the level of severity for all indicators were increased. There was largest increase in overgrazing and livestock population pressure both accounting for 87.35%. In addition, there was also increased distance to grazing land (87.05%). Likewise, during the Gadaa of Guyyoo Gobbaa the severity of overgrazing (92.77%) and livestock population pressure (92.47%) was increased. In Gadaa of Kuraa Jaarsoo there were increased severity of low grazing capacity and livestock population pressure both accounting for 92.77%.

5.4.2.3 Human Related Indicators of Rangeland Degradation

Human related indicators are related to human exploitation of resources that leads to degradation of rangeland resources. The study found that increase in privatization of grazing land, human population pressure, deterioration of water points and conversion of pastureland to farmland were the main indicators of rangeland degradation related to human exploitation. Previous studies consistently found that human activities such as deforestations, charcoal productions, unwise use of resources, population growth (Birhanu et al., 2017), increased cultivation (Angassa & Beyene, 2003; Elias et al., 2015), and privatization (Angassa & Beyene, 2003; Napier & Desta, 2011; Tache, 2011) contributed to rangeland degradation. As it was depicted in **Table 5.2** during Gadaa of Boruu Madhaa water points were deteriorated (60.24%). Respondents also indicated that there was high population pressure (53.92%). Respondents indicated that from 2000-2008, there was high human population pressure (88.25%) followed by conversion of pastureland to farmland (86.75%), and deterioration of water points (85.84%). During 2008-2016, the main human related indicators of rangeland degradation were conversion of pastureland to farmland (96.69%), human population pressure (94.58%), and privatization of grazing land (91.27%). From 2016 on (in the Gadaa of Kuraa Jaarsoo) 94.58% of respondents indicated that human population pressure was the main indicator of rangeland degradation. In addition, respondents indicated that the deterioration of water points (93.98%) and conversion of pastureland to farmland (91.57%) were the main indicators of rangeland degradation. The result also revealed that privatizations of grazing land and conversion of pastureland to farmland were highest during Gadaa of Guyyoo Gobbaa and population pressure and deterioration of water points become highest in Gadaa of Kuraa Jaarsoo.

Table 5.2: Human Related Indicators of Rangeland Degradation

Indicators	Boruu Madhaa	Liiban Jaldeessaa	Guyyoo Gobbaa	Kuraa Jaarsoo
	Freq. (per)	Freq. (per)	Freq. (per)	Freq. (per)
Privatization of grazing land	162 (48.80)	274 (82.53)	303 (91.27)	297 (89.46)
Human population pressure	179 (53.92)	293 (88.25)	314 (94.58)	314 (94.58)
Deterioration of water points	200 (60.24)	285 (85.84)	301 (90.66)	312 (93.98)
Conversion of pastureland to farmland	159 (47.89)	288 (86.75)	321 (96.69)	304 (91.57)

Source: Own Survey Data, 2019

The respondents indicated that during last 30 years, the severity of human related indicators of rangeland degradation was increased for all Gadaa periods. During Gadaa of Boruu Madhaa, the largest increase was observed for deterioration of water points and conversion of pastureland to farmland both accounting for 54.22%. Respondents also indicated that the severity of privatization of grazing land and human population pressure were also increased. Similarly, during the Gadaa of Liiban Jaldeessaa respondents perceived that the largest increase was observed in deterioration of water points (87.95%) and conversion of pastureland to farmland (87.35%). In between 20008-2016, the severity of privatization of grazing land (91.57%) and conversion of pastureland to farmland (91.87%) were increased. In the someway in the Gadaa of Kuraa Jaarsoo there was increased the severity of privatization of grazing land (91.87%) and conversion of pastureland to farmland (92.47%). The percentages of responses for human related indicators were higher for Gadaa of Guyyoo Gobbaa than current Gadaa (Kuraa Jaarsoo) for some indicators. These differences in the responses were attributed to and affected by severe drought that was observed during Gadaa of Guyyoo Gobbaa.

5.4.2.4 Environmental and Climatic Related Indicators

Boorana rangelands are under pressure from multifaceted climatic and environmental factors. The study found that extreme temperature, drying up of wells and ponds, lack of water for livestock, changes in average rainfall, increase of soil erosion and runoff and bare land were the main indicators of rangeland degradation related to climatic and environmental conditions (**Table 5.3**). In line with this findings studies confirmed that increased dryness (Birhanu et al., 2017), bare land (Elias et al., 2015), and aridity (Kassahun et al., 2008) were the main features of rangelands. Respondents also confirmed that lack of pastures, recurrent drought, increased bareness and lack of water were the main features of rangeland degradation. Participants perceived that during from 1992, for nearly a decade, lack of water for livestock (59.64%), drying up of wells and ponds (58.13%) and increased bareness of land (56.02%) were the main indicators of rangeland degradation under this category.

Further participants perceived that during Gadaa of Liiban Jaldeessaa (2000-2008) the main indicators of rangeland degradation were changes in the average rainfall (87.05%), increased bareness of land (86.14%) and increase of soil erosion and runoff (85.54%). Likewise

respondents indicated that between 2008 and 2016, bareness of the land (97.29%) was increased and in the someway increase of soil erosion and runoff (97.28%) and changes in average rainfall (96.08%) were the main indicators. From 2016, respondents indicated that lack of water for livestock and increased bareness of land were the main indicators of rangeland degradation, both accounting for 96.69%. It was further indicated that increase of soil erosion and runoff (96.08%) in rangeland was the main indicators of rangeland degradation. Respondents indicated that there was increase in occurrence of indicators from one Gadaa period to another. As compared to the other Gadaa periods, the percentages of climatic and environmental indicators were small during Gadaa of Boruu Madhaa. During Gadaa of Guyyoo Gobbaa and Kuraa Jaarsoo, there were high percentages of responses for all indicators. The percentages of responses for environmental and climatic related indicators were higher for Gadaa of Guyyoo Gobbaa than current Gadaa (Kuraa Jaarsoo) for some indicators. These differences in the responses were attributed to and affected by severe drought that was observed during Gadaa of Guyyoo Gobbaa.

Table 5.3: Environmental and Climatic Related Indicators

Indicators	Boruu Madhaa	Liiban Jaldeessaa	Guyyoo Gobbaa	Kuraa Jaarsoo
	Freq.(per)	Freq.(per)	Freq.(per)	Freq.(per)
Extreme temperature	167 (50.30)	279 (84.04)	320 (96.39)	317 (95.48)
Drying up of wells and ponds	193 (58.13)	280 (84.34)	316 (95.18)	298 (89.76)
Lack of water for livestock	198 (59.64)	281 (84.64)	316 (95.18)	321 (96.69)
Changes in average rainfall	178 (53.61)	289 (87.05)	322 (96.99)	304 (91.57)
Increase of soil erosion and runoff	181 (54.52)	284 (85.54)	322 (97.28)	319 (96.08)
Increased bareness of land	186 (56.02)	286 (86.14)	323 (97.29)	321 (96.69)

Source: Own Survey Data, 2019

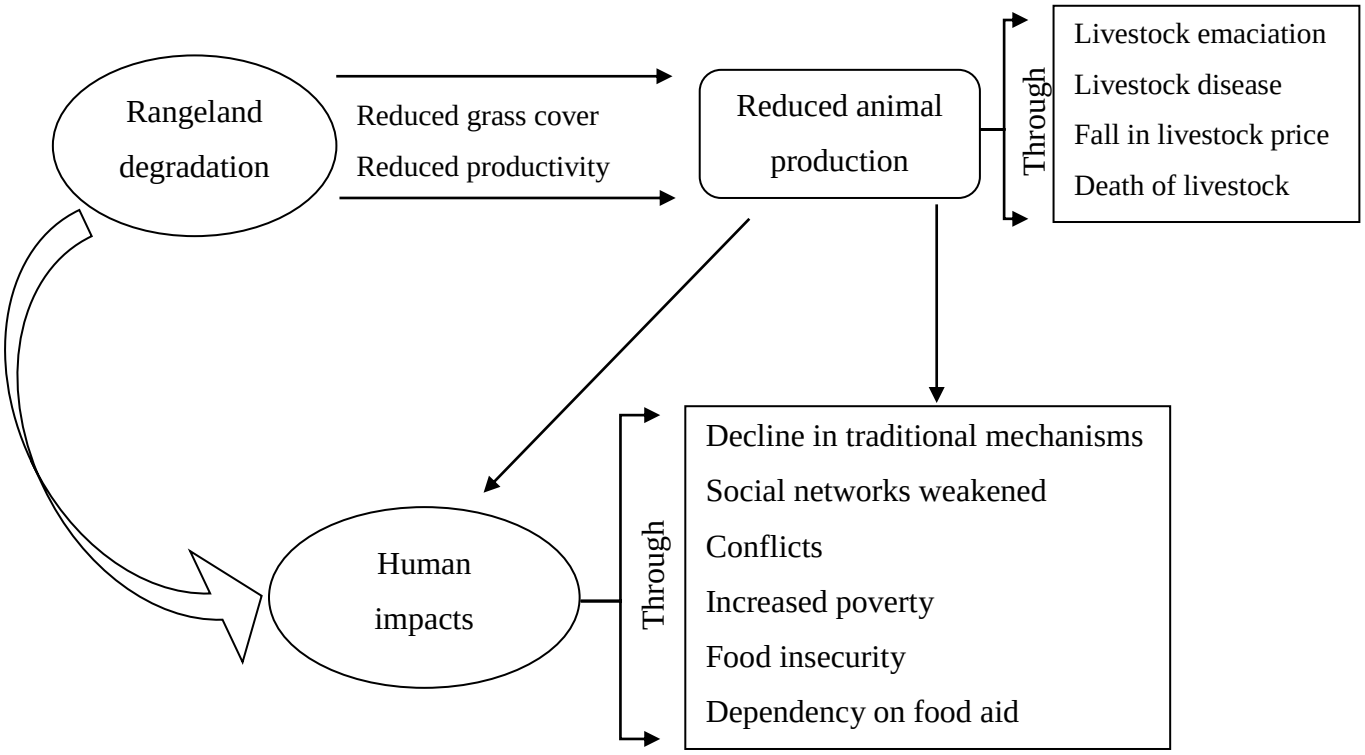
During the last 30 years, the respondents indicated that there was high increase for the severity of environmental and climatic indicators of rangeland degradation. There was largest increase for drying up of wells and ponds (55.12%) and changes in the average rainfall (55.72%) during 1992-2000. Respondents also indicated that the severity of other indicators was also increased. During Gadaa of Liiban Jaldeessaa respondents perceived that there was largest changes in the average rainfall (88.55%). In addition, largest proportion of respondents (88.25%) observed increase in soil erosion and runoff and increased bareness.

During Gadaa of Guyyoo Gobbaa there was largest increase in the severity of changes in the average rainfall (93.67%) followed by increase in the severity of extreme temperature and soil erosion and runoff both accounting for 92.17%. In the Gadaa of Kuraa Jaarsoo, there was increased severity for change in the average rainfall (94.58%) and soil erosion and runoff (93.05%).

5.4.3 Impacts of Rangeland Degradation

Pastoralist perceived that Boorana rangelands were severely degraded. Boorana rangelands have been highly degraded at increasing trends. Many authors (Angassa, 2007; Dalle et al., 2006b) consistently indicated that Boorana rangeland is in a transitional state. The impacts of rangeland degradation were also assessed based on the pastoralists' expert knowledge and their experience of resulting adverse effects of rangeland degradation post- 1992. The progressive degradation of rangeland resources has jeopardized pastoral production and livelihoods of pastoralists in Boorana rangeland system. The study found that rangeland degradation has an impact on three broad dimensions of pastoralists and semi-arid environments of Boorana. Deterioration in rangeland resources affects rangeland productivity, livestock productivity, and human wellbeing. **Figure 5.7** below portrays how rangeland degradation affects several dimensions of pastoralists and rangeland features.

Figure 5.7: Impacts of Rangeland Degradation

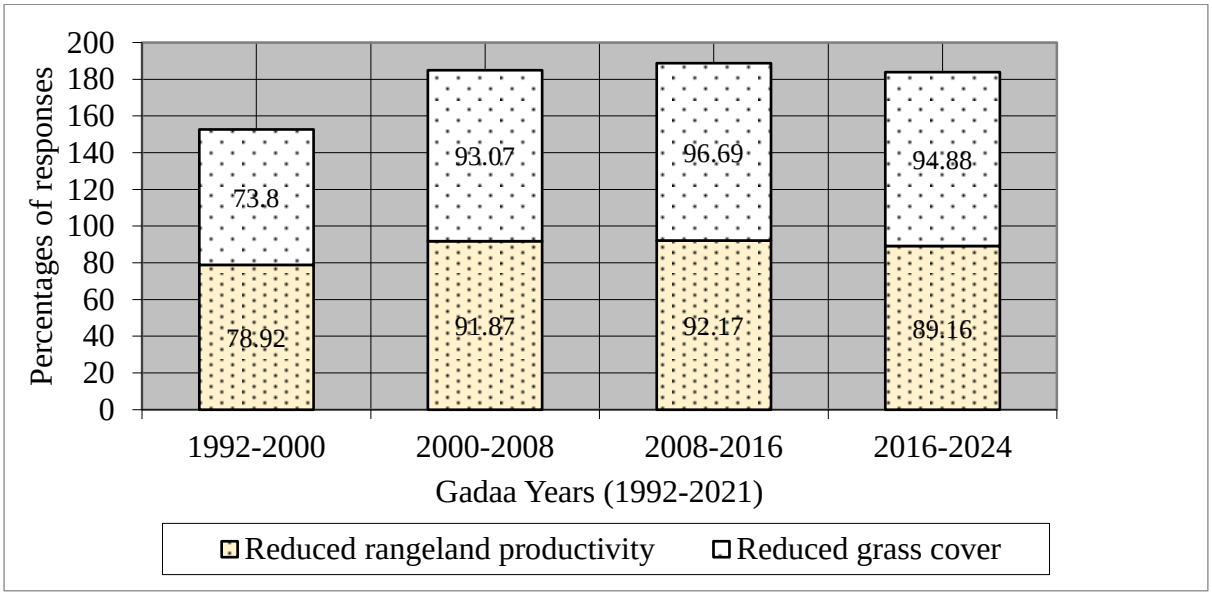


Source: Own Construction

5.4.3.1 Impacts on Rangeland Productivity

Participants perceived that progressive deterioration in the conditions of rangeland resources have adversely affected the productivity of rangelands. The major impacts of rangeland degradation related to rangeland productivity were reduction of rangeland productivity and grass cover (**Figure 5.8**). This is consistent with previous studies (Angassa & Beyene, 2003; Wu et al., 2015). From 1992, for nearly a decade, largest proportions of respondents perceived that rangeland degradation has resulted in the reduction of rangeland productivity. In addition, from 2000, from more than two decades, rangeland degradation has resulted in the reduction of grass cover. Comparing all Gadaa period it was indicated that largest decline in rangeland productivity and grass cover was observed during Gadaa of Guyyoo Gobbaa. This is probably due to severe drought that stuck Boorana during his term. Discussants in focus groups consistently agreed that rangeland degradation leads to reductions in the productivity of rangeland and grass cover. In an interview, an elder stated that there was no adequate pasture for their livestock. “There is no grass, grass has now lost form the area” he said. In addition, participants believed that the grass is not nutritious for livestock. Thus, it can be understood that rangeland degradation resulted in reduction and loss of grass cover, which in turn reduces the *finna* (nutritiousness), and productivity of the pasture. Boorana pastoralists usually say *laftii finna hin qabdu* (the land/pasture is not nutritious). Generally, pastoralists believed that despite abundance and plenty of pasture and water *finna* (nutritiousness) of the resources is very important. Sometimes despite the abundance of pastures, there are no *finna,* whereas in some case very few resources have *finna* for livestock.

Figure 5.8: Impacts of Rangeland Degradation on Rangeland Production



Source: Own Survey Data, 2019

Respondents confirmed that there is no grass. In an interview, a young woman indicated that there was no pasture at all. “Yes, there is no grass. Livestock have nothing to grass from the land” she said. Angassa and Beyene (2003) consistently reported reduction in rangeland production and grasses. There were limited growths of grasses during rainy season. Thus after the rain livestock grass the available pastures and different leafy vegetation. After running out of the available pastures pastoralists usually collects grasses from nearby rangelands and also uses the advantages of crop residue during the harvest and keeps livestock around farm. Participants believed that recurrent droughts, erratic rainfall and degradation of rangelands are inextricable. Lack of rain for over a long period of time results in the protracted drought which together leads to the progressive degradation of rangeland and reduction of rangeland productivity. Besides erratic rainfall and prolonged drought several factors contributes to reduction in grass cover. In the discussion, one of the participants stated that, “pasture land was highly covered with encroaching species”. Other participant also stated that, “the other issues were erratic rainfall and rapid expansion of bush cover”. In all study sites the respondents consistently attested that bushes prohibit the growth of grasses, suppress the available grasses and “thus it is not possible for new grass to grow under dense bush cover” they said.

5.4.3.2 Impacts on Livestock Production

Respondents perceived that rangeland degradation has adversely affected the productivity of livestock. Largest proportions of participants indicated that progressive degradation in rangeland resources has reduced animal production, resulted in the outbreak of livestock disease, death of livestock, livestock emaciation and rapid fall in the livestock price. Previous studies consistently indicated that rangeland degradation reduces livestock production through reduction of animal production (Kassahun et al., 2008), outbreak of livestock disease (Kassahun et al., 2008; Tolera & Senbeta, 2019), death of livestock (Angassa & Beyene, 2003), emaciation (Birhanu et al., 2017), and rapid fall in livestock price (Le Sage & Majid, 2002). As it is depicted on **Table 5.4** during the early and late 1990s, rangeland degradation has resulted in rapid fall in livestock price (84.94%), death of livestock (83.43%), and reduction of animal production (82.83%). From 2000-2008, deterioration of rangeland resources was associated with rapid fall in livestock price (94.88%), reduction of animal production (91.87%), and the outbreak of livestock disease (91.27%).

Respondents also indicated that reduction in animal production (95.48%), livestock emaciations (94.58%), and death of livestock (94.26%) were the main impacts of rangeland degradation during Gadaa of Guyyoo Gobbaa. In addition, before *gadaamojjii* (the seventh and last grade in Gadaa system) of Gadaa of Kuraa Jaarsoo livestock were emaciated (90.36%), animal production was reduced (88.86%), and rapid fall in the livestock price (86.14%) were noticed. These all happened due to late coming of *gannaa* (main rainy season) rain which affected the production of rangeland in *adoolessaa* (small dry season) and late coming of *haggayya* (short rainy season) rain, though sufficient amount of rain occurred all over Boorana land later. Participants perceived that largest reduction in animal production was observed during Gadaa of Guyyoo Gobbaa and outbreak of livestock diseases were noticed during Gadaa of Liiban Jaldeessaa. In addition largest proportion of respondents also indicated that emaciation and death of livestock were highest during Gadaa of Guyyoo Gobbaa. Further, participants indicated price of livestock was not good during Gadaa of Liiban Jaldeessaa. The percentages of responses for impacts on livestock production were higher for Gadaa of Guyyoo Gobbaa than current Gadaa (Kuraa Jaarsoo). These differences in the responses were attributed to and affected by severe drought that affected the productivity of livestock during Gadaa of Guyyoo Gobbaa.

Table 5.4: Impacts on Livestock Production

Impacts on livestock production	Boruu Madhaa	Liiban Jaldeessaa	Guyyoo Gobbaa	Kuraa Jaarsoo
	Freq. (per)	Freq. (per)	Freq. (per)	Freq. (per)
Reduced animal production	275 (82.83)	305 (91.87)	317 (95.48)	295 (88.86)
Outbreak of livestock disease	271 (81.63)	303 (91.27)	299 (90.06)	282 (84.94)
Death of livestock	277 (83.43)	290 (87.35)	312 (94.26)	283 (85.24)
Livestock emaciation	270 (81.33)	296 (89.16)	314 (94.58)	300 (90.36)
Rapid fall in livestock price	282 (84.94)	315 (94.88)	304 (91.57)	286 (86.14)

Source: Own Survey Data, 2019

Participants reported that due to their dependency on livestock their life is difficult, vulnerable and worrisome. During rainy time the conditions of livestock is good because they look fat, they breed and make pastoralists happier. However, in an interview an elder said that, "we wilt like dying leaf of cabbage if drought comes". It can be understood that pastoral livestock production is highly vulnerable to shocks. Several conditions contributed to vulnerability of livestock sector. Respondents indicated that rangeland degradation was severe and pasture was not enough to feed livestock. Grazing lands were not sufficient because many areas were taken by settlement and cultivation. In addition, the pastoralists perceived that crop residues were not appropriately collected and it was wasted to the rain and sun. Participants reported that beside pasture, the main problem of pastoralist is insufficient amount of water. Thus, prolonged drought together with very low availability of grasses and erratic rainfall affected livestock production. In line with this Angassa and Beyene (2003) indicated that rangeland degradation reduced mitigation to risks of livestock loss during drought. Participants felt that prime grazing lands were already degraded and threatened the production of livestock. Many of respondents confirmed that though emaciated the condition of livestock was generally good except for camel, goats and sheep. Some of respondents' perceptions of impacts of rangeland degradation on livestock production were put in verbatim form as follows:

> "Since there is no enough pasture livestock are emaciated and dying. The condition of goat and sheep is very bad".
>
> An elder from Hiddii Aallee, Eelwayyee district

> "Goats and camels are in very bad conditions. Camels and goats are dying".

An elder from Dharriito, Yaabello district

> "…due to lack of plenty of grasses and protracted drought, conditions of livestock is very bad. You keep them well they die; you water them well they die and also you cut and carry fodder for them they die"

An elder from Aadee Galchat, Eelwayyee district

Respondents reported that lack of resources, particularly pastures and water had significantly affected the productivity of livestock. It can be understood that generally livestock were emaciated however particularly the conditions of goats, sheep and camels were not good. Participants indicated that *bona haggayya* (severe dry season) and late coming of *gannaa* has resulted in severe feed shortages and emaciation of livestock. All respondents consistently stressed that the conditions of cattle were relatively good; however, goats, sheep and camels were severely emaciated and dying. "Sheep and goats were starving and dying in kraal and on the way to home" many of the respondents said. In addition, the respondents reported that camels were sitting everywhere. Most respondents consistently stated that, "currently livestock are never full up". The responses of participants were different from orthodox view that camels, goats and sheep are more resilient (Z. Birhanu et al., 2017; Megersa, Markemann, Angassa, & Valle Zárate, 2014; Tolera & Senbeta, 2019) because of condition of disease for camels, goats, and sheep during data collection. Respondents have an understanding that in the past sheep, goats and camels were more resilient to drought and harsh environmental conditions. However, the respondents indicated that the reason for this beside feed shortages and droughts was that goats, sheep and camels have diseases. Though feed shortages, droughts and associated diseases might have reduced the resilience of these livestock species, the study is still optimistic that camels, goats and sheep are more resilient than cattle. The paragraph blow narrates the view of an elder from *Aade Galchat* on the impacts of rangeland degradation and protracted drought on livestock production:

> According to Boorana age-set, I am Dambala Diidaa[23]. In the past death of livestock during drought was very rare. There were plenty of grasses, which were sufficient to feed our livestock. We freely utilize mobility and grass our livestock in the garaacha kootichaa[24] and

[23] *Dambala Diidaa* is one of the age-set (*Harriyya*) in Boorana. In Boorana age of individuals is counted from the Gadaa period in which he was born. *Dambala Diidaa* was born in Gadaa of Guyyoo Boruu Galma (1944-1952). At time of interview *Dambala Diidaa* is an elder at of age of late 70s.

[24] *Garaacha Kootichaa* means the midst of land of black cotton soil where adequate pasture is available.

> water them by sadeen (each third days) at[25] Eela Araarii, Eela Galchat, Carii, Burqaa and Galaana konsoo (segen river) and livestock were not dead by drought, because the pastures were abundant and plenty. In this drought in Aade Galchat, livestock are emaciated and people are holding a tail of cattle to support them stand. The conditions of goats, sheep and camels are bad. Goats consume few remaining leafy trees like Canaa (haplocoelum foliolosum). Sheep cannot consume trees like goats and since there are no grasses sheep are starving. Camels have nothing to consume and are failing into big gullies while trying to consume from the trees on the edge of the gullies. Therefore, due to lack of plenty of grasses and protracted drought the conditions of livestock are very bad. You keep them well they die; you water them well they die and also you cut and carry fodder for them they die.

The narration of the elder above is in line with perceptions of discussants in discussion at *Harweeyyuu* where participants indicated that cattle were emaciated, goats and sheep were dying due to drought, some of which have unborn with it. Discussants had reached to the consensus that weak livestock has been watered at home. Respondents reported that though goats and camels can supposedly resist the drought than cattle unexpectedly current drought has made the conditions difficult for them. They were severely emaciated and dying. Participants reported that in some areas livestock were emaciated and needs human support even to stands. It was indicated that the possible reason for this was insufficient amount of rainfall. Failure of *hagayyaa* rain and continuation of drought to *bona hagayyaa* and late coming of *gannaa* had extended the duration of drought. The respondents also reported that in addition to drought and lack of feeds, contagious bovine has exacerbated the conditions for goats and sheep.

5.4.3.3 Human Impacts of Rangeland Degradation

Rangeland degradation affects not only rangeland and livestock production but also human aspects. Pastoralist perceived that rangeland degradation is associated with weakening of social network, declining of traditional coping mechanism, escalation of conflicts, food insecurity, increased poverty and dependency on food aid (**Table 5.5**). In line with this finding rangeland researches found weakening of social network (Z. Birhanu et al., 2017), declining of traditional coping mechanism (Angassa & Beyene, 2003; Kassahun et al., 2008), escalation of conflicts (Coppock et al., 2017), food insecurity, increased poverty, and dependency on food aid (Kassahun et al., 2008) as impacts of rangeland degradation.

[25] *Eela Araarii, Eela Galchat, Carii, Burqaa and Galaana konsoo* (Segen River) are the main sources of water for livestock for Boorana in *gaara-garjaloo* (below mountain, including Eelwayyee, Carii and its environs).

Respondents indicated that during the early and late 1990s, rangeland degradation has resulted in the weakening of traditional coping mechanism (85.84%), and food insecurity (81.63%). Progressive degradation of rangeland resources and underlying factors was associated with decline in traditional coping mechanism (93.67%), weakened social network (92.47%), and escalation of conflicts (92.17%) from 2000-2008. During the Gadaa of Guyyoo Gobbaa largest proportions of respondents indicated weakened social network (94.88%), dependency on food aid (94.56%) and food insecurity (94.28%) were the main impacts of rangeland degradation. Participants confirmed that due to rangeland degradation and feed shortages there was increased poverty (93.98%) from the year 2016. In addition, respondents also perceived that dependency on food aid (92.17%) and food insecurity (91.27%) were other human related impacts of rangeland degradation. Overall the respondents indicated that largest decline in traditional coping mechanism was observed during Gadaa of Liiban Jaldeessaa. In addition, largest proportions of respondent perceived weakening of social network, escalation of conflicts, food insecurity, and dependency on food aid was largest during Gadaa of Guyyoo Gobbaa. The level of poverty was unacceptably increased during Gadaa of Kuraa Jaarsoo. The percentages of responses for human impacts of rangeland degradation were higher for Gadaa of Guyyoo Gobbaa than current Gadaa (Kuraa Jaarsoo). These differences in the responses were attributed to and affected by severe drought that affected the productivity of livestock during Gadaa of Guyyoo Gobbaa.

Table 5.5: Human Impacts of Rangeland Degradation

Impacts	Boruu Madhaa	Liiban Jaldeessaa	Guyyoo Gobbaa	Kuraa Jaarsoo
	Freq. (per)	Freq. (per)	Freq. (per)	Freq. (per)
Social network weakened	268 (80.72)	307 (92.47)	315 (94.88)	297 (89.73)
Decline in traditional coping mechanism	285 (85.84)	311 (93.67)	308 (92.77)	286 (86.14)
Conflicts	262 (78.92)	306 (92.17)	309 (93.35)	293 (88.25)
Food insecurity	271 (81.63)	301 (90.94)	313 (94.28)	303 (91.27)
Increased poverty	270 (81.33)	304 (91.57)	308 (92.77)	312 (93.98)
Dependency on food aid	268 (80.72)	302 (91.24)	313 (94.56)	306 (92.17)

Source: Own Survey Data, 2019

Participants believed that shortage of rainfall, which has lengthened the night of drought, have reduced the productivity of livestock and crops. As a result, informants from *Hiddii Aallee* stressed that people were starving. In the discussion, discussants at *Hiddii Aallee* consistently stated that, "peoples are starving". "Before coming of the drought we have some foods to eat" discussants clearly said. One of the discussants expressed his sincere confirmation to us by stating, "you might have observed the situation in the villages". Actually, *Hiddii Aallee* communities were known for their poverty and largest proportions of community were supported by productive safety net program. Therefore, if it did not rain soon "we are in a big fear" they said. Likewise, respondents attested that even for those peoples who engaged in livestock trade, the price for livestock was not good. "It is declining" they said. These conditions have led to high vulnerability of pastoralists to the impacts of progressive rangeland degradation and recurrent droughts. When asked about their coping mechanisms and resiliency discussants from *Hiddii Aallee* community consistently stated "we have no other hope other than *Waaqaa* (God), because no one has ever cut hope from God".

5.4.4 Rangeland Degradations and Impacts of Climatic Changes and Variability

In arid and semi-arid areas of pastoralists, rangeland degradation is highly associated with climate change and underlying factors. This is true in for East African pastoralist (Kameri-Mbote, 2013; Tolera & Senbeta, 2019). In Boorana pastoralist areas, environmental and climatic conditions were the main driving factors for rangeland degradation. Participants believed that climatic conditions like prolonged drought, increased dryness and climate related diseases were highly associated with rangeland degradation and productivity of the pastoralists (**Table 5.6**). Sulieman and Siddig (2014) also attested that climate change and rangeland degradation have combined effects on pastoralist. Largest proportions of respondents perceived that during last 30 years, prolonged drought was the main climatic factor that has been affecting Boorana pastoralist production, during Gadaa of Boruu Madhaa (81.57%), Liiban Jaldeessaa (87.61%), Guyyoo Gobbaa (98.49%) and Kuraa Jaarsoo (95.78%). There was increase in dryness during Gadaa of Guyyoo Gobbaa (97.29%) and Kuraa Jaarsoo (95.78%) followed by Gadaa of Liiban Jaldeessaa (85.54%) and Boruu Madhaa (79.82%) post-1992. Further largest number of respondents also perceived that during Gadaa of Guyyoo Gobbaa (92.47 %), Kuraa Jaarsoo (89.16%), Liiban Jaldeessaa (86.14%%) and Boruu Madhaa (79.82%) diseases related to drought and climatic conditions was observed. Overall water scarcity (Z. Birhanu et al., 2017; Solomon et al., 2007) and

recurrent drought (Solomon et al., 2007; Tolera & Senbeta, 2019) were the main bottleneck for Boorana pastoralists.

Table 5.6: Climatic Conditions Associated with Rangeland Degradation

Climatic conditions	Boruu Madhaa	Liiban Jaldeessaa	Guyyoo Gobbaa	Kuraa Jaarsoo
	Freq.(per)	Freq.(per)	Freq.(per)	Freq.(per)
Prolonged Drought	270 (81.57)	290 (87.61)	326 (98.49)	318 (95.78)
Climate-related disease	265 (79.82)	286 (86.14)	307 (92.47)	296 (89.16)
Increased dryness	265 (79.82)	284 (85.54)	323 (97.29)	318 (95.78)

Source: Own Survey Data, 2019

5.4.4.1 Water Scarcity

Water is the basic and fundamental human needs. Pastoralists perceived that water is life and the availability of pasture without water is nothing. This is in line with (Solomon et al., 2007). Lack of water and erratic rainfall was the main features of Boorana rangelands. Participants further confirmed that water sources like *eela* (wells) were mainly found in the rugged topography at longer distance from homes where weak cows and humans could not make it to the top due to its distances and topography. In an interview an elder stressed the problem of water by stating that "today we are obtaining water for our domestic consumptions by *limaalima* (each two days) like livestock". In an interview, a young woman also confirmed that during drought the priority for water was given to livestock than human. For instance, on the watering days of livestock people can be prohibited from fetching water from nearby *Eela* and transferred to the next available sources. T Abate et al. (2010) also consistently indicated that water shortage was the main features of pastoralist in Bale zones of Oromia region. During drought pastoralist sometimes get water from large plastic container brought by truck which itself is not sufficient. In addition respondents indicated that women went for *dhaanee* (fetching water on animals back, particularly by donkey and camel), in late night and come back exhausted. Previous study consistently indicated that water scarcity made Boorana more susceptible to the effects of recurrent drought (Z. Birhanu et al., 2015).

Respondents indicated that after *oolaa* (severe drought) of Gadaa Boruu Guyyoo (1984-1992), sufficient *gannaa* and *hagayyaa* rain was obtained in Gadaa of Boruu Madhaa. "Even

in Gadaa of Boruu Madhaa we were in fear of failure of rain" an elder said. An elder indicated that as a result, a group of elders from Boorana land including Abbaa Gadaa Boruu Madhaa and other stakeholder discussed on the issue and reached to the consensus that the rain would not come and thus pastoralist should destock and sell some of their livestock. Unfortunately, the short *hagayyaa* rain that was continued to *gannaa* had changed the decision to sell livestock during Gadaa of Boruu Madhaa. "The rain was sufficient to grow both foods and fodders" an elder said. However, since then the rainfall was erratic, insufficient and inadequate for both human and livestock. Debela, Mohammed, Bridle, Corkrey and McNeil (2015) consistently stated that decrease in rainfall was the main features of Boorana rangelands. Respondents also confirmed that even this year the *gannaa* rain was too late. In an interview, an elder said that, "the *gannaa* was expected to rain before a month. However, it was not. Now the next month is *Caamsaa*". *Caamsaa* is the month of May and is expected to be the last month of long rainy season, *gannaa*.

Participants also confirmed that beside nature of rainfall and insufficient amount of water in the area there was unequal access to the developments of water resources in the area. Development interventions were inappropriately designed (Homann et al., 2008) and government policies were not pastoral sensitive (Gebeye, 2016). In group discussions participants consistently confirmed that water is the biggest problems for pastoralist and the government is not equally serving them. The rural, urban and pre-urban residents have not had equal access to clean water. Respondents confirmed that for residents of the towns clean water has been supplied form rural areas "without benefiting the rural residents" they said. Many of previous water projects were either failed or took too long time, sometimes more than a decade. Participants confirmed that they also need water projects that can sustain their water needs. "We don't want to rely only on erratic rainfall, we also want to irrigate if there is a potential for irrigation" they said. Except these needs for clean water largest proportions of the community in Boorana rangeland depends on unprotected sources of water for both domestic consumptions and livestock.

In Boorana rangeland system the main sources of water for both livestock and human were *haroo didiqqoo* (small ponds), *Eela adaadi* (shallow wells), *tulaa* (deep wells), *haroo gugurdoo* (large lakes), *dambalaa* (natural pools) and some water cistern constructed by developed projects. As can be seen from **Table 5.7** small ponds (84.94%) and natural pools (31.63%) were the main source of water during rainy season, whereas during dry season

shallow wells (91.27%) and large lakes (23.19%) were the main source of water for both livestock and human. Where it is available, *tulaa* is also the main dry season water sources. Single trip mean walking distances from home to watering points in minutes were identified for all sources. Considering four main sources of water, during rainy season mean walking distance to small ponds and natural pools were 58.67 and 12.94 minutes respectively. Whereas during dry season mean single trip walking distance from home to shallow wells and large lakes were 124.2 and 52.5 minutes respectively. The maximum mean walking distance for small ponds, shallow wells, large lakes and natural pools were 180, 380, 240 and 30 minutes respectively.

Table 5.7: Rain and Dry Season Sources of Water and Average Walking Distances

	Rain season	Dry season	Mean walking distance		
	Freq. (per)	Freq. (per)	Mean	Std. Dev.	Max
Small ponds	282 (84.94)	42 (12.65)	58.66667	39.78613	180
Shallow wells	6 (1.81)	303 (91.27)	124.2549	47.92339	380
Deep wells	0 (0)	12 (3.61)	43.33333	66.58328	120
Large lakes	63 (18.98)	77 (23.19)	52.58889	54.0501	240
Natural pools	105 (31.63)	(4 1.20)	12.94118	6.388178	30

Source: Own Survey Data, 2019

5.4.4.2 Recurrent Droughts and its Coping Mechanisms

Respondents indicated that protracted drought is the main impacts of climate change and the major factors that has been driving rangeland degradation. Recurrent drought has also aggravated rangeland degradation in *Rayitu* district of *Bale* (T Abate et al., 2010) and Somali region of Ethiopia (Gezahegn, 2006; Kassahun et al., 2008). In the pastoralist areas of Boorana drought is recurrent, prolonged and highly destructive. The frequency of drought has now become yearly. This is in line with Riché et al. (2009). In an interview, *jaarsa argaa-dhageettii* recalled the drought of Gadaa of Jiloo Aagaa (1976-1984) best known as *oolaa kittaanaa* (drought of tsetse fly). *Oolaa kittaanaa* was the drought that was associated with the occurrence of tsetse fly in Boorana rangelands. Tsetse fly sucks the blood of cattle, camel and other livestock, prevents them from grazing and causes the diseases like *luuxaa* (bovine trypanosomiasis). Besides livestock diseases, the main threat of this drought was emaciation of livestock, hunger and lack of *okaa* (cut fodder) for livestock.

Boorana believes in the cyclical nature of the events and that the disastrous events that occurred in a given Gadaa period may occur in another Gadaa time with similar features. These features can be similarity in names, *gosa* (clan) and *maq-baasa* (cyclical name giving tittle associated to each *gogeessaa*) of Abbaa Gadaas. Thus, particular Gadaa period may experience similar events that were occurred during previous Gadaa period due to *mara* (cycle of events). Tiki, Oba and Tvedt (2013) have also related Gadaa timeline and event repetitions with pastoral economy and human aspects. Currently the frequency of drought is unpredictable. Drought is common features of pastoralist in developing countries (Coppock et al., 2017). Somali (Kassahun et al., 2008) and Afar (Tilahun et al., 2016) regional states of Ethiopia are notable examples. In group discussion with group of men at *Diida Goofoo*, area of *Harweeyyuu* all participants attested that in Boorana rangelands drought was recurrent, prolonged and rainfall was always insufficient for growth of grasses and cultivation. This is in line with (Riché et al., 2009; Solomon et al., 2007; Tolera & Senbeta, 2019). The respondents recalled the occurrence of drought post- 1992 and its impacts on pastoral production. During Gadaa of Boruu Madhaa, many of pastoralists have lost their livestock to drought mostly known as *oolaa bubbee* (the windy drought). During Gadaa of Liiban Jaldeessaa drought was not much severe, somehow emaciation and death of livestock was minimum. Participants confirmed that *oolaa* of Gadaa of Guyyoo Gobbaa was the most recent experiences for all of them. In an interview, one of key informants expressed that in *bahima*[26] of Gadaa of Guyyoo Gobbaa, severe drought had struck Boorana. The drought was disastrous and left many pastoralists with scars. "It was like the end of Boorana all over Boorana lands including *malbee*, *dirree* and *goomolee* and other grazing zones[27]*"* he said.

One of the discussants stated that due to the severity of the drought of Gadaa Guyyoo Gobbaa and scarcity of pasture many of pastoralists from *Harweeyyuu* were camped at *Didibisaa* (the center of *Harweeyyuu* kebele) and sold their livestock at very low price each market day. Zewdie, Negalign and Argaw (2015) consistently confirmed that drought was severe during Gadaa of Guyyoo Gobbaa. One of the informants expressed the issues as "we sold our cattle 8 consecutive market days and I myself returned home with only 10 cattle. Now I am keeping only few cattle. Even there were peoples who sold all of their cattle and bought few camels.

[26] *Bahima* is the time towards the end of a Gadaa period. It is a time before power handover between the outgoing and incoming Abbaa Gadaa (*Baallii*).

[27] In Ethiopia Boorana land is broadly categorized as Liiban and Dirree. Liiban grazing zone (*dheeda*) is divided into *Golbaa* and *Gubbaa*. Dirree encompasses *goomolee*, *Malbee*, *Golboo*, *Dirree* (Tula wells grazing zone) and *Wayaama* grazing zone (Dika, 2016; G. Oba & Kotile, 2001).

Now others have also learned from that drought and are keeping more camels and goats. Few are saving into banks and building homes in towns". It is therefore, clear that pastoralists were more aware of the impacts of drought and keeping more drought resistant livestock species. However, respondents expressed that with exceptions of its *bahima* Gadaa of Guyyoo Gobbaa was prosperous. Specially, after *gadaamojjii* of Gadaa of Guyyoo Gobbaa, Boorana had many livestock, though many of them were died during that fateful *bahima*. Current Gadaa period (Kuraa Jaarsoo) was marked by escalation of inter-ethnic boarder conflict. One of informants indicated that "with exception of boarder conflicts that was brought by time, the conditions of cattle and pasture was good". However, late coming of *gannaa* rain has prolonged *bona hagayyaa*, livestock were emaciated, and death was occurred in some areas. The chronology of major drought events and its effects was presented in **Table 5.8** below.

Table 5.8: Chronology of Major Drought Events and Its Effects in Boorana, 1968-2020

Gadaa	Year	Major droughts and its effects
Gobbaa Bulee	1968-1976	There was average drought in Boorana. The drought did not actually cover the whole Boorana. People moved with livestock to places where pasture was available.
Jiloo Aagaa	1976-1984	Severe drought. *Oolaa kittaanaa* (drought of tsetse fly), emaciation of livestock, hunger and lack of *okaa* (cut fodder) for livestock. This drought was acute and covered whole Boorana land.
Boruu Guyyoo	1984-1992	The drought affected some parts of Boorana. People were able to move from place to place with their animals.
Boruu Madhaa	1992-2000	There was average and acute drought. Many of pastoralists have lost their livestock to drought mostly known as *oolaa bubbee* (the windy drought).
Liiban Jaldeessaa	2000-2008	There was good rain. Somehow emaciation and death of livestock was few. But the effects of the previous droughts were persistent.
Guyyoo Gobbaa	2008-2016	In *bahima* of Gadaa of Guyyoo Gobbaa, severe drought had struck Boorana. Emaciation and major livestock loss.
Kuraa Jaarsoo	2016-	Average drought. Emaciation of cattle and severe conditions

	for camels, goats and sheep. Later good rain was obtained.

Source: Own synthesis

Boorana pastoralists have comprehensive indigenous knowledge to cope with the adverse effects of droughts. Fassil, Diress and Synnevåg (2001) indicated that understanding and supporting existing indigenous pastoral strategies to cope with drought is an important step. Boorana pastoralists have adopted a range of strategies to cope with loss of livestock during drought (Birhanu et al., 2015). Indigenous knowledge of pastoralists have enabled pastoralist to cope up with arid and semi-arid lands. Indigenous knowledge has eroded through time. Different authors (Dika, 2016; Homann et al., 2008; Kebebew et al., 2001) consistently indicated this indigenous ecological knowledge of pastoralists has been under pressures. Though there are different survival mechanisms that can be employed by pastoralists participants emphasized that collections of grasses and haymaking, destocking and collections of crop residue from farms were the main drought coping mechanisms by pastoralists.

A. Collection of Grasses and Hay

Largest proportion (80.72%) of respondents indicated that collection of grasses and different forages is the main coping mechanism of pastoralist during drought. Discussants in group discussions in the study area agreed that collection of grasses during rain and keeping it for drought time is one of the main drought coping mechanisms that helps pastoralist accumulate large quantity of fodder. Tache (2010) consistently indicated that drought reserve have big role in protecting pastoralist assets and in availing fodder for critical times. Fodder is usually collected by women. Participants indicated that they collect forages from the area far from villages, where the forages are available. The challenges in collecting forages were that it was far and women were expected to travel long distance to collect it. One of the discussants indicated that it took nearly six hours for women from *Harweeyyuu* to collect forages from *Dororii* Mountain. In an interview young a woman also confirmed that the pasture was finished from the available areas so that they move from one area to another searching for fodder. One of the respondents expressed that “searching for fodder is our usual routine. I have learnt many things form my experiences of last drought. I have been collecting grasses from our small farmland and nearby pasture areas. Up to now, I have collected two pile-ups of grasses. Two pile of grass is even not enough for livestock. Now that pile was finished”. It

can be understood that recurrent drought has reduced the availability of grasses. It is also clear that even collections of fodder from rangeland can provide fodder only for short period.

Figure 5.9: Grass Collected for Drought Reserves

a) Grass collected by district mobilization, Eelwayyee

b) Stored around homestead

Source: Photo by the Researcher

B. Destocking and Saving

Participants indicated that to become resilient to droughts and reduce the impacts of droughts, the riches have to destock and save money into banks. One of the informants indicated that "If you sell livestock during drought and save to bank you can restock during the rain" he said. The respondents stressed that destocking during drought and restocking during the rain is the main option. Fassil, Diress and Synnevåg (2001) consistently indicated that pastoralists have been involving in trade activities by selling some of their animals. In an interview, an elder indicated that since pastoralist lives in harsh environment where there is high degradation of rangeland, erratic and insufficient rainfall and recurrent drought building pastoralist resilience is very difficult. Respondents have an understanding that mobility was also limited due to lack of pasture and other factors.

C. Collecting of Crop Residue

It was indicated that collecting crop residue from farm is very important coping mechanisms for pastoralist who have small farmlands. Collecting and preserving residue of different crops also helps pastoralist cope with drought. Largest proportion (68.67%) of respondents confirmed that collection and storing residue of grain was the main coping mechanism of

drought. Though collections of residue of crop can support weak cows and other livestock, however the culture of collecting and storing residue of crops was not good. One of the respondents indicated that pastoralists are not fully collecting the residue of crops. “In some cases, we consume what should have been kept for drought season in rainy season” he said. The main problem related to residue collection was that pastoralists freely leave livestock on farm and exploit the residue within short periods after harvest and not residue of all crops are collected. For instance, many pastoralists collect the residue of *teff* but not stalk of maize. One of the respondents expressed that “this wasteful practice has to be changed. We have to preserve the residue of all crops appropriately”. Thus, it is clear that pastoralist have an understanding that nothing should be wasted.

Figure 5.10: Crop Residue Collected for Drought Reserve

a) Teff residue stored around homestead

b) Teff residue stored behind home

Source: Photo by the Researcher

5.4.5 Indigenous Knowledge of Boorana Pastoralists in Rangeland Management

5.4.5.1 Customary Institutions

Boorana pastoralists have comprehensive indigenous knowledge in rangeland management. Respondents indicated that asses to and management of rangeland was made by customary institutions. It was indicated by many authors (Dida & Woldemariam, 2014; Dika, 2016, 2018; Homann et al., 2008) that customary institutions of Boorana pastoralist were generally categorized as micro and macro institutions. The institutions for rangeland managements are categorized into different hierarchical levels at which access to and management of rangeland resources are made. *Gadaa* and *Qaalluu* institutions are the two major macro institutions in Boorana (Dida & Woldemariam, 2014). The role of *Qaalluu* institutions is mainly rituals and

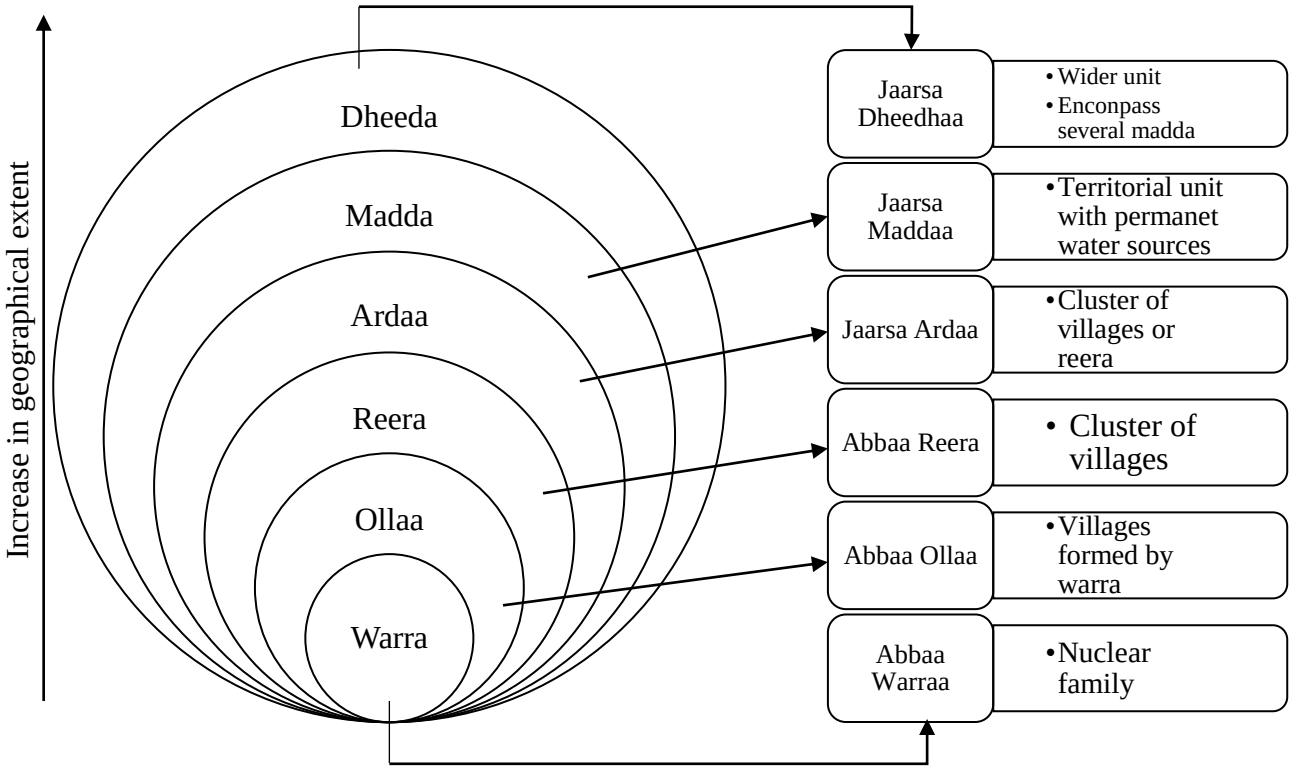
is associated with religious affairs. This institution has its own *yaa'a* (confederation) and the leader of institution the *Qaalluu* is the most respected. Therefore, with respect to rangeland management different high level decisions on the use and management of rangelands can be made at the *qa'ee* (village place) of the *Qaalluu*. Gadaa is an indigenous political system in which all Oromos are supposed to identify themselves. Gadaa can be understood through generational classes, grades and different age sets. Through *Gadaa* institutions, notably by *Gumii Gaayoo* assembly, Boorana enact, amend and enforce different laws and strategies for all living things. These laws are in general *seera uumaa-uumamaa* (the law of creator and creatures) and in particular *seera namaa-sa'aa* (the law of human and livestock) and *seera marraa bisaanii* (the law of grass and water).

Bassi and Tache (2011) consistently stated that the sound management of the rangeland in Boorana rangeland is promoted through norms of *seera marraa bisaanii*. It can therefore be understood that the uses and management of pasture and water resources are inextricably linked. In Boorana rangeland systems, both pasture and water resources are two sides of the same coin. Thus, access to wet season grazing is made available with the access to wet season temporary water points and access to dry season grazing is also access to permanent water points like *tulaa*. Rangeland management in Boorana is practiced at different levels, seasons and functional land use units. Respondents indicated that rangeland management is the responsibility of all Boorana as access to grazing is also not restricted to any Boorana. The Boorana usually say *laftii Boorana Boorana kutaa hin qabdu* (Boorana land is not restricted to Boorana). From this saying it can be understood that pastoralist have not only the right to have access and use rangelands but also have an obligation to manage rangeland at different levels. Management of rangelands can be categorized into different functional land use units as *lafa seera yabbii* (calve zones), *kaloo* (enclosure), *lafa seera daargulaa* (well zones), *lafa seera foora* (mobile herds zones). This is in line with Tiki, Oba and Tvedt (2011) view on land use zonation around *tulaa* wells.

It is clear that at the macro institutions enactment and amendment of *seera marraa bisaanii* and highest level rangeland management decisions can be made. However, micro level institutions are where laws and decisions made at the macro levels are put into effects. At micro level the institutions for rangeland management ranges in scales from *warra* (household), *Ollaa* (village), *reera* (cluster of villages), *ardaa* (cluster of villages or *reera*), *madda* (wider territorial unit with permanent water sources) and to *dheeda* (wider unit than

madda encompassing several *madda* under it) (**Figure 5.11**). Survey results also indicated that at micro level rangeland can be managed at *warra* (83.13%), *ollaa* (94.58%), *reera* (85.24%), *ardaa* (71.69%), *madda* (75.02%) and *dheeda* (84.04%) levels. This is consistent with the findings of previous authors (Dida & Woldemariam, 2014; Dika, 2016, 2018). Rangeland is managed hierarchically at all these levels. The peculiar features of the customary institutions at different levels are that the whole system is highly decentralized and the individual level has an ability to solve the complex problems through its representative and concerned community members. Though the level of influence and geographical scope varies, at all level of rangeland management the resources, head of the community and concerned community members are interconnected by regular discussions and meetings on the management of resources.

Figure 5.11: Customary Institutions of Boorana Pastoralist



Source: Own Construction

Warra

Warra refers to several interconnected meanings. However, for this purpose it is the smallest unit of all micro customary institutions, which includes family of one household. An individual can have his own *warra* after being married. This is also consistent with (Dida &

Woldemariam, 2014; Dika, 2016). *Abbaa warraa* is the head of *warra*. The roles of *warra* in rangeland management are associated with the advice *Abbaa warraa* provides to children who look after livestock. A father usually tells herders not to be out of customary law of Boorana and to keep livestock in the area where adequate pastures are available. Thus, Boorana herders know how to protect livestock from the area closed for calves and other purposes. Dika (2016) indicated that herders or member of *warra* take care of rangeland resources on their own and even reports wrong doers to the concerned body or village heads.

Ollaa

The *ollaa* (village) is the collection of different *warra* and is the second smallest micro institution. Halake and Tadesse (2014) discussed *moggaa* and *ollaa* as separate micro institutions. *Moggaa* is the sub-section of the village. We believe that both *moggaa* and *ollaa* have common *tika* (to herd), *obaa* (watering of livestock) and rangeland resources and head known as *Abbaa ollaa*. *Abbaa ollaa* (head of village) is the most popular man among his villagers in terms of his ability to organize, analyze and manage things according to *Aadaa* Boorana (Boorana custom) (Dida & Woldemariam, 2014; Dika, 2016). One or more villages have *kaloo* (enclosure) in common. Villagers usually discuss on the issues of management of pastures and water resources.

Reera

Reera is the cluster of village in particular geographical area. The head of *Reera* is called *Abbaa Reeraa.* Under current settings, one *ardaa* (kebele) can have more than one *reera* under it and a given *reera* can have common grazing grounds like enclosure (*kaloo*) and rainy season grazing. *Abbaa reeraa* represents the community of that particular site at next higher level. At this level community can discuss on issues that matter including management of resources and other socioeconomic issues.

Ardaa

Ardaa is particular locality inhabited by residents. Under current conditions, *ardaa* is larger than *reera*. Previous study (Dida & Woldemariam, 2014; Dika, 2016) indicated that *Ardaa* is a small grazing territory where its residents can commonly share water, pasture and other resources within the context of *aadaa seera* Boorana (Boorana customary laws). *Jaarsa ardaa* usually hold meetings on how to manage and share resources in their territory at arda level and with other Boorana community.

Madda

Madda is a wider territorial unit with permanent water sources that can connect many *ardaa*. As indicated by Halake and Tadesse (2014) *madda* is administered by the council of elders (*jaarsa maddaa*) drawn from different clusters of that *Ardaa*. The head of clusters that is connected by *madda* usually discuss on how to manage and share water and pasture resources at water source.

Dheeda

Dheeda is the largest territorial units or grazing zone. *Dheeda* has corporate identity and is led by council of elders (*jaarsa dheeda*). In Ethiopia Boorana land has two major grazing zones Liiban and Dirree. Liiban grazing zone (*dheeda*) is further divided into *Golba* and *Gubbaa* while Dirree is includes *goomolee, Malbee*, *Golboo, Dirree* (Tula wells grazing zone) and *Wayaama* grazing zone. *Jaarsa dheeda* are responsible for decisions about mobility; addressing social disputes and have an important role in conflict resolution.

5.4.5.2 Mobility

Respondents indicated that mobility is one of the key indigenous knowledge to make use of scattered rangeland resources. Pastoralist practice mobility as a key strategy in land use units such as *lafa seera foora* (mobile herd zones) between dry and wet season grazing areas in different grazing zones. More than half (50.90%) of participants indicated that they practice mobility to make use of limited pasture resources. This is supported by many studies (Coppock et al., 2017; Dika, 2016; Homann et al., 2008; Tolera & Senbeta, 2019) on rangelands. Respondents indicated that herds were categorized into different forms for mobility. The dominant categories indicated by most of respondents were *loon foora* (mobile herd) and *loon warraa* (homestead herds). Categorization of livestock is based on the number of livestock household had. Thus, pastoralist can split and categorize herds into different groups. Dika (2016) indicated that herd splitting is the practice of dividing the livestock into separate herds depending on their age, sex and productivity. Mobility is practiced to make use of rangelands resources to its fullest potentials under two conditions. The first condition is to move livestock to the area where the pasture and water is available to minimize the effects of drought. This is mobility during drought. Livestock is moved to the places not hit by drought throughout Boorana land and where the pasture is available in their locality. This is in line with previous study where mobility is indicated as the strategy to escape drought conditions

(Oba & Lusigi, 1987). The second condition is mobility during rainy season. This mobility is undertaken to increase the productivity of livestock through fatness and pregnancy of animals.

Though mobility is not restricted for Boorana throughout Boorana lands, at given localities pastoralists also practice mobility between wet and dry season grazing. One of the respondents from *Dharriito* indicated that dry season grazing reserve is enclosed during the rain and kept for drought season. In an interview, an elder from *Dharriito* described that, "during rain *goda dharriito* and *Gomboo* Mountains were enclosed and kept for drought season grazing reserves". Respondents further described that *Gomboo* Mountains includes *Gomboo diqqoo* (small gomboo) and *Gomboo Guddoo* (big gomboo) *Mountains* and g*oda Dharriitoo* blends *goda ona daalacha*, *goda dhirrii* and *dhadhacha dhoqqee*. *Goda Dharriito* literally means the lee of the mountains and has different local names indicated. Respondents also indicated that rainy season grazing for livestock is *kaarraa hammeessaa* (wide plane area covered dominantly by commiphora) and *qarsaa kuraa guutoo* (is the name of locality close to *Dambala sadeen kebele*). One of the respondents from *Aadee Galchat* also indicated that during dry season their prime grazing season is *Xiniqaa* and *Mole* Mountain. He said "livestock from *Goda Loonii, Aadee Galchat, Teessoo Galchat and Fuloo Burraa* grass at these mountains during drought". *Goda Loonii, Aadee Galchat, Teessoo Galchat and Fuloo Burraa* are the names of particular locality in the area.

The dry season grazing is open for grazing during *Adoolessaa* (interim cool dry season) and *bona hagayyaa* (long dry season). Respondents from *Dharriito* indicated that in *Adoolessaa* there is opportunity for livestock to grass the residue of crops in farm after harvest. In an interview, one of the elder described that, "grazing of livestock in farmland during *Adoolessaa* enables the grasses to grow fibrous routs and flourish in a good manner for *hagayyaa*". However, respondents indicated that currently the major factor that reduces the availability and cover of grass is that the grass do not blossom and flower properly. "If it is not blossoming then, there would be no seed to fall to the ground into soil seed bank. Then, the growth of new grasses will be problematic" an elder said. From this, it can be understood that Boorana pastoralists are an expert and have comprehensive knowledge of rangeland resource management. Respondents indicated that mobility is not only limited between dry and wet season grazing areas of the locality and pastoralist can take their livestock anywhere throughout Boorana grazing zones based on Boorana customary laws.

Mobility is also restricted by the availability of rain. Where there is rain relatively there is pasture and where there is no rain there is no pasture. Thus, pastoralist moves their livestock from where there is no rain to the places where there is adequate rainfall. One of *jaarsa argaa-dhageettii* indicated that looking at *uusa* (practice of reading the intestine of a livestock), listening to the call of *Baraarattoo* (rain bird), and croaking of frogs are among the major methods Boorana have been using to forecasts the rain in Boorana. Boorana often sees the *uusa* to predict the future of Boorana. Study consistently indicated that herders make traditional weather forecasting through intestinal treading (Ayal et al., 2015). An elder indicated that he himself knows *uusa* however; pastoralist has not been slaughtering either goats or cattle for this purpose regularly. However, an elder indicated that there is one thing he knows, the call of *Baraarattoo* (rain bird). "If a *Baraarattoo* calls and the second one also responds to the call there is a good hope for the rain" he said. An elder indicated that he noticed that the second *Baraarattoo* responded to the call of the first one and in addition, he also heard the frog croaked. Thus, an elder indicated that the coincidence of the calls of rain birds and croaking of frogs is an indication of the rain to be expected and "I will expect a cloudy day" he said. This indicates that Boorana pastoralist have untapped ecological and environmental knowledge.

5.4.5.3 Enclosure

Establishment of enclosure (*kaloo*) is one of the popular methods of reserving pastures. More than half (52.41%) of the respondents indicated that establishment and management of *kaloo* is the main method for rangeland management. Solomon et al. (2007) consistently indicated that *kaloo* has been used by the Boorana for more than half a century though the number and size of range enclosures has increased steadily since the 1990s. Enclosure existed in various forms in Boorana rangeland, dominantly as private, cooperative and communal. Several actors facilitate and initiate the establishments of enclosures. For instance, non-governmental organizations (NGOs) support *kaloo* with the objectives of rehabilitating degraded or bush-invaded rangeland, and providing a pasture reserve for animals during extended dry season. Though enclosure has been established with different initiatives and objectives customary institutions still play a pivotal role in determining the size and location of communal grazing enclosures (Napier & Desta, 2011). However, with respect to enclosures established by private, cooperatives and NGOs it is not clear whether the role of customary institutions is as such significant. Respondents indicated that currently different areas has been fenced and

protected by cooperatives during the rain and the cooperatives sell the grass collected to the community during the drought. Informants showed that the enclosed area belongs to cooperatives alone and community cannot use it. It is clear that managing enclosure by cooperative organization is not the interest of the community but motives of the government. Thus, the flawed government interventions and establishment of more private and cooperative enclosure could further fragment rangelands and weaken indigenous knowledge for rangeland management. Similarly Tache (2011) also indicated that the existence of enclosures with many forms, objectives and motives implies land fragmentation and decline in common property resource tenure.

5.4.5.4 Bush Clearing and Controlled Burning

Respondents indicated that the expansion of bushes, shrubs and forbs were the main factor that were responsible for rangeland degradation. Discussants in Focus Group Discussions confirmed that pasture land is covered with highly encroaching species. Expansion of bush encroachment began during the Gadaa of Gobbaa Bulee (1968–1976), and the expansion became severe during the Gadaa of Jiloo Aagaa (1976–1984), about two decades after the official ban of range fires (Angassa & Oba, 2008b). Respondents indicated that one of key strategy they were using was clearing the bushes through cutting. Clearing bushes was initiated by different rangeland rehabilitation projects of NGOs and watershed management programs of the government. One of the respondents indicated that the whole drought year they were clearing the bushes. However, the bushes have encroached beyond the management by hands. Informants indicated that though the expansions of bushes were very severe bush clearing has allowed the natural growth of grasses so that pastoralist can cut and pile the grasses for drought reserves. It was also indicated that in addition to cutting controlled burning can also be applied to the areas encroached by herbaceous species like *adaa* (*aspilia mossambicensis*). It is clear that not all areas encroached by bushes should be burned and burning is based on types and cover of encroachments and requires careful techniques and practices.

Burning was one of the efficient techniques of controlling bush encroachments in Boorana rangelands. Government policy that bans the fire began in the early 1970s with the expansion of bush cover (Angassa & Oba, 2008b). Several studies (Teshome Abate & Angassa, 2016; Angassa & Oba, 2008a, 2008b) indicated that, official ban on fire resulted in the rapid proliferation of bush cover in Boorana rangeland. Respondents indicated that they have used

controlled burning to control herbaceous species (**Figure 5.12**). Discussants at *Harweeyyuu* site consistently stated that *adaa* (*aspilia mossambicensis*) have taken the entire land in *Diida Goofoo* and has become above simple hand management. Majority of the discussants indicated that people of the area discussed and reached to the agreement that it can only be managed by controlled fire. “Then the fire was set to the entire area taken by *adaa*” they said. Some of discussants indicated that *aspilia mossambicensis*, and other shrubs and forbs were like water and the fire cannot flame them up. They indicated that the flames flow underneath the trees and shrubs.

One of the mechanisms used by pastoralist to protect the fire from encroaching to the other areas was fencing/bordering the areas to be burnt by making the furrow in the ground using bulldozer, so that the fire will not intrude into the other areas. Discussants however, indicated that the fire had not cleared entire *adaa,* so that they were clearing it by traditional hoe. Angassa and Oba (2008a) in their bush control demonstration study also indicated that tree cutting and fire combined with grazing were more effective in suppressing the regeneration of encroaching species. It can be understood that the attempted controlled burning of the area covered by *adaa* did not fully cleared bushes. The message of this controlled burning exercise by pastoralist indicate that burning should be careful exercise, as such, clearing bushes and pile up all together at different places, letting it dry and careful burning of pile of collected bushes. Then, the areas should be restricted from livestock grazing for a while to allow the regeneration of grasses.

Figure 5.12: New Growth of Bushes and Controlled Burning

a) Growth of new encroaching species

b) Livestock grazing in encroached area

c) Bush area cleared by controlled burning

d) Researcher discussing on the burned field

Source: Photos by the Researcher

5.5 Conclusions and Policy Recommendations

The study constructed perceptions of pastoralists on the rates, trends, indicators and impacts of rangeland degradation based on Gadaa timeline. Perceptions of community experts post-1992 (the year Boruu Madhaa took office) to current Gadaa period was assessed. It was found that in the late 1960s, rangeland resources were abundant and the conditions of rangelands were good. However, the conditions of rangeland resources have been decreasing from time to time. Deterioration of rangeland has showed increasing trends. Participants indicated that this year is not equal to last year and the coming year will also not be equal to this year. Therefore, it can be concluded that Boorana rangeland is in a state of worst degradation unless serious management options that incorporates indigenous and ecological techniques of restorations is undertaken.

The study underscored that vegetation, rangeland production, human, and environmental and climate change related indicators were the main indicators of rangeland health. Rangeland

degradation is associated with factors that reduce the productivity of rangelands. Thus, addressing these factors can minimize the process of degradations. Boorana rangelands are more noticeably characterized by loss of palatable plants and proliferation of unpalatable species and bush encroachments. It is therefore evident that Boorana rangeland could be totally converted to bush dominated landscape over time. The study suggests that much effort should be given to how to reduce the adverse impacts of bush encroachments on rangeland production. Besides human exploitation of rangeland resources through privatization of grazing land, population pressure and expansion of crop cultivation into communal rangelands were the main drivers of rangeland degradation. This has distorted functioning of indigenous knowledge of pastoralists and become a source of persistent disputes in the community. Thus, privatization must be strictly prohibited and community based zonation and mapping of traditional land use types should be maintained. Further, it can be concluded that community knowledge provides the foundations to understand the key indicators of rangeland degradation.

The progressive degradation of rangeland resources has jeopardized rangeland production, livestock productivity and human wellbeing in Boorana rangeland system. Prolonged drought and water scarcity were the main climatic factor that has been affecting Boorana pastoralist production. Thus, much effort must be given to how to minimize the adverse effects of drought through pre-drought destocking and reserving of grain and post-drought recovery and restocking where needed. Further government and concerned stakeholders should put their efforts on development of water projects that can sustain pastoralist needs. The study underscored that though all livestock were emaciated the conditions of goats, sheep and camels were not good due to *bona haggayya* (severe dry season) and late coming of *gannaa* which resulted in severe feed shortages. This is different from orthodox view that states that camels, goats and sheep are more resilient due to the fact that they have diseases besides bad conditions. Notwithstanding bad conditions experienced, this study is still optimistic on promotions of drought resistant livestock species in peripheral pastoralist areas. It is therefore evident that reliance on livestock continuous to make life much difficult, vulnerable, worrisome and hopeless for pastoralist. However, recognitions and promotions of indigenous ecological knowledge of pastoralist can sustain pastoralist community in arid and semi-arid rangelands. Therefore, understanding Boorana pastoralist knowledge in constructions of trends, indicators and impacts of rangeland degradations was crucial for understanding dynamics of rangeland ecosystem in East Africa.

6 LOOKING FOR ALTERNATIVES: DETERMINANTS OF LIVELIHOOD STRATEGY OF PASTORALISTS IN BOORANA RANGELAND SYSTEM, SOUTHERN ETHIOPIA

Abstracts

Livelihood diversification is getting the remarkable attentions to reduce poverty in peripheral pastoralist areas of developing countries. This study is an effort to assess pastoral livelihoods and determinants of livelihood strategy of Boorana pastoralists by integrating sustainable livelihood framework into pastoralist livelihood study. The paper was based on the household survey (n = 332), interviews and focus group discussions. Data were analyzed by descriptive statistics, summarizations of qualitative responses and Multivariate Probit Model (MVP). The result showed that pastoralists are vulnerable to conflicts, climate changes and resulting crisis due to outbreak of livestock diseases and death of livestock, crop damage, food insecurity and hunger. The study underlined that pastoralists manage risks by engaging into diverse set of income generating portfolios. Though pastoralism is still the dominant way of living people are now engaging into a diverse range and combination of activities to reduce vulnerability to internal and external shocks. The study underscored that respondents prefers to choose intensive rain-fed farming and non-farm activities, pastoralism, labour works, diversifications, mobility and hired herder as ways of living. MVP result indicated that the decisions of household to simultaneous engage in these livelihood strategies are determined by various socioeconomic characteristics (head sex, marital status, head literacy), and skill training, microfinance, assess to credit, and livestock diversification of households. The study therefore suggests the need for more diversified opportunities to reduce pastoralist vulnerabilities to livelihood shocks and to reduce poverty.

Keywords: Vulnerability, Livelihood strategies, Diversification, Multivariate Probit Model, Boorana, Ethiopian Pastoralists

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6.1 Introduction

Pastoralist inhabiting peripheral environments of arid and semi-arid areas are highly vulnerable to the impacts of various external and internal shocks (Berhanu, 2019). Climate related factors (Berhanu, 2019; Megersa, Markemann, Angassa, & Valle Zárate, 2014; Schmidt & Pearson, 2016; Tilahun et al., 2017) and loss of productivity of pasture lands (Sabyrbekov, 2019) are among the factors that can increase the vulnerability of pastoralist and reduces their resiliency. As a result, still rangelands of developing country are home to millions of poor and politically marginalized pastoralist (Coppock et al., 2017). Since 1960s pastoralism had been a focus of research (Tolossa, 2018). Hogg (1991) indicated that even there was a period at which pastoralism as way of living was questioned in Africa due to wrongly held assumptions, stereotyped belief about pastoralism, belief on existence of more efficient livelihood activity and imperfect belief that dubbed pastoralist as unruly. But the irony is that pastoralism is still one of the most sustainable and viable production system (African Union, 2010; Gebeye, 2016). Pastoralist are epitome of risk managers and can survive droughts and other shocks (Coppock et al., 2017) through indigenous environmental knowledge (Angassa & Oba, 2008b; G. Oba & Kotile, 2001) and engagement in diverse portfolio of livelihoods.

The diversification of rural livelihood is receiving the attention in decision to reduce poverty in developing countries (Ellis, 2000). In developing countries rural households engages in diverse set of income generating activities (Khatiwada et al., 2017) to reduce risks and survive during difficult times (Jiao et al., 2017). Pastoralist practice other livelihood activities either to save the main livelihood from risk or to generate additional incomes from new livelihood activities. Saving the main livelihood from failure is the main goal of pastoralist because failure of the main livelihood could results in poverty, which according to Tache and Sjaastad (2010) is caused by multifaceted factors of natural, man-made, and supernatural origins. Livelihood of pastoralist can be affected by several multifaceted factors. Climate change and associate ills are the peculiar features of arid and semi-arid peripheral environments. To this point as Megersa et al. (2013) indicated the livelihood of Boorana pastoralist has been affected by climate change and variability. Uncertainty in climate can reduce access to grazing land and water, and reduces mobility that can affect the sustainability of livestock systems in Ethiopia (Tilahun et al., 2017).

Similar to Boorana area livelihoods of pastoralists in Awash basin is also influenced by climate variability which is characterized by recurrent drought and lack of water (Schmidt & Pearson, 2016). These situations have been exacerbated by overgrazing, erosion processes and invasion of exotic plant. Likewise in Somali region of Ethiopia livelihoods of pastoralist is constrained by drought, erratic rainfall and conflicts over resources which pushed households to diversify income sources (Samatar, 2015). Therefore, given the stochastic climatic conditions and its adverse impacts looking for and engagement into diverse portfolio of livelihoods has become a primary choice in peripheral pastoralist areas of Ethiopia. Diversification can manage climate induced risks and shocks that Berhanu (2019) indicated can limit the long-term livelihood sustainability of pastoralism. In addition to climate related risks the resilience of Boorana pastoralist household have been reduced by socioecological system transformation (Tolera & Senbeta, 2019). Thus, reduction of resiliency and adaption capability of pastoralists and resultant increase in vulnerability of households can affect households' livelihood strategy, which in turn leads to poverty.

Understanding (Khatiwada et al., 2017) and classification (Jiao et al., 2017) of livelihood strategy of household is essential to reduce poverty and understand dynamics of rural livelihoods. In the pastoralist areas pastoralism is the main livelihood strategy of people in rangelands (Berhanu, 2019; Inkermann, 2015; Megersa, Markemann, Angassa, & Valle Zárate, 2014; Tache & Sjaastad, 2010). As indicated by Berhanu (2019) millions of traditional pastoralist make their living from livestock and its products. This is also true for Boorana pastoralist which mainly depends on livestock production (Tache & Sjaastad, 2010). Livestock production is the foundation of livelihood in Boorana with cattle being the most valued animal species (Megersa, Markemann, Angassa, & Valle Zárate, 2014). Beside livestock production pastoralist has been largely engaging in crop cultivation. Many authors (Megersa, Markemann, Angassa, & Valle Zárate, 2014; Tilahun et al., 2017; Tolera & Senbeta, 2019) have already confirmed that Boorana pastoralist has now embraced crop cultivation as promising alternative livelihood strategy.

Pastoral livelihoods has now highly transformed in many pastoralist areas. In Afar area different external and internal factors are responsible for the change (Inkermann, 2015). In the same way Tolossa (2018) stated that pastoral system in Boorana has shifted from pure pastoralism to agro-pastoralism and other non-pastoral activities. By this, it can be understood that Boorana pastoralist are diversifying sources of income to survive in arid and

semi-arid environments. Beside livelihood diversification indigenous social supports and networks have been playing pivotal role for households' food security. Though indigenous support institutions to overcome external shocks has been weakening (Berhanu, 2009) social networking and solidarity still provides pivotal livelihood support (Anbacha & Kjosavik, 2018). This study has tried to look at indigenous social support institutions as factors of social networking and binding through which pastoralist can support each other during difficult times. Therefore, this study has tried to add to body of knowledge by integrating sustainable livelihood framework in pastoralist livelihood study to comprehend how pastoralist contexts of vulnerability shapes and affects livelihood choices of pastoralist. This study aims to assess and investigate pastoral livelihoods and determinants of livelihood strategy of Boorana pastoralists using sustainable livelihood framework. In particular, the study aims to serve three basic purposes. First, the study is intended to identify major shocks that make pastoralist households vulnerable. Second, the study aims to identify mutually exclusive pastoralist livelihood choices and its determinants. Third, the study intends to overview the role of indigenous mutual supports of pastoralist to provide livelihood supports.

6.2 Sustainable Livelihoods Approach and its Framework

Livelihood refers to the means of earning a living or the activities undertaken by a family to obtain the basic materials needed to sustain household survival and development (Xu et al., 2015). It comprises assets and activities, and the access to these, mediated by institutions and social relations that together determine the living of an individual (Nyangile, 2013). Livelihood also comprises capability needed for means of living (Chambers & Conway, 1991). Rural households can bring together different set of income generating, social activity and construct a portfolio of livelihood to meet and, if possible, to enhance better livelihood outcomes (Khatiwada et al., 2017). However, activities chosen by households may not bring sustainability. Scoones (1998) stated that livelihood is sustainable when it is resilient, can cope with and recover from shocks, able to enhance its capability and assets without undermining resource base. This is consistent with excerpt from works of Chambers and Conway below.

> A livelihood is sustainable when it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term (Chambers & Conway, 1991, p.6).

It is evident that sustainable rural livelihoods have increasingly become central to the debate of poverty reduction, environmental management and rural development (Scoones, 1998). Brundtland commission on environment and development introduced the sustainable livelihood idea first and the concept was further expanded and advocated as goal for eradicating poverty by United Nations conferences on environment and development in 1992 (Krantz, 2001). Sustainable rural livelihoods depend on how household withstand shocks depending on available options, with respect to capability, assets and activity. A livelihood strategy is the way in which those options are organized and chosen by household. Therefore, understanding the factors contributing to each livelihood strategy is mandatory to improve the coping mechanisms related to poverty and food shortages in developing countries (Alinovi et al., 2010). Sustainable Livelihoods Approach (SLA) offered a fresh approach (Alinovi et al., 2010) and become the leading approach since 1990s. SLA seeks to find out the significance of assets in livelihood, their trends and nature and impacts of shocks upon assets (Morse et al., 2009). Livelihood approach is more participatory and poverty reduction interventions focus on empowering the poor through building their own opportunities, supporting their access to assets, and developing an enabling policy and institutional environment (Alinovi et al., 2010).

Though there are several frameworks in use to deal with rural livelihoods, Sustainable Livelihoods Framework (SLF) proposed by the UK Department for International Development (DFID) is the most influential and widely used (Xu et al., 2015). Several livelihood studies (Inkermann, 2015; Khatiwada et al., 2017; Smyth & Vanclay, 2017; Xu et al., 2015) were based on SLF. Therefore, this study employed SLF as the underpinning framework in analyzing livelihoods of pastoralist (see **Figure 2.2**). The study used SLF because it is flexible and can fit to specific local setting (Department fo International Development, 2008). In addition, SLF is guided by core principles of people-centered, holistic, dynamic, building on strengths, macro-micro links and sustainability (Department fo International Development, 2001; Kollmair & Gamper, 2002; Morse et al., 2009). The motives behind the use of SLF in this study are that several of its principles and elements help researchers to deal with multifaceted problems of rural households. This framework realizes rural community as operating in the contexts of vulnerability where they have access to the assets mediated by various policy and institutions, which in turn make households to engage in certain livelihood activities whereby households achieve livelihood outcomes.

6.3 Research Methodology

6.3.1 Description of the Study Area[28]

The study was conducted in Boorana Zone (**Figure 3.1**), a zone which extends between 3^{o} 26' and 6 ^{o} 32' North latitudes, and between 36^{o} 43' and 40^{o} 46' East longitudes. In the south Boorana shares international boundary with Kenya, and is bordered with Somali region in the East and Southeast, Guji zone in the East and Northeast, and with SNNPR in the west, northwest and north. The study area is dominated by a semi-arid climate (Coppock, 1994) with an altitudinal range of 1000 to 1500 meter above sea level (m.a.s.l), and a mean annual rainfall measuring below 600mm (Tache, 2008) and average mean annual rainfall from 1990 to 2017 measures nearly 520mm (**Figure 5.1**). Boorana area receives bimodal pattern of rainfall with the main rains (*gannaa*) falling between March and May, and the short rains (*hagayya*) between September and November (Angassa, 2007). The data for this research was gathered in March and continued to the months of *Adoolessa*. Though data collections were started during the month of *ganna*, the *ganna* was late and did not come on the expected time. Boorana zone falls under three agro-climate zones namely, *Kola* (tropical) 56%, *Weyna Dega* (sub-tropical) 31% and *dega* (warm temperate) 13% (Tolossa, 2018). Based on Boorana traditional ecological zonation, Boorana land is broadly categorized as Liiban and Dirree. Liiban grazing zone (*dheeda*) is divided into *Golbaa* and *Gubbaa*. Dirree encompasses *goomolee*, *Malbee*, *Golboo*, *Dirree* (Tula wells grazing zone) and *Wayaama* grazing zone (Dika, 2016; G. Oba & Kotile, 2001) and the badda sadeen (the three sub-humid zones).

Data from National Meteorological Agency 2019 indicates that temperature of the area ranges from 14.2 °C to 25.4 °C. Frequency of the drought has increased to every 1-2 years (Riché et al., 2009). Like in other pastoral rangelands of Ethiopia, the fauna in Boorana is mostly characterized by sparse vegetation composed of mainly grasses, bushes, shrubs, small trees and bare land. Plant communities on the flat and hilly plains of the central Boorana semi-arid area consist of diverse mixtures of woody and herbaceous vegetation (Coppock, 1994). In addition, the woodlands of Boorana rangelands are characterized by species from the genera Combretum and Terminalia, whereas the bush lands and thickets, which cover major parts of the Boorana lowlands, are dominated by Acacia and Commiphora species (Dalle et al., 2006a).

[28] For more details about the study area see section (**3.3.1**).

6.3.2 Research Method and Design

The study was guided by mixed research method approach to understand the perceptions of pastoralist on livelihoods, determinants of livelihood strategy and to comprehend the role of indigenous social networks on households' livelihood support. Both methods complement each other by triangulation strategy. Both data were integrated in the analysis phases. Data were collected from pastoralists at one time and thus, a cross-sectional research design was employed in this study. To understand pastoral livelihoods and the interplay between the context of vulnerability and livelihood assets the study used sustainable livelihood approach as guiding framework. SLA was preferred due to its role to understand and solve complex rural development problems from the perspectives of local people (Smyth & Vanclay, 2017). Many of previous studies (Brown et al., 2006; Dinku, 2018; Khatiwada et al., 2017) have used SLF as guiding framework. This study was guided by pragmatism as underpinning philosophical assumption. Pragmatism involves the collection, analysis, and integration of quantitative and qualitative data in a single or multiphase study (Creswell, 2014). Many of previous (Griensven et al., 2014; Tolossa, 2005) studies had pragmatism as philosophical foundations.

6.3.3 Sampling Techniques and Procedures

The paper was based on multi-stage purposive sampling where; in the first and second stages the study districts (*Yaabello* and *Eelwayyee*) and the study *kebeles* under each district were selected respectively using purposive sampling techniques based on homogeneity of population and for efficient and timely data acquisition. From *Yaabello* district, the data was generated from *Harweeyyuu* and *Dharriito kebeles*, whereas from *Eelwayyee* district data was collected from *Aadee Galchat* and *Hiddii Aallee kebeles*. In the third stage, the villages in each kebeles were selected using simple random sampling techniques. In the fourth stage, the participants were selected using systematic random sampling.

The study was based on household questionnaire survey, semi-structured interview and focus group discussions to generate the data for the study. Cross-sectional household survey of 332[29] households was conducted. Household survey was conducted to gather information related to the vulnerability contexts of pastoralists, pastoral livelihoods and determinants of livelihood strategy. Data were collected from sampled households during the field survey

[29] The sample size determination technique was presented before under section **4.3.4**.

conducted by the lead researcher from March to June 2019 at multiple scales. Household questionnaire survey was prepared in English and translated to Afaan Oromoo, the native language of Boorana pastoralists, to make it easier for enumerators to gather necessary information. The questionnaire includes both open-ended and close-ended questions. A pilot study was conducted before the actual administration of the survey questionnaire. Eight research assistants were hired to assist in the data collection and were trained by the lead researcher for two days on how the questionnaire survey would be administered, the way they can approach the respondents, and on research ethics. These research assistants were selected based on their academic level (i.e two MA degree and six Bachelor degree holders), research experience and exposure to the local area.

Semi-structured interview was conducted with local elders, village heads, case households, *jaarsa argaa-dhageettii*, development agents and leader of *ganda* to elucidate pastoralist understanding of their livelihoods, factors influencing livelihood choice of households and illuminate indigenous social support of pastoralist. The interviewees were selected based on their knowledge of the problem under investigation and referral from the community about who is knowledgeable in the community. The case households were selected randomly from each study sites. This study conducted 26 semi-structured interviews with respondents. A total of 18 semi-structured interviews were conducted with local elders, village heads, development agents and leader of *ganda.* In addition, interviews were also conducted with 4 case households and 4 *jaarsa argaa-dhageettii*.

In addition, focus group discussions were conducted with four groups to substantiate Boorana pastoralist livelihoods and factors associated with livelihood strategy. The discussants were selected based on their knowledge of the problems under investigation, popularity and position in the community. Heterogeneous and homogenous groups of elders, women, village heads and other community members were contacted. The number of participants in each group ranges from 6-8 individuals.

6.3.4 Data Analysis

As the data were both quantitative and qualitative in nature, both methods of data analysis were considered. The study used mixed method of data analysis to corroborate quantitative analysis with qualitative analysis. Therefore, the study mixed and analyzed the both qualitative and quantitative findings concurrently. The contexts of vulnerability and pastoral

livelihoods were analyzed through systematic descriptions of data obtained by cross-sectional survey and narrations of cases. In addition the determinatns of livelihood strategy of pastoralists were analysed using Multivariate Probit Model (MVP). Futher views of participants on factors that influence pastoral livelihoods and indigenous institutions for mutual supportss were analyzed through narration of cases and summarization of quantitative data. Qualitative data were rephrased and put in verbatim form and were analyzed by explorative analysis, which includes descriptions of response, content analysis and narratives of case studies.

6.3.4.1 Econometric Model

Pastoralist reported that they adopt multiple livelihood strategy to manage risks in peripheral pastoral areas. Adopting multiple livelihood strategy simultaneously makes livelihood choice multivariate (Mehar, Mittal, & Prasad, 2016). To understand pastoral household decision to engage in certain livelihood strategies, first households made rational choice among different livelihood activities for the living of their family. Based on the ranking of responses top six groups of livelihood strategies were identified. For mutually exclusive livelihood strategies, multinomial logit and probit model can be used (Greene, 2012). In this case since livelihood strategies provided are not mutually exclusive, pastoralist adopt a mix of strategies at the same time to deal with multifaceted problems of poverty and vulnerability and, therefore, the random error components of the livelihood strategies may be correlated. Therefore, the study used multivariate probit model, which allows for the possible synchronous correlation in the choice to use six livelihood strategies concurrently. As Mehar et al. (2016) indicated one source of correlation may be complementarities and substitutability between different livelihood strategies. Therefore, dependent variable used in this model is livelihood strategy. Thus, a multivariate probit model of the following form is used based on Greene (2012):

$$Y_{ij} = X'_{ij}\beta_j + \varepsilon_{ij}$$

Where Yij (j = 1,...,6) representing the six livelihood strategies [Y_{1i} = 0, if pastoralist decide on intensive rain-fed farming + nonfarm (1 otherwise). Y_{2i} = 0, if pastoralist decides to engage into pastoralism (1 otherwise). Y_{3i} = 0, if pastoralists choose labour works (1 otherwise). Y_{4i} = 0, if pastoralists decide on diversification (1 otherwise). Y_{5i} = 0, if pastoralists decide on mobility (1 otherwise). Y_{6i} = 0, if pastoralist choose to be hired as herder (1 otherwise)] chosen by the i^{th} pastoralist (sampled from 1 to n). X'_{ij} is a 1 x *k* vector

of observed variables that influence the choice and decision of the pastoralist; β_j is a *k* x 1 vector of unknown parameters (to be estimated), and ε_{ij} is the unobserved error term. Assuming the error terms (across j = 1,..., m alternatives) are multivariate normally distributed with the mean vector equal to zero, the unknown parameters in equation above are estimated using simulated maximum likelihood. The method uses the Geweke-Hajivassiliour-Keane (GHK) smooth recursive conditioning simulator procedure to evaluate the multivariate normal distribution (Mehar et al., 2016). Before estimating the model, multicollinearity test among predictor is necessary. As indicated by Mehar et al. (2016) a pair-wise correlation of the error terms associations with the pastoralists' livelihood strategies decision was computed and its significance was tested to further justify the use of the multivariate probit model.

6.3.4.2 Definition of Explanatory Variables

The explanatory variables included in this model are described in the **Table 6.1** below. The choice of these variables was based on the review of literature. The study hypothesized that these explanatory variables would potentially determine the dependent variable, livelihood strategy of pastoralist.

Table 6.1: Definition of Explanatory Variables for MVP

Explanatory variables	Description	Mean	Std. Dev.	Sign
Head sex	Dummy (0= male headed and 1=female headed)	0.1837349	0.3878524	+/-
Head Age	Continuous variable in years	42.0994	15.18285	-
Marital status	Categorical (0=single, 1=married/monogamous, 2=married/polygamous, 3=Widowed and 4=Divorced)	0.9457831	0.3769174	+/-
HH size	Continues variable in number	5.915663	2.163721	+
Head literacy	Dummy (0=non-literate, 1=read and write)	0.1746988	0.3802824	+
High educ. level HH mem	Categorical (0=No HH member educated, 1= grade 1-4, 2= grade 5-8, 3=grade 9-12, 4=College Diploma and 5= University graduate and above	1.243976	1.290493	+
Skill training in LS	Dummy (0=Yes, 1=No)	0.6686747	0.4714002	+
Microfinance institution	Dummy (0=Yes, 1=No)	0.3915663	0.4888373	+
Access to credit	Dummy (0=Yes, 1=No)	0.7319277	0.4436241	+
Member to cooperative	Dummy (0=Yes, 1=No)	0.8343373	0.3723387	+

Institution Mutual Asist	Dummy (0=Yes, 1=No)	0.0240964	0.1535799	+/-
size of cultivated land	Continuous variable in number (ha)	1.16988	0.759191	-
Prod/Hec/Main crop	Continuous variable in number (quintals)	7.614458	11.22647	-
TLU	Continuous variable in number (TLU)	7.991476	19.09437	-
Livestock diversification	Categorical (0 = Cattles only, 1 = Cattles + Goat, 2 = Cattles + goat + sheep, 3 = Cattle + goat + sheep + Camel, 4 = Cattle + goat + sheep + Camel + equines, 5 = No livestock)	2.596386	1.47887	+

6.4 Results and Discussion

6.4.1 Vulnerability Contexts and its Impacts on Pastoral Livelihoods

Pastoralist living in the peripheral dryland environment has experienced the increasing vulnerability (Berhanu, 2019). Vulnerability is broad concepts and can be associated with various shocks, trends and seasonality. The study identified nine major shocks experienced by Boorana pastoralist (**Table 6.2**). Many of these shocks are associated with changing climatic conditions and recurrent drought (98.19%). Similar study indicated that pastoralist become vulnerable due to double exposure to climate and non-climate transformation (López-i-Gelats, Fraser, Morton, & Rivera-Ferre, 2016). This is in line with many of previous studies (Berhanu, 2019; Megersa, Markemann, Angassa, Ogutu, et al., 2014; Megersa, Markemann, Angassa, & Valle Zárate, 2014; Schmidt & Pearson, 2016; Tilahun et al., 2017). Participants indicated that changing environmental conditions has put pastoralist in shocks as result of death of livestock (98.49%), livestock disease (93.98%), crop damage (97.89%), food insecurity (81.33%) and hunger (97.29%). Similar study also reported food insecurity (Megersa, Markemann, Angassa, & Valle Zárate, 2014) and livestock diseases (Tolossa, 2018). In addition, pastoralist become vulnerable due to the seasonality of the prices, which resulted in the price fall for livestock (98.80%), and price rise for food items (99.10%).

Table 6.2: Major Factors that Make Households vulnerable

Socks	Percentages of Responses
	Freq.(per)
Recurrent drought	326 (98.19)
Death of livestock	327 (98.49)
Outbreak of livestock disease	312 (93.98)
Crop damage	325 (97.89)
Price fall for livestock	328 (98.80)
Price rise for food items	329 (99.10)
Ethnic conflict	265 (79.82)
Food insecurity	270 (81.33)
Hunger	323 (97.29)

Source: Own Survey Data, 2019

In addition, ethnic conflict (79.82%) in highly contested boarder areas which was orchestrated by ill driven government policies of the past was another shocking experience for Boorana pastoralists. Though Boorana were local hegemonic power in a region that extends to present day Kenya and Somalia, up to Tana and Juba river they were pushed towards the East by various Somali groups (Helland, 2001). The inter-ethnic conflicts over access to and competition of resources (Feyissa, 2014; Tache & Oba, 2009; Tiki & Oba, 2017) were exacerbated when large number of refugees come to Boorana land with help of international agencies (Bassi, 1997, 2010). Tache and Oba (2009) consistently indicated that government politics of land control and countries ethnic federalism has gave an impetus for an old inter-ethnic games. Bassi (2010) stressed that Boorana area is characterized with food insecurity and ecological crisis and half of wet and dry season grazing and permanent deep wells (*Tulas*) were lost to the returnees of Somalia war.

In discussion one of discussants said, “when we see the major problems that pastoralists have been facing the first is border conflict, the second is drought and third is lack of government support”. From this, it can be clearly understood that the support of government in providing adequate support during drought and its role in settling contested boarder issues is minimum. Participants underscored that drought itself is a war because it can take life of both human and livestock. Respondents further stressed that conflicts has disastrous consequences, which leads to loss of human life. One of Oromo Liberation Army (OLA) member, *Gurraacha*

Waato[30], stated that, "you see these innocent peoples usually clashes over the border. The government is even not providing the very minimum support expected, which is protecting the life of people on both sides. Rather the government provides fire support". The other discussants congruently stated that, "pastoralist should have been at home to protect their dying livestock rather than fighting over the border. When they return home from the war, they may find the whole of their livestock dead". Therefore clashes either on the resources or border not only cuts the lives of people involved short but also affects the livelihood base of pastoralists.

With respect to the impacts of drought on livelihoods of pastoralist, one of key informants narrated her experiences as follows:

> "I was married to an old man. Previously we had sufficient livestock and lead our life without worries. Since I got married, we had not obtained any aid from any organizations, because our livestock was enough to lead successful living. Unfortunately, we have lost many livestock during last drought and left with nothing. We have lost more than 50 cattle. It was then that I was registered for aid to obtain goats to be distributed by NGO. They gave me four goats. It is now one year since then. From those goats, one had *sirgoo* (*coenurosis*) and then I sold it and changed it by sheep. I still have those goats. Besides, I sell beer and soft drinks for living. The agony is that previously I had plenty, but now because of drought I am receiving aids from others. It is painful. In the past I did not received a single kilogram (kg) of food aid, but now, you see others are helping me".

It can be understood from this narration that shocks particularly droughts can put pastoralist into distressful conditions through loss of livestock and resulting livelihood shocks. Many of previous studies consistently indicated that recurrent drought is the major risks for Boorana pastoralist (Z. Birhanu et al., 2015; Riché et al., 2009; Solomon et al., 2007; Tolera & Senbeta, 2019). This is because the unexpected change from plenty to pauper conditions can lead to psychological, social and economic miseries. This key informant stressed that her experiences can be very good lessons for other pastoralist. "Keeping a lot of livestock that you cannot feed during drought by itself is a problem" she said. Another respondents stated that pastoralist have to keep a livestock that can be managed appropriately. Pastoralists have

[30]Our deployment to the field was marked with heightened political tension in the study area where there was insurgence of OLA (Oromo Liberation Army) in different part of the zone. Southern front OLA (WBO zoonii kibbaa) mainly operates in different districts of Boorana zone. In our case, two kebeles, Harweeyyuu from Yaabello district and Aade Galchat from Eelwayyee district were under regular operation of 'notorious' OLA rebel Gurraacha Waato and his other comrades. Local residents indicated that Gurraacha and his companion were separated from their southern front OLA few months ago.

the understanding that selling livestock before onset of drought and saving the money into bank can minimize the effects of drought. However, the problem with destocking is that during drought, emaciated livestock are bad even to eyes and also during rainy season the conditions of livestock are very good, so that pastoralist do not want to sell one. Pastoralists experiences these shock because of external environment in which they exists. Based on the perceptions of participants recurrent drought is the most severe shock followed by hunger and crop damage. Largest majority of participants indicated that all shocks experienced have reduced their income, asset and food stock and increased food purchases. Therefore, shocks experienced by households had increased vulnerability because it affects livelihood base of pastoralist through reduction of household income and their resiliency to cope up with shocks.

6.4.2 Pastoralist Livelihood Assets

6.4.2.1 Natural Capital

Natural capital is the stocks of natural resources from which the resources and services useful for pastoral livelihoods are obtained. Land, water, forests and its products and soil of the area are the main natural capitals in the area. Land and water are the major natural capital of Boorana pastoralists under utilization. Pastoralists use the land mainly for cultivation and grazing. Boorana pastoralist started using the land for cultivation during *Menelik II* conquest of the area (Angassa & Oba, 2008b). Currently pastoralists have already embraced cultivation on boorana land. In some areas, the respondents reported that expansion of farmland has become the threat to rangeland resources. It has already taken large areas of rangelands. However, in many areas pastoralist reported that crop cultivation is one of the promising means of living in their area. Rangeland resources are the dominant natural capital in pastoralist areas. Currently rangeland is highly fragmented and degraded. In all study sites respondents reported that rangeland is severely deteriorated. In Boorana pastoralist areas range and water resources are inextricably linked. Both range and water resources are managed by customary laws of Boorana. These resources are communally held, and are managed by community elders according to the set of rules and regulations (Tolossa, 2018). Beside land and water Boorana lowlands has great potential for forest and its products. Savanna woodland of Boorana has potential for gums and resin. Boorana pastoralist areas are rich in different woody species that can produce commercial gums and resins, which can

support the livelihoods of pastoral and agro-pastoral communities (Worku, Lemenih, Fetene, & Teketay, 2011).

6.4.2.2 Physical Capital

In Boorana pastoralist areas there are no adequate physical capital that comprises basic infrastructure and services needed to support livelihoods of pastoralist. There is no quality shelter and houses in pastoralist areas. In the past Boorana pastoralist dwell in small dome shaped house fully covered with grasses and supported by branches of *Harooressa* (*Grewia bicolor*) and *Hammarreesa* (*Acacia brevispica*). This particular kind of housing is called *Galma*. Currently Boorana build *Galma* during ceremonial events live name giving ceremony and for different ceremony of Gadaa system. However, currently Boorana started to construct houses with proper walls and thatched roofs (Tolossa, 2018). In some rural areas, few households have started to build steel houses near main roads. Concerning transportation, pastoralist use buses and *bajaj* (three-wheel drive) to travel to markets and towns nearest to them. Some of the pastoralists have already bought their own motorbikes and *bajaj*. Currently some of pastoralists provide motorbike and *bajaj* transportation services to support their livelihood. Respondents reported that providing motorbike transportation services has become the supplementary livelihood activities for many households. In addition, access to road is one aspects of physical capital. With this respect, many of rural *kebeles* are now connected to the center (district towns) with earth roads. However, many of roads connecting rural areas to towns had very low quality. Further, pastoralists have very low access to clean water supply and sanitation. In all study sites pastoralist depends on *Haroo* (ponds) and *Eela* (well) water both for human and livestock consumptions.

6.4.2.3 Human Capital

Household require necessary skills, knowledge and good health to embrace various livelihood strategies for livings. Scoones (1998) indicated that human capital is essential to successfully pursue different livelihood activities. Education, indigenous knowledge and good health are among the few things that can enhance the knowledge and skills of individuals to engage in various livelihood strategies. In the past Boorana pastoralist are among the less educated pastoralist groups. However, currently there is changes in access to education in Boorana (Tolossa, 2018). Many of pastoralist households are sending their children to schools. At least there are primary schools in many of rural *kebeles.* However, still many of pastoralist kids did

not have the opportunities for education. They look after livestock and undertake other activities customary in the society. Therefore, there is a need for comprehensive and flexible approaches and education systems that is suitable for all pastoralist kids. Education of pastoralist household members can positively contributes to the livelihoods of the pastoralist. Apart from formal education Gadaa System is one of very big institution through which Boorana Oromo gain all-embracing indigenous knowledge. Boorana pastoralists have comprehensive cultural and environmental knowledge of their areas. It is because of the indigenous knowledge that Boorana pastoralists have been surviving various shocks experienced because of environmental conditions. This comprehensive knowledge can also enable pastoralist to choose different livelihood activities that can sustain them under arid and semi-arid environmental conditions. Beside skills and knowledge to pursue diverse livelihood activities pastoralists also needs good health and wellbeing to undertake livelihood of their choice. However, in many of pastoralist areas there are very low health facilities. Health centers are not equipped with necessary materials and staffs.

6.4.2.4 Financial Capital

Financial capital is one of key livelihood assets by which household can achieve their livelihood goals (Department fo International Development, 2001). Livestock and crop cultivation are the main sources of finance for Boorana pastoralist. Tolossa (2018) also indicated that the pertinent financial capital of Boorana pastoralist is their livestock. Boorana pastoralist make money from sales of livestock and other activities related to livestock trade. Pastoralists do not sell livestock frequently. Livestock are sold particularly during drought to buy grain for household, and buy the grasses and residue of *teff* for their livestock. Through sale of livestock pastoralist can support their own food needs and supports their livestock during drought. In addition, many of pastoralist households make their living from livestock trade. Some of them buy and sell livestock to gain some profits. Others become a broker in livestock markets. There are even people who make money by taking livestock to and from markets. Besides livestock sale, Boorana pastoralist also makes money from the sales of crop production. Cereals like *teff* and wheat are mainly produced for commercial purposes. Pastoralists usually sustain their households with the money they obtain from the sales of these cereals after harvest. In addition, some of the pastoralists have now good awareness of saving money in banks from their sales. Significant numbers of pastoralist also build houses in towns and generate some incomes from its rent. In some of the study sites pastoralists are

obtaining the credit from different cooperative associations. Therefore, currently pastoralists have many alternatives to accumulate financial capitals.

6.4.2.5 Social Capital

Social capital is social resources upon which people depend to pursue their livelihood objectives (Department fo International Development, 2001). Boorana pastoralists have very strong institutions for mutual supports. Abiyot and Kjosavik (2018) indicated pastoral society like Boorana are known for strong social networks for social and livelihood supports. Social bondages among the Boorana are so solid and intact (Tolossa, 2018). Boorana pastoralists have different social responsibilities and obligations to mutually support each other. People support each other at different levels. Social networking and supports can be made with families, relatives, close friends, villages, and cluster of villages at *kebele* and the whole Boorana level. People support each other during major livelihood shocks like occurrence of droughts and other risks. Boorana pastoralist support each other by milks, grain, money, live animals and labour. These supports can be made through indigenous institutions for mutual supports like *buusaa-gonofaa, marroo, dabaree* and other support mechanisms. Tolossa (2018) indicated that *buusaa-gonofaa* is the clan-based insurance that can pulls households from poverty traps. *Marroo* is voluntary social support mechanism that particularly involves women. This is in line with Abiyot and Kjosavik (2018). *Dabaree* is loan of domestic animals which can be given either for short period of time (milk cow) or for prosperity and life.

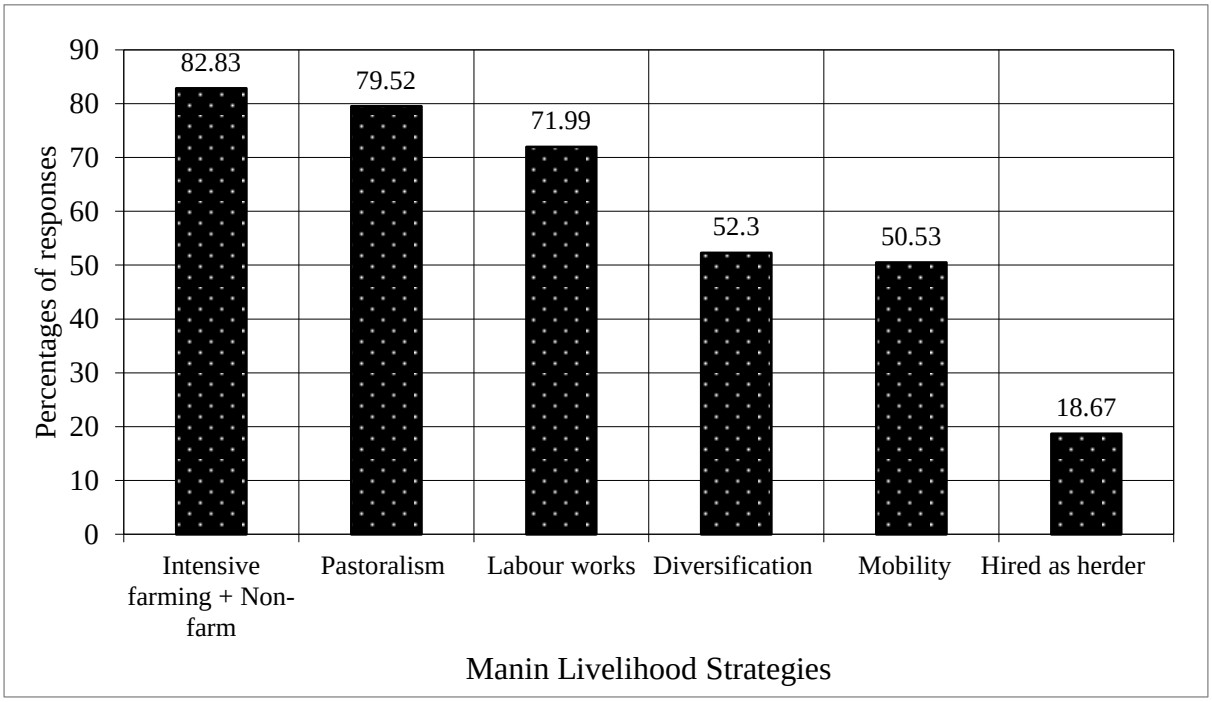
6.4.3 Livelihood Strategy of Pastoralist and its Determinants

Pastoralist usually makes choices that are difficult and risky by itself under unpredictable environment of arid and semi-arid rangelands. Notwithstanding perilous external environmental factors and limited capabilities of pastoralist, people engage in ranges of livelihood activities to achieve their livelihood goals. Though pastoralism was the dominant practice in the peripheral pastoralist areas people are now engaging in the diverse range and combination of activities to reduce vulnerability and increase their resiliency to external factors. This is in line with (Jiao et al., 2017; Khatiwada et al., 2017). The study assessed and ranked ranges of livelihood activities mainly practiced in the study area. These activities are the livelihood choices that households have already made or are willing to make in the future because they believe it is more returning. Based on the perceptions of respondents six main

livelihood strategies were identified as the top livelihood strategies participants preferred to engage in (**Figure 6.1**).

Largest proportions (82.83%) of participants indicated that intensive rain fed farming and other non-farm activities were the main promising alternative livelihood activities. This is consistent with (Megersa, Markemann, Angassa, & Valle Zárate, 2014; Tilahun et al., 2017; Tolera & Senbeta, 2019). Crop cultivation is seen as an alternative livelihood activity in pastoralist areas. Currently many of households in the study area were engaged in crop cultivations. The study found that the average size of cultivated land holding per household is 1.2 hectares. This is different from the findings of (Tilahun et al., 2017) which indicated average cultivated land holding to be ranging between 1.68 to 2.12 hectares. Surprisingly however, this is equal to Ethiopians small holders average size of cultivated land (Centeral Statistical Agency, 2008). The major crops cultivated in the area are maize, *teff* (*Eragrostis tef*), beans, sorghum and barley.

Figure 6.1: Main Livelihood Strategy in Study Area



Source: Own Survey Data, 2019

Pastoralists are now more engaging in crop cultivation. One of respondents in *Aadee Galchat* indicated that they cultivate maize, *teff* and wheat. However, the biggest challenge to crop production was erratic and insufficient amount of rainfall. Tilahun et al. (2017) also identified lack of rainfall as the main challenges to crop production. Erratic rainfall is affecting not only livestock sector but also supposedly alternative crop cultivation. One of the informants

expressed the condition by stating that, “we have lost maize and harvested few *teff* production and 2 quintals of wheat”. The failure in production forced people to depend on the grain bought from the market for consumptions. Beside low production respondents indicated that people do not save the harvests for future consumptions. “We sell it with low price and buy it with high price during the drought season” an elder said. This indicates that selling of agricultural productions immediately after harvest can affect pastoralist during drought. At first place, prices are low and household cannot invest the money into other assets like buying livestock. It also lefts grain stores empty and forces household to sell livestock to buy grain at high prices during drought.

Following intensive rain-fed farming and non-farm activities, participants believed that pastoralism (79.52%) is still the dominant means of living in for Boorana pastoralist (**Figure 6.1**). This is also confirmed by (Berhanu, 2019; Inkermann, 2015; Megersa, Markemann, Angassa, & Valle Zárate, 2014; Tache & Sjaastad, 2010). In fact, livelihoods of pastoralist in the study area predominantly depend on livestock raring. Cattle (84.64%) were the dominant livestock species in the area and significant proportion of the community depends on goats (78.01%), sheep (66.57%), camels (22.89%), and donkeys (31.63%). The mean average TLU in study area was 7.9. Participants believed that livestock production is highly vulnerable due to the impacts of climate change and underlying factors. However, livestock diversification is one of the important risk management methods in pastoralist areas. Megersa et al. (2014) indicated that diversification plays critical role for household food security. Largest proportions (32.53%) of respondents indicated that they have combination of three (Cattles + Goat + Sheep) livestock species followed by those who have five (Cattle + Goat + Sheep + Camel + Equines) livestock species (15.96%).

Significant number (71.99%) of participants also indicated that they engage in labour works for living. Some of respondents indicated that they depend on wages from labour works in the nearby towns and their area. One of young women from *Aadee Galchat* expressed that “as a household, we have no livestock. Thus, our livelihood depends on small jobs like making doors from timber and mud works. My husband goes up to *Eelwayyee* town for mud works. Sometimes, he takes a work by contract of 10,000 Ethiopian birr (ETB). From this amount he also pays for his workers and brings home the money left”. It can be understood that pastoralist household are engaging in wide range of activities for living besides livestock husbandry. In addition, participants indicated that mobility (50.53%) and looking after others

herd (18.67%) were other alternative means of living during time of difficulty. Pastoralists practice mobility to make use of scarce rangeland resources (Coppock et al., 2017; Dika, 2016; Homann et al., 2008; Tolera & Senbeta, 2019).

Diversification of income sources (52.3%) were also one of livelihood strategy practiced by pastoralist households (**Figure 6.1**). Dinku (2018) consistently indicated that households' livelihoods were highly diverse. It is evident that diversifying sources of income can support pastoralist during time of difficulty. Pastoralists are now engaging more in small business in villages and around roads that connects center of *kebele* to district towns. It was noticed that some of pastoralist households sell drinks (beer and soft drinks) and *ckat* (*Catha edulis*); some have small shops and sell foods in the villages and around the center of the *kebele*. Poultry has also become means of living for people. One of respondents indicated that as alternatives pastoralist could generate income by being a broker in livestock market. Middleman in livestock market can generate income from the commission obtained from the seller and buyer. In addition, participants also see charcoal making and selling wood as an alternative means of generating incomes. However, one of informants argued that, "charcoal making is simply clearing of the trees and could not help much to improve livelihoods". It is understandable that participants understand long-term impacts of clearing trees for charcoal than its short-term immediate economic benefits.

Further fetching and selling water and giving motorbike transport services are another means of livelihoods. Tolossa (2018) also confirmed that some people were involved in business of motorbike transport services. One of poor woman from *Hiddii Aallee* indicated that she sells water and woods for living. "I fetch water from *Eela Areerii* (*Areerii* well) and sell it to people for living. *Eela Areerii* is far from here and it takes us 2hrs double trips to fetch water. Every day I fetch two to three 20 litters jerrycan of water. The price of one 20 litter jerrycan is 20 ETB. In addition, I sell firewood. The price of one backload wood is 30 ETB". Form this it is understandable that poverty is at its peak in some areas. Particularly *Hiddii Aallee* is known for its poverty. Respondents also indicated that giving motorbike transport services is also one of the alternative means of generating incomes. One of discussants in Focus Group Discussion indicated that, "those who have motorbike have good livelihood. They fetch water and sell one 20 litter jerrycan by 20 ETB during drought. For instance, we have four calves and one lactating cow watered at home". This informant indicated that every watering day they buy four 20 litter jerrycan for calves and a cow. The major problem participants

indicated was that the water sources are far from the villages. Participants stressed that they need water nearby their homes. Thus, development of water supply projects in rural villages is mandatory. Besides fetching water during drought motorbike also provide transport services to the residents of the areas and in nearby villages.

The livelihoods of the pastoralist are highly transforming. This was confirmed by other pastoral livelihood transformation studies (Inkermann, 2015; Tolossa, 2018). These authors indicated that the shifts from pure pastoralism to agro-pastoralism and/or other non-pastoral activities could be influenced by different external and internal factors. Notwithstanding the shocks that could be faced pastoralist has been engaging into diverse portfolio of livelihoods. The livelihood activities practiced by households are mostly owned by all families and head of household. Majority of households engaged in their current livelihood activity to minimize the impacts of external and internal shocks on livestock production, which is the dominant livelihood activity. Beside this, pastoralists engage in different livelihood activities to get more income, to send their children to school, to buy grain and hay during drought. Largest proportion of respondents indicated that engaging in diverse livelihood activity can improve household income (57.83%), wellbeing (56.63%) and reduces household vulnerability (52.11%).

6.4.3.1 Determinants of Livelihood Strategy of Pastoralist

The factors that determine the mix of livelihood strategy practiced by pastoralist households were identified using Multivariate Probit Model (MVP) (**Table 6.3**). This model allowed us to analyze the determinants of six livelihood strategies that were chosen by pastoralist households concurrently. Various household demographic characteristics and other indicators were used as explanatory variables. The test of multicollinearity between explanatory variables revealed that variables were not highly correlated with each other. A test of the full model against a constant only model was statistically significant. The result of Multivariate Probit Model Wald chi2 is significant at 1 percent and this indicates the significance of model and the role of socioeconomic and households demographic characteristics in explaining livelihood strategies of pastoralists. The likelihood ratio test result indicates that at least one covariance of the error term is statistically significant. This indicates that the equations in the model are linked, implying that the estimated coefficients account for unobserved correlation among the livelihood strategies.

Table 6.3: Multivariate Probit Regression Result of Determinants of Livelihood Strategy

	Intensive rainfed farming + nonfarm	Pastoralism	Labour work	Diversification	Mobility	Hired herder
	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)
Head sex	0.4117 (0.2255)*	0.5198 (0.2068)**	0.1427 (0.1990)	0.4732 (0.2418)**	0.3327 (0.2396)	-0.3806 (0.2026)*
Head Age	0.0081 (0.0068)	0.0050 (0.0063)	0.0065 (0.0056)	0.0006 (0.0065)	0.0117 (0.0066)*	-0.0049 (0.0062)
Marital status	-0.1044 (0.2298)	0.3836 (0.2283)*	0.1804 (0.2053)	-0.3880 (0.2319)*	0.0210 (0.2295)	-0.3174 (0.2343)
HH size	-0.0091 (0.0547)	0.0033 (0.0504)	-0.0942 (0.0458)**	-0.0372 (0.0474)	-0.0713 (0.0452)	-0.0030 (0.0524)
Head literacy	0.7873 (0.2526)***	0.3838 (0.2497)	-0.0279 (0.2212)	-0.1354 (0.2350)	-0.3359 (0.2190)	-0.2549 (0.2362)
High Educ. Level HH me	-0.0966 (0.0871)	-0.0292 (0.0854)	0.1587 (0.0746)**	-0.0381 (0.0789)	0.0486 (0.0774)	0.0445 (0.0876)
Skill training in LS	0.6601 (0.2793)**	-0.3522 (0.2323)	0.5570 (0.2091)***	-0.2659 (0.2300)	-0.0691 (0.2073)	0.4175 (0.2168)*
Microfinance	0.3627 (0.2297)	0.4588 (0.2162)**	-0.0976 (0.1884)	-1.0300 (0.2267)***	0.1677 (0.2061)	-0.6682 (0.2139)***
Access to credit	-0.7294 (0.2700)***	-0.1277 (0.2413)	-0.2785 (0.2032)	0.6168 (0.2344)***	-0.0300 (0.2070)	0.4146 (0.2327)*
Member to cooperative	0.9389 (0.4135)**	-0.2518 (0.2457)	-0.4771 (0.2277)**	-0.1268 (0.2704)	0.4556 (0.2248)**	0.1074 (0.2339)
Institution Mutual Asist	-4.1556 (195.0925)	0.9667 (0.4739)**	0.5307 (0.4800)	4.1266 (141.8887)	4.5650 (169.4638)	-1.0773 (0.4759)**
Size of cultivate land	-0.3534 (0.16401)**	-0.0841 (0.1512)	-0.3088 (0.1263)**	-0.1556 (0.1356)	-0.1965 (0.1214)*	-0.1226 (0.1450)
Prod/Hec/Main crop	-0.0254 (0.0156)*	0.0104 (0.0123)	0.0114 (0.0082)	0.0165 (0.0109)	0.0106 (0.0078)	-0.0048 (0.0122)
TLU	0.0087 (0.0055)	-0.0661 (0.0221)***	0.0071 (0.0046)	-0.0107 (0.0045)**	-0.0029 (0.0043)	0.0639 (0.0203)***
Livestock diversification	-0.0859 (0.0601)	0.1062 (0.0537)**	0.0204 (0.0515)	0.0624 (0.0588)	-0.0125 (0.0578)	-0.1703 (0.0541)***
_cons	-1.5784 (0.6743)	-1.1868 (0.5460)	-0.3218 (0.4769)	1.6828 (0.5476)	0.5255 (0.5086)	1.4580 (0.5261)

Number of obs = 332
Wald chi2 (90) = 189.65
Likelihood ratio test of rho21 = rho31 = rho41 = rho51 = rho61 = rho32 = rho42 = rho52 = rho62 = rho43 = rho53 = rho63 = rho54 = rho64 = rho65 = 0: chi2 (15) = 201.706 Prob > chi2 = 0.0000

*** Statistically significant at 1% (p<0.01), ** statistically significant at 5% (p<0.05), * statistically significant at 10% (p<0.1). The values in parenthesis are standard errors.

The regression result of MVP revealed that various households' socioeconomic and demographic characteristics influence the probabilities of simultaneous adoption of different livelihood strategies by pastoralist. The model illuminated that the likelihoods of pastoralist households to engage in intensive rain-fed farming and other non-farm activities were determined by head sex, head literacy, skill training to engage in more returning livelihood strategy (LS), access to credit, members to cooperatives, size of cultivated land and production of main crops per hectare of lands (**Table 6.3**). Sex of household positively influence the intensive rain-fed farming and other non-farm activities implying that female head households are more likely to engage in intensive cultivations and activities out of farm. This is in line with Samatar (2015). The literacy of household head is strongly and positively associated with intensive rain-fed farming and non-farm suggesting that educated heads are more likely to maximize production from a smaller area and engages in activities out of farm. The study also indicated that education boosts non-farm employment (Rahut & Micevska Scharf, 2012).

Intensive rain-fed farming and nonfarm activities are also negatively influenced by size of cultivated land and productions of main crops per hectare of lands. This implies that households with large area of cultivated land are less likely to engage in intensive farming. In addition, increased production of main crops from extensive land reduces the probability of households to maximize productivity from small farms and other nonfarm activities. Skill training to engage in more returning LS is positively associated with intensive farming and nonfarm activities, which imply that training increases the probability of households to practice intensive farming. Access to credit is strongly and negatively associated with the probabilities of households to practice intensive rain-fed farming suggesting that access to more credit could make households to choose other business activities over cultivation. However, being member of cooperatives is positively related to intensive rain-fed farming suggesting that cooperatives increases the cooperation among its members to practice intensive farming and other nonfarm activities.

The model illuminated that pastoralism is determined by households socioeconomic and demographic characteristic (**Table 6.3**). Sex of household head positively influences decisions of household to remain pastoralist. Similarly, marital status positively influences pastoralism suggesting that married households are more likely to prefer pastoralism. Surprisingly Tropical Livestock Unit (TLU) is strongly and negatively associated with pastoralism. This implies that pastoralism is defined not only by number of livestock species owned but also by other enabling environment for sustainable pastoralism. However, livestock diversification is positively associated with pastoralism, which suggests that pastoralism is more defined by diversification of livestock species to manage risks that make pastoralism more vulnerable in arid and semi-arid lowlands. The availability of microfinance institutions in the area also positively influences pastoralism suggesting that households need financial institutions that can support pastoralism during shocks. More importantly, institutions for mutual assistance positively influence the likelihood of households to remain pastoralist. This indicates the needs for customary social networks and institutions to survive in peripheral environment of pastoralist.

Labour works is also another livelihood strategy dominantly opted by Boorana pastoral households. The model (**Table 6.3**) clarified that size of household is negatively associated with labour works suggesting that households with large size are less likely to engage in labour works. This is probably because large size family may diversify sources of income through engagement of family members in different livelihood activities. The highest education level of household member is positively associated with likelihood of households to go for labour work. This implies that households whose members are educated do not look down to labour work and other supposedly inferior works. In addition, skill training strongly and positively influences decisions of households to engage in labour work denoting that training can improve the attitude of individuals and families towards wages from labour work. However, being members to cooperatives negatively influences probability of households to engage in labour works. This suggests that member of cooperatives can enjoy benefits and shares from profits of cooperative association. The probability of households to engage in labour work is also negatively influenced by size of cultivated land, which implies that households with larger farm size are less likely to go for labour work.

Boorana pastoralist has now been diversifying income sources to survive in arid and semi-arid lowlands. The model (**Table 6.3**) illustrated that sex of household head is positively

associated with diversification. Marital status is negatively related with diversifications implying that younger (single) individuals are more likely to diversify income sources. Younger people can be able to engage into different petty trade activities and can work in nearby towns. The model also revealed that the availability of microfinance in the area is strongly and negatively associated with diversification. This implies that microfinance institutions are not adequately supporting rural youth. However, access to credit is strongly and positively associated with diversification suggesting that credit provides a basis to begun new business and any income generating activities. It is clearly indicated that TLU is negatively related with diversification. This denotes that households with large number of livestock are less likely to diversify sources of income and therefore they predominantly depend on pastoralism. Dinku (2018) consistently found that access to credit and cattle size determines livelihood diversification in Boorana pastoralist areas.

Mobility is one of the mechanisms that enable pastoralists to make use of limited and geographically disperse rangeland resources. Respondents indicated that mobility is the main livelihood strategy of Boorana pastoralist. The output of the model (**Table 6.3**) illustrate that age of household head positively influences mobility. This implies that households led by elders are more likely to practice mobility. In addition, mobility is also positively influenced by members of cooperatives suggesting that formal and informal associations of peoples prefer mobility to make use of scarce rangeland resources. On the other hands size of cultivated land is negatively associated with mobility. Households with larger farm size are less likely to practice mobility. In addition, this implies that mobility is highly restricted in the settled and farming communities as high priority is being given to cultivation.

Looking after the herds of others in return for income is one of households' livelihood strategies in Boorana rangeland system. Sex of household head negatively influence hired herder as livelihood strategy. This implies that female-headed households are less likely to look after herds of others. Looking after the herds of others as livelihood strategy is positively influenced by skill training suggesting that trained individuals are more likely to be hired as herder. The availability of microfinance institutions in the area strongly and negatively influences hired herder suggesting that access to financial institutions initiate households to engage in more returning activities other than working for others. However, access to credit is somewhat positively associated with hired herder implying that rural areas have very low access to credit to give up low returning activities. Looking after herds of other is negatively

influenced by institutions for mutual supports. This suggests that Boorana pastoralists rely on customary institutions mainly for mutual supports that benefits all involved individuals. TLU is strongly and positively associated with hired herder, which suggests that households with more livestock are more likely to hire herder. However, hired herder is negatively influenced by livestock diversification. This suggests that diverse group of herds are not suitable for hired herders, which suggests that hired herders prefer single category of herds to look after. In other words, hired herders are more likely to look after cattle.

6.4.3.2 Views of Pastoralist on Factors Affecting Households Livelihoods

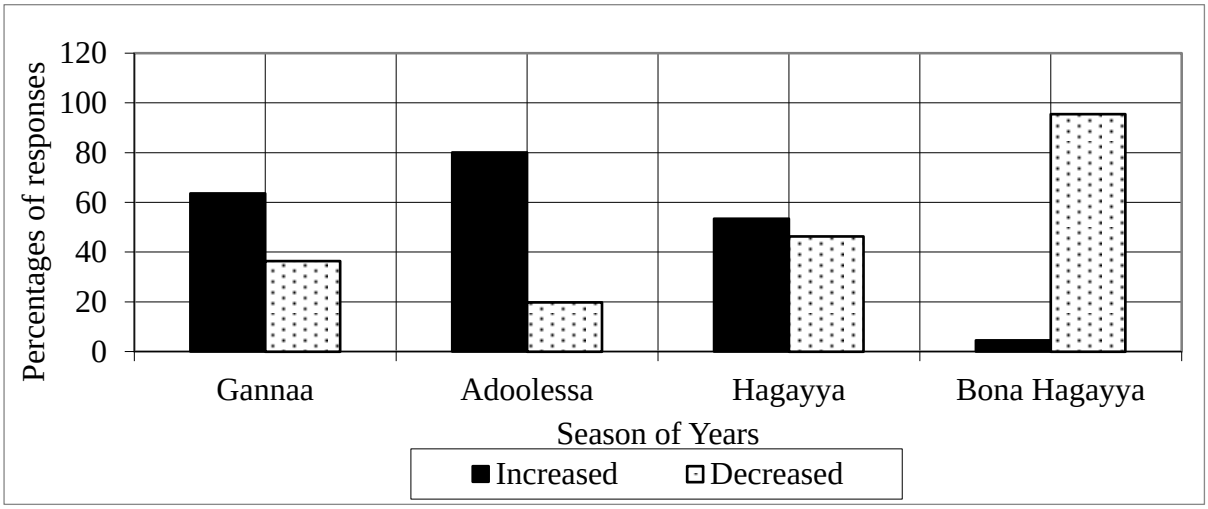
Besides what was already presented in the model (**Table 6.3**) respondents perceives that livelihoods of pastoralists are affected by climate change (50%) and resulting recurrent drought (55.72%) and erratic rainfall (54.22%). Climate change and uncertainties (Berhanu, 2019; Megersa, Markemann, Angassa, & Valle Zárate, 2014; Tilahun et al., 2017; Tolera & Senbeta, 2019) are the main factors that affect livelihoods of the pastoralists. One of our respondents indicated that lack of adequate rain is the main factor that is holding pastoralist back. “Always the rain is not sufficient” he said. One of the discussants in focus group indicated that though they did not experienced severe drought, insufficient rain resulted in stagnation of the whole economy, livestock emaciation and low production from cultivation. Further respondents indicated that insufficient amount of water was harvested into ponds and lakes. One of interviewee stressed that, “totally the rains were erratic and insufficient to support our life”. This provides clear message that water is inseparably linked to livelihood of the pastoralist. In all study sites respondents repeatedly confirmed that lack of rain and recurrent drought are the dominant factors that affects the livelihoods of pastoralist.

In discussion, *Hiddii Aallee* kebele leader stated that, “lack of rain resulted in failure of production and as a result people are in bad conditions, they are starving now. Almost half of households in the *kebele* are being supported by Productive Safety Net Program (PSNP)”. Another respondent confirmed that they are in fear because the rain may not come on time. “People have no hope, because livestock are emaciated and dying” he said. Community in agro-pastoralist areas indicated that though the crops were grown well and people sufficiently fed themselves, there is always insufficient amount of production. Failure of *haggayya* and *gannaa* rain or late coming of both made life of pastoralist difficult and uncertain. It is clear that livestock raising and crop cultivations are the dominant livelihood strategy that is affected by lack of rainfall and drought. Therefore, it can be understood that simultaneous

livelihood strategy practiced by pastoralist households are determined by various environmental factors of peripheral lowlands in addition to socioeconomic and demographic characteristics of households.

Respondents also indicated that high fluctuation in livestock prices affects livelihoods of pastoralist. It was indicated that the price of livestock was good even though there is mismatch between livestock price and price of grain during drought. It can be clearly understood that during drought pastoralist experiences fall in livestock price and rapid rise in the price of grain. One of respondents indicated that generally price of livestock is good during *Adoolessaa* (interim cool season). "If livestock have good conditions they can be sold at good prices" he said. Largest proportion (80.12%) of respondents perceived that the price of livestock was good during *Adoolessaa* (**Figure 6.2**). Respondents indicated that the price of livestock during *gannaa* is good than *hagayyaa*. More than half (63.55%) of respondents indicated that livestock price was increased during *gannaa*. One of the informants stressed that, "the price of *haggayya* is very poor because there is *bona hagayyaa* in front and people afraid it". Respondents also observed increase in price of livestock during *hagayyaa* (53.47%) and decrease during *bona hagayyaa* (95.48%). *Bona hagayyaa* is long dry season in which, livestock can be emaciated severely and even die.

Figure 6.2: Livestock Prices in Four Season of the Year



Source: Own Survey Data, 2019

6.4.4 Indigenous Institutions of Pastoralists for Mutual Support

Respondents confirmed that Boorana pastoralist have various mutual support mechanisms that can support livelihood basis of households. This is consistent with study of Abiyot and Kjosavik (2018) which accessed the role of *marroo* (social security network) in overcoming household food security. The study found that almost all (97.59%) of the participants was members to the institutions for mutual supports. As the name itself indicates the supports is mutual and household gives probably to receive in return during time of difficulty. However, in some cases the support can be obligatory for *miiloo* (lineage) and *gosa* (clan) to support the needy. The respondents indicated that mutual supports could be in the form of *buusaa-gonofaa, dabaree* and *marroo*. Largest proportion (81.52%) of respondents indicated that *buusaa-gonofaa* is the main system of social supports and networking in Boorana pastoralist areas. Leus (2006) indicated that *buusaa-gonofaa* is the formal system of giving help to a needy through the *miiloo*.

The phrase *buusaa-gonofaa* is formed from two words, *buusaa* and *gonofaa*. *Buusaa* means to help with milk and other necessary things and *gonofaa* is to strengthen with cattle. Therefore, it is clear that *buusaa-gonofaa* is social support system by which member of *miiloo* and *gosaa* help each other by giving milks, milk cows and even cattle. Tolossa (2018) also indicated that *buusaa-gonofaa* is the clan-based insurance that can pulls households from poverty trap. Largest proportion of respondents indicated that they support each other at *miiloo* (96.07%) and *gosaa* (97.27%) level. *Buusaa-gonofaa* is very important system of social networks that can support pastoralist particularity during shocks and drought. At the first stage, the person in need has to be supported by *aanaa* (close person). Largest proportions (96.37%) of respondents confirmed that mutual support starts at *warra* (nuclear family) level. If a person is in serious need during dry season and meeting of *miiloo* is not possible close relatives like father or a brother can provide necessary help (Leus, 2006). To help individuals in need the members of the *miiloo* meet to discuss the problems and identify those in critical conditions. Therefore, *miiloo* can decide that the help can be provided from either close person or rich member of the *miiloo*. Respondents indicated that in *buusaa-gonofaa* they offer milk (76.83%), oxen (70.12%), milk cow (65.85%) and grain (50.46%). Since *buusaa-gonofaa* involves both offering and receiving, respondents also indicated that they receive milk (64.31%), oxen (69.85%), milk cow (68.62%) and grain (51.70%).

In *buusaa-gonofaa* if needy person despise the help or giver refused to provide the support the case can be taken to the next higher level, *kora deebanuu* (meeting of whole clan members). It can be understood that this institution is not limited to close family member but it can cover larger geographic units. Respondents indicated that a member of community in critical need can also be supported at village (89.97%), *reera* (cluster of villages) (82.98%), *madda* (territorial unit with permanent water sources) (82.37%) and *dheeda* (grazing zones) (81.16%) level. *Buusaa-gonofaa* is crucial social support and networks in Boorana pastoralist areas through which people help each other during severe drought, shocks, war and other events that can result in the failure of main livelihood strategy. In line with this Leus (2006) stated that since Boorana culture is based on mutual assistance *buusaa-gonofaa* is very strong institutions in the area.

Dabaree is also another important supports and social networks that are customary in Boorana pastoralist areas. Leus (2006) described *dabaree* as loan of domestic animals. In *dabaree* a person can lend a livestock to the receiver so that they can return it in short period of time or use it for longer. The *dabaree* that lasts for short period is *ameessa* (milk cow) that the receiver has to returns after a cow stopped giving milk. *Dabaree* can stay with receiver for many years and can even be inherited by the receiver's son. This kind of *dabaree* is given for *hormaataa fi bultumaa* (prosperity and life). Receiver can keep as many livestock the original *dabaree* gave birth to and use them for milk and meat. Respondents indicated that *dabaree* involve lending (63.13%) and receiving (59.11%) of oxen and lending (54.06%) and receiving (61.46%) of milk cow. *Dabaree* usually depend on the willingness of lenders, pity of lenders to receiver and request of receiver and unlike *buusaa-gonofaa*, it is not necessarily *miiloo* based and obligatory. Therefore, it can be understood that through *dabaree* poor people can obtain milk and can even cultivate the land by oxen received as *dabaree*.

Marroo is another strong social support and network system that can support household food security in Boorana pastoralist areas. *Marroo* literally means to give something and expect an offer in turn someday. Therefore, *marroo* can build partnerships and networks between those who help each other. More than half (64.24%) of respondents underscored that *marroo* is an indigenous social security networks that is build based on mutual supports of individuals or households involved. In line with this, Abiyot and Kjosavik (2018) showed that *marroo* is a voluntary support of women with friends, neighbors and families irrespective of livelihood bases, economic status and age differences. Respondents indicated that people, particularly

women support each other by food, raw grain, sugar, firewood, water and other activities in *marroo*. This kind of indigenous social support mechanism can sustain poor and those affected by recurrent drought in Boorana pastoralist areas.

6.5 Conclusions and Policy Recommendations

The study assessed pastoral livelihoods and determinants of livelihood strategy of Boorana pastoralists by integrating sustainable livelihood framework into pastoralist livelihood study. The study underscored that various shocks related to climate changes and environmental conditions and resulting crisis due to outbreak of livestock diseases and death of livestock, crop damage, food insecurity and hunger are the major factors that increases the vulnerability of pastoralist households. This is in line with many of previous studies (Berhanu, 2019; Megersa, Markemann, Angassa, Ogutu, et al., 2014; Megersa, Markemann, Angassa, & Valle Zárate, 2014; Schmidt & Pearson, 2016; Tilahun et al., 2017). Therefore, it is evident that climate change would continuously impose unprecedented impacts on pastoralist livelihood. Though pastoralists are the most vulnerable groups living in the vulnerable places they are still epitome of risk managers. It is therefore suggested that holistic measures that can strengthen, support and increase the adaptive capacity and resiliency of pastoralist has to be put in places. In addition, Boorana pastoralist areas are highly contested due to ethnic conflict, which was orchestrated by ill driven government policies of the past. Boorana pastoralists were already on peril due to lose of many of wet and dry season grazing and the most important *Tula* wells to the returnees of Somalia war. It is implied that to reduce clashes over the border the root causes of conflicts has to be solved. Therefore, it is suggested that to bring lasting peace and harmony in the contested areas government, community leaders, civic society and recently established border commission should work on peace building by engagement of grassroots community, and collections and reviewing of historical documents.

Given high vulnerability of pastoralist, it is elucidated that the main livelihood asset land and water are under threat of degradation. Climate change has been ravaging the productivity of range and water resources. Thus, strengthening and supporting indigenous resource management could help in efficient utilization of degraded resources. In addition, Boorana pastoralists have no adequate physical infrastructure and services needed to support livelihoods of pastoralist. Pastoralists are at the bottom of the ladder due to misconceptions that dubbed pastoralist as located in remote areas and are unruly. Nevertheless, the truth is that lack of basic infrastructure is one of the basic factors that forced pastoralist to move in

search for water and pastures where available. Now pastoralists are more settled, people do not move but livestock move. Therefore, the study suggests that provision of basic infrastructural services would highly support pastoral livelihood system. It is believed that provision of such services particularly water could minimize additional burden from satellite herders whereby they can also gain the opportunity for education. Education of pastoralist household members positively affects livelihood of pastoralists. Therefore, there is a need for comprehensive and flexible approaches and education systems that is suitable for the contexts of pastoralists. Pastoralist financial assets, livestock and crop production are also under threat due recurrent drought and other shocks. However, Boorana pastoralists have still very strong institutions for mutual assistance and livelihood support systems.

The study underlined that pastoralists manage risks by engaging into diverse set of income generating portfolios. Pastoralism is still the predominant way of living in Boorana pastoralist areas. However, people are now engaging in a diverse range and combination of activities to reduce vulnerability and increase their resiliency to internal and external shocks. By doing so pastoralists would not only reduce risks but also generate incomes. Therefore, the motive of pastoralists to practice different means of living has to be supported. In addition, national and international organization and government has to support pastoralists to establish their own enterprises and companies. Since livestock sector plays a key role in countries economy creating business for pastoralist around what they herd (livestock) and facilitation of market linkages at both national and international level is crucial to transform pastoralist livelihoods. Therefore, organization of pastoralist (individuals, pastoralist youth and businesspersons and women) and facilitation of business opportunities, bank loan and market linkages are very important to improve livelihoods of pastoralists.

The descriptive and empirical analysis found that pastoralist households practices multiple livelihood strategies simultaneously either to save main livelihoods or to generate additional incomes. The study underscored that pastoralist prefers to go for intensive rain-fed farming and non-farm activities, pastoralism, labour works, diversifications, mobility and hired herder as ways of living. The decisions of household to simultaneous opt for these livelihood strategies are determined by various socioeconomic characteristics of households. Using multivariate probit model the study found that sex of household head is the main variable that influences pastoralist households to engage in multiple livelihood strategies at the same time. Head sex positively influences household decision to go for intensive rain-fed farming and

non-farm activities, pastoralism, and diversification and is negatively associated with hired herder. Further, the study underlined that the preference of pastoralist households to engage in multiple activities for living is determined by various socioeconomic characteristics of households. Therefore, for improving and supporting of pastoralist ways of living policy options and interventions have to comprehend and built on what constitute the dynamics of pastoral livelihoods in arid and semi-arid environments.

7 SUMMARY, SYNTHESIS, CONCLUSION AND FURTHER IMPLICATIONS

This study assessed pastoral poverty, rangeland degradation and livelihood of pastoralists in Boorana rangeland system. When we see the nexus between rangeland and poverty, rangeland people that dwell in arid and semi-arid region of the world make their livelihood directly or indirectly from rangeland resources. Thus, rangeland has become critically important for the livelihoods of many rural populations, particularly pastoralist. Therefore, combined with other factors rangeland degradation is one of the major factors that leads to pastoral poverty. The changes in rangeland ecology due to encroachment of bushes, human population growth, and change in land use patterns in rangelands due to expansions of cultivation and other land use types are the main driving factors for changes in rangeland. The changes in rangeland ecology and resource degradation reduce pastoral productions and increase the level of poverty, and pastoralist livelihood crisis.

Rangeland, poverty and livelihood of rangeland dwellers are linked in such a way that rangeland resources are the main livelihood support for pastoralist. Activities of rangeland people can also manage or degrade rangeland in different ways. In this study SLF is a guiding framework through which the study assessed the pastoral context of vulnerability, pastoralist livelihood assets and livelihood strategies of households. It was understood that pastoralists context of vulnerability has limited their access to assets. Pastoralists are vulnerable to different states of environmental degradation, socioeconomic and political problems. Vulnerability affects pastoralist access to assets (i.e. social, natural, physical, social, and human). Rangeland resources are the main natural assets for pastoralist. As result of social and environmental problems, rangeland resources are under continuous degradation because of various natural and man-made drivers. Currently Boorana rangeland is in state of worst degradation. Assess to and control over rangeland resources are also affected by various policy, cultural, and institutional processes. Generally, the increased vulnerability of pastoralists and change in livelihood assets, for instance, rangeland resource degradation affects pastoralist's livelihood bases and thereby increase pastoralist level of poverty. Therefore, this research was an attempt to answer the queries of widespread pastoral poverty, rangeland degradation and pastoral livelihood crisis.

Why is Poverty so Persistent in Boorana Pastoralist Areas?

Poverty, marginalization and instability have become the common features of pastoralist in sub-Saharan Africa (Coppock et al., 2017; Little et al., 2008). Though once considered one of the most productive rangelands in East Africa (Cossins & Upton, 1987) the productivity of Boorana rangelands have been rapidly changing and destitutions is widespread. Poverty was assessed from two dimensions. First, understanding poverty from the perspectives of pastoralist themselves was crucial. This is convergent with (Blocker et al., 2013; Narayan & Petesch, 2002) which emphasized that understanding poverty from poor people's perspective is crucial. Second, the study investigated the dimensions and extents of multidimensional deprivations in Boorana rangeland system. Pastoralists perceive that poverty is associated with possessions of livestock assets, dignity, wellbeing, education and enabling environmental factors. Livestock is the main parameters used in defining poverty. This implies that livestock are the backbone of pastoral economy. In Boorana pastoralist areas poverty is now widespread and is multidimensional. The impact of poverty has now become more evident than any time in history. Multidimensional poverty is deeply established in Boorana pastoralist areas. This is consistent with the studies in the other pastoralist areas (Esayas et al., 2019; Jemal et al., 2017). Pastoralists have very poor health system, low level of education and standard of living.

The study found that climate change and variability, deterioration of pasture and water resources, lack of education and over utilizations of resources were the main root causes of pastoral poverty. Impacts of climate change; particularly recurrent drought is the main cause of pastoral poverty. This is convergent with (Kristjanson et al., 2010; Tolera & Senbeta, 2019). In addition, multidimensional poverty was also highly associated with various household demographic characteristics. It was clearly indicated that understanding pastoralist perceptions of poverty is essential to reduce the impacts of poverty. People underlined that diversification of income sources, crop cultivation, improvements of pastoral education, and destocking could help in reducing poverty. This implies the flexibility of pastoralists in embracing different means of living. Beside this, the country's economic growth is also not equally benefiting all groups. Pastoralists are usually at the bottom of the ladder with respects to country's developments. Thus, these kinds of marginalization would further push pastoralist to peril. This implies that reducing pastoral poverty and putting pastoralist issues

on policy agendas has to be priority concerns for policymakers and other stakeholders. Therefore, formulation of pro-pastoralist policies should be the concerns of the government.

The Continuous Degradation of Rangeland Resources and Its Impacts

Rangeland occupy the vast areas of world rangelands and is inhabited with millions of pastoralist often poor, politically marginalized, and dependent on livestock for survival in developing countries (Coppock et al., 2017). Beside sociopolitical marginalization, environmental changes and associated factors put pastoralist on perilous precipice. This is also the case for Ethiopian pastoralist and many areas had already experienced substantial changes. Boorana rangeland systems were once considered one of the most typical and sustainable production system in East Africa (Cossins & Upton, 1987). However, rangeland conditions and traditional land use patterns of Boorana had changed since the 1960s (Angassa & Oba, 2008b; Homann et al., 2008). Gemedo, Maass and Isselstein (2006) indicated that overall rangeland condition appeared to be in a transitional state from good to poor with a downward trend. It is also appealing that the study found the rate and trends of degradations was worse than any time in history.

In the discussion, discussants stressed that "Let alone by Gadaa period, deterioration of rangeland occurs yearly. This year is not equal to last year and the coming year will also not be equal to this year". This has clear message that the future of pastoralist are uncertain. Degradation has highly threatened pastoralist resource base. Currently the potential of Boorana rangelands has been decreasing over time and degradation showed increasing trends. Thus, with current human and livestock population growth rangeland resource would not be able to meet the needs of the pastoralist. Change in rangeland vegetation and ecology, various man-made and environmental and climate change related factors have already been impairing rangeland production. Boorana rangelands are more noticeably characterized by loss of palatable plants and proliferation of unpalatable species and bush encroachments. This is divergent from the study of Elias et al. (2015) which observed decrease in bush land cover. However many of previous studies (Teshome Abate & Angassa, 2016; Angassa & Oba, 2008b; Z. Birhanu et al., 2017; Dalle et al., 2006a; Solomon et al., 2007; Tilahun et al., 2016) indicated that bush encroachment was the main indicator of rangeland degradation. Not only these indicators affected rangeland productivity but also there is observed increase in severity of all indicators of rangeland degradation. Thus, with current population and resource degradation trends rangeland is not going to provide necessary services. The concerns of

policymakers and other stakeholders should be on reducing the impacts of factors driving the changes and devising policies and strategies that are appropriate and suitable for pastoralists.

Among all factors associated with rangeland degradation, climate change and underlying factors has become so severe. East African pastoralist are notable examples of the impacts of climate changes (Kameri-Mbote, 2013; Tolera & Senbeta, 2019). In Boorana rangeland system environmental and climate change has put pastoralist on peril. Prolonged drought, increased dryness and occurrence of climate related diseases have highly reduced rangeland resources potentials and productivity of the pastoralists. Thus, strengthening the adaptive capacity and mitigation options of pastoralists should be priority for policymakers and other stakeholders to reduce the impacts of climate changes. Particularly, water scarcity (Z. Birhanu et al., 2017; Solomon et al., 2007) and recurrent drought (Solomon et al., 2007; Tolera & Senbeta, 2019) were the main bottleneck for Boorana pastoralists. This indicates the needs for interventions on more water development projects in pastoralist areas and on reducing the impacts of recurrent droughts. Overall, the progressive degradation of rangeland resources has jeopardized rangeland production, livestock productivity and human wellbeing in Boorana rangeland system. However, Boorana pastoralists were epitome of risk managers due to their comprehensive indigenous knowledge in rangeland management through customary institutions, mobility, enclosure management and various indigenous social support systems.

Pastoral Livelihood and Sustainable Livelihood Framework

The changes in socioeconomics, political and ecological dynamics have put livelihoods of pastoralists into risks. These changes have put the sustainability of livelihood system into jeopardies. Berhanu (2019) indicated that dwellers of arid and semi-arid areas are highly vulnerable to the impacts of various external and internal shocks. Climate changes (Berhanu, 2019; Megersa, Markemann, Angassa, & Valle Zárate, 2014; Schmidt & Pearson, 2016; Tilahun et al., 2017) and loss of rangeland productivity (Sabyrbekov, 2019) can increase the vulnerability of pastoralist and reduces their resiliency to overcome shocks. Thus, identifying the drivers of changes and working towards minimizing its impacts on pastoral livelihoods is very important. The study assessed pastoral livelihoods and determinants of livelihood strategy of Boorana pastoralists by integrating sustainable livelihood framework into pastoralist livelihood study. Boorana pastoralist mainly depends on livestock production (Tache & Sjaastad, 2010) with cattle being the most valued animal species (Megersa,

Markemann, Angassa, & Valle Zárate, 2014). Livelihoods of Boorana pastoralist have become highly vulnerable to various shocks.

Boorana pastoral household vulnerability has increased as a result of climate changes and resulting crisis due to outbreak of livestock diseases and death of livestock, crop damage, food insecurity and hunger. Further Boorana pastoralist areas are known for heightened boarder conflicts and seasonal fluctuations in the prices, which resulted in the price rise for food items, and price fall for livestock. This context of vulnerability has affected pastoral livelihood assets. Identification of these contexts of livelihood vulnerability would inform policymakers, institutions and other stakeholders that works on the improvements of pastoral livelihoods. Though various factors makes pastoralist vulnerable Boorana pastoralists usually makes active responses and were epitome of risk managers in unpredictable environments. This implies that the efforts of pastoralists to cope with the socioeconomic and environmental dynamics have to be recognized and strengthened. Boorana pastoralists manage the vulnerability to risks by engaging into diverse set of income generating portfolios. Though pastoralism is still the dominant way of living people are now engaging into a diverse range and combination of activities to reduce vulnerability to internal and external shocks. Currently, pastoralist prefers to go for intensive rain-fed farming and non-farm activities, pastoralism, labour works, diversifications, mobility and hired herder as ways of living. It should be understood that engaging into diverse means of living is one of the methods to reduce the impacts of poverty and livelihood crisis in pastoralist areas. Besides diversifying the means of incomes, Boorana pastoralists are also known for indigenous mutual livelihood supports that could support household food security.

Theoretical and Methodological Implications

This research has contributed to the theory and methods for the study of pastoral poverty, livelihood and resource (rangeland) degradation studies. The study of poverty has been relied on theories of multiple origins. Poverty has been theorized from different individual behaviour, culture, political, socioeconomic situations, and geographic perspectives. Different theories of poverty blame individual behaviour, culture and socioeconomic and political structure to poverty of individuals and/or society. In this study, the pastoral poverty was assessed from the perspectives of the society. Pastoralists perceive poverty as lack of livestock, educations, jobs and health to lead a successful life. In the findings of chapter three (paper I), it was indicated that individual consumption behaviours was a cause of poverty,

and thus pastoralists should overcome poverty by returning to forefathers cultural practices. In this sense, the study assessed poverty from individual behaviors and cultural traits. Thus, it is argued that the study had made theoretical contributions by analyzing the pastoralist understanding of poverty. In addition, the use of qualitative method and constructivism paradigm enabled us to understand the social dimensions and construct of belief of pastoralist on pastoral poverty. Further, the study analyzed pastoral poverty from the multidimensional perspectives. Multidimensional poverty index (MPI) was launched to monitor various human development dimensions. MPI is very crucial measures to understand various dimensions of poverty. By using Alkire-Forster method of MPI constructions, this study has made decisive theoretical and methodological contributions in the study of multidimensional poverty of pastoralists.

The study also assessed the historical changes in rangeland conditions, and its impacts. Different ecological theories have been the basis for the understanding of the dynamics and rangeland conditions of Arid and Semi-Arid Lands (ASAL). The applications of equilibrium and non-equilibrium grazing models which respectively assumes the stability and variability in the ecological systems has been the most widely used theories. In chapter five (paper II) the finding of this study tested the applicability of the stepwise degradation model and state and transition model of rangeland degradation. This study envisaged that the rate and trends of degradation of Boorana rangeland is a stepwise process. Stepwise degradation model has five steps. The study identified that various features of degradation under step two and three of rangeland degradation applies to current status of rangeland degradation in Boorana rangeland. Using this model the study clearly indicated the current levels of rangeland degradation in Boorana rangeland. The study also used the state and transition model to describe the indicators of rangeland degradation. This model allowed us describes the vegetation, environmental, human and climatic related indicators of rangeland degradations. Moreover, the study was also based on unique approach to construct pastoralist perceptions of conditions of rangeland based on Gadaa timeline. This approach enabled the researchers to understood dynamics of changes in pastoral resources from one Gadaa period to another. In this regard, the study underlined how Boorana pastoralist can better narrates the conditions of their environment and other important events based on the Gadaa timelines.

The study also revealed various livelihood strategies of pastoralist in Boorana rangeland system. The issues of sustainable livelihoods have become the central issues of debate for

poverty reduction and rural developments. There are different livelihood frameworks and approaches used so far to analyze rural livelihoods, among which SLF is the most widely used. By using SLF, this study implied the importance of applications of SLF into pastoralist livelihood studies.

Generally, this study has analyzed the ontological enquiries of pastoral poverty, livelihoods and rangeland degradations. It was implied that though the views of reality of these problems are well documented in the literature, there are difference in the forms, depth and breadth of problems associated with these realities. However, through scientific inquiries the research has tried to know about those problems.

Implications for Policy and Further Researches

Implications for Policy

Given current status quo of widespread poverty, increased rangeland degradation and pastoral livelihood crisis, sustainable pastoral production would be highly impaired. However, current research is optimistic that poverty can be reduced and pastoral livelihood would be improved. To reduce pastoral poverty, improve pastoralist livelihoods, sustainably manage and utilize rangeland resources there should be enabling institutional frameworks, policy and legal frameworks. This study implied three main areas were interventions and considerations are needed by different actors.

First, to reduce pastoral poverty recognitions of environmental, socioeconomic and political dynamics in pastoral areas and inclusion of pastoralist issues into national and international agendas is very important. It has to be clear that poverty is now more multidimensional in pastoralist areas. Thus, seeing pastoral poverty from multidimensional perspectives and understanding various dimensions and indicators of poverty is essential for any poverty reduction interventions. Therefore, any efforts to reduce pastoral poverty and designing of policies, strategies and institutional framework should consider and based on the issues listed below.

- The federal and regional government should ensure that pastoralists enjoy fair and equitable shares from national economic development by increasing economic opportunities, investment on various development projects and infrastructures, and development of pastoral resources and economies.

- Since possession of livestock is the main indicator of pastoral poverty, more emphasis should be given to removing factors that can reduce livestock productivity. Thus, government and nongovernment organizations should work on reducing the impacts of climate changes and associated ills like recurrent drought, erratic rainfall and degradation of pastures. Further, there should be efforts to increase livestock prices and market linkages.
- Supporting the initiatives of the pastoralist for crop cultivation through establishments of various micro and macro dams in different parts of Boorana and increasing the opportunity for small-scale irrigation.
- Multidimensional poverty is highly entrenched in pastoralist areas. Not only pastoralists are deprived from many dimensions (educations, standard of livings and health) but also they are highly vulnerable.
- The dimension of education was the largest contributor to MPI followed by standard of living and health dimension. Therefore, it is suggested that policy makers and concerned stakeholder should give more emphasis on the improvements of pastoral education and pastoralists standards of living. Thus, developments of education infrastructure and adoption of more flexible approaches and workable models (alternative basic education and herder's night school) of pastoral educations that is suitable and appropriate to the setting of the pastoralist are essential.
- The efforts in reducing poverty should focus on connecting pastoralist to the market centers by establishment of markets at the appropriate locations and in proper radius that connects villages surrounding it at possible shortest distance. Further improving livestock market prices and linkages for pastoralist to sell their livestock at very good prices are essential.

Second, the study puts forward that Boorana rangeland is in state of worst degradation and could be totally converted to bush dominated landscapes overtime. Restoring and rehabilitating rangelands and strengthening of current efforts therefore, require the collective actions of institutions, policymakers and grassroots communities. Such efforts should be based on:

- The management options that incorporates indigenous and ecological techniques of rangeland managements and restorations.

- Recognitions and promotions of indigenous ecological knowledge of pastoralist in arid and semi-arid rangelands.
- Prohibitions of privatization and maintaining of community based zonation and mapping of traditional land use types.
- Working on drought cycle management and raising the awareness of pastoralists on how to change livestock to other assets before onset of drought.
- Minimizing of the adverse effects of drought through pre-drought destocking and reserving of grain and post-drought recovery and restocking where needed.
- Development of water projects that can sustain pastoralist needs.

Third, the study implied that achieving sustainable pastoral livelihood requires policy options and interventions that can improve and support pastoralist ways of life and built on what constitute the dynamics of pastoral livelihoods in arid and semi-arid environments. These kinds of efforts therefore need reducing of what makes pastoralist vulnerable and supporting of pastoralist livelihoods by:

- Reducing the impacts of climate change on pastoralist livelihoods by strengthening, supporting and increasing the adaptive capacity and resiliency of pastoralist.
- Bringing lasting positive peace and harmony in the contested border areas by engagement of various concerned stakeholders.
- Provision of basic infrastructural services such as access to clean water, schools, roads, health facilities, and electricity that can support pastoral livelihood system.
- Supporting of the initiatives of pastoralists to practice different livelihood activities for living.
- In addition, national and international organization and government should support pastoralist to establish their own enterprises and companies. These companies could be Share Company like slaughter houses, tanneries, and enterprises that work on export of meat and live animals.
- Since livestock sector plays a key role in countries economy creating business for pastoralist around what they herd (livestock) and facilitation of market linkages at both national and international level is crucial to transform pastoralist livelihoods. Therefore, organization of pastoralist (individuals, pastoralist youth and business men and women) and facilitation of business opportunities, bank loan and market linkages are very important to improve livelihoods of pastoralists.

Implications for Further Researches

Though Boorana rangeland system is highly researched several issues still begs the concerns of researches. This study on its part has tried to address many issues and refers the following gaps for further researches.

- Climate changes and variability is the main cause of pastoral poverty and livelihood shocks. However, the long-term impacts of climate changes on pastoral household poverty were not covered in depth and thus should be investigated using longitudinal data to better understand climate change-poverty-livelihood nexus.
- Land-use and land cover changes and how this is related with pastoralist perceptions of change in the rangeland conditions based on the Gadaa timeline should be investigated.
- Detail analysis on pastoral household's vulnerability to multidimensional poverty should be investigated to comprehend household's exposure to multiple deprivations.
- Though integrating indigenous and modern ecological rangeland management techniques is widely suggested, still various issues remain unanswered. This study on its part shortfall on the challenges and synergies in integrating indigenous and modern ecological techniques in rangeland managements.
- The research is also required on the contributions, impacts and the effectiveness of various pastoral livelihood improvements programs and projects in Boorana rangeland systems.
- The study also implied that the role of various indigenous livelihood support should be assessed to understand its contributions to pastoral livelihoods.

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APPENDICES

Appendix A: Goodness-of-fit test /Hosmer-Lemeshow test of Logistic Regression

```
. estat gof, group (10)
```

Logistic model for MPov, goodness-of-fit test

```
  (Table collapsed on quantiles of estimated probabilities)

      number of observations =       324
            number of groups =        10
    Hosmer-Lemeshow chi2(8) =      0.68
                Prob > chi2 =      0.9996
```

$p = 0.68 > \alpha = 0.05$. Therefore, we fail to reject H0 and concluded that our model fits the data reasonably well.

Appendix B: VIF (Variance Inflation Factor) For Test of Multicollinearity

```
. vif, uncentered
```

Variable	VIF	1/VIF
headAge	11.63	0.086015
marstatus	7.70	0.129918
membercoop	7.65	0.130678
cookingfuel	6.93	0.144236
hometocent~t	5.82	0.171925
Cultivatel~e	5.41	0.184883
AccessToCr~t	5.21	0.191899
skilltrngLS	5.04	0.198523
Ageles15	5.00	0.200041
HighEducLvl	3.46	0.289050
Habitpurif~r	3.26	0.306801
microFince	2.89	0.345950
ownmobile	2.66	0.375855
Rshiphead	2.34	0.426474
ProdPerHec~p	2.33	0.429543
yearsofsch~g	1.78	0.560611
sanitation~t	1.75	0.572842
TLUown	1.68	0.594526
schoolatte~e	1.58	0.632350
floorofdwell	1.58	0.634907
HHagegret65	1.55	0.647117
Recievingf~d	1.50	0.667274
headLiteracy	1.45	0.687490
Participat~P	1.41	0.707672
headsex	1.40	0.716316
ownradio	1.22	0.818394
InstituMut~t	1.09	0.916527
Mean VIF	3.53	

VIF is not greater than 10. Therefore there is no problem of multicollinearity. Head age is slightly greater than 10 because inclusion of age category (<5 and > 65) in the model.

Appendix C: Likelihood Ratio Test

```
. linktest

Iteration 0:   log likelihood = -124.96098
Iteration 1:   log likelihood = -75.718337
Iteration 2:   log likelihood = -53.142056
Iteration 3:   log likelihood = -42.068172
Iteration 4:   log likelihood = -40.674661
Iteration 5:   log likelihood = -40.633309
Iteration 6:   log likelihood = -40.617674
Iteration 7:   log likelihood = -40.503651
Iteration 8:   log likelihood = -40.499394
Iteration 9:   log likelihood = -40.499379
Iteration 10:  log likelihood = -40.499379

Logistic regression                             Number of obs     =        324
                                                LR chi2(2)        =     168.92
                                                Prob > chi2       =     0.0000
Log likelihood = -40.499379                     Pseudo R2         =     0.6759

------------------------------------------------------------------------------
        MPov |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        _hat |   .9796256    .208622     4.70   0.000     .5707341    1.388517
      _hatsq |  -.0184899   .0660554    -0.28   0.780    -.1479561    .1109764
       _cons |   .0306137   .3009893     0.10   0.919    -.5593145     .620542
------------------------------------------------------------------------------
```

_hatsq is not significant (0.78). Therefore there is no specification problem

Appendix D: Household Questionnaire Survey in English

Introduction

Hello. My name is _____. I am a doctoral student at Addis Ababa University. We are conducting a survey about poverty, vulnerability, livelihood and rangeland degradation. Your household has been randomly selected to participate in the survey. The aim of this survey is to collect information on food consumption, livelihood, demography, and rangeland degradation. The interview will take about 30 minutes to 1 hour. Your response will assist us to achieve our research objectives.

We assure you that your answers will be completely confidential. Only summary information will be used for analysis, and no individual questionnaire will be made available to any authority. If there is any particular question that you do not like to answer, that will, of course, be accepted.

We greatly appreciate your assistance and we thank you for your cooperation in advance.

[I]. Background information

Questionnaire Number _____ Enumerator's Code _____

Household name/ID _____ Supervisor's Code _____

Kebele Dharrito ☐

Harweyyu ☐

Aade Galchat ☐

Hiddii Aalle ☐

Village _____

Date of Interview _____

[II]. Demography and education attainment

	1.	2.	3.	4.	5.	6.	7.
	Household name/Id	Sex of household head 1. Male 2.Female	Age of household head	What is your relationship with HH	Marital status 1.single 2.married(monogamous) 3.mareied (polygamous) 4.Widowed 5.Divorced	Household size	Number of household members age <15
Answer							

	8.	9.	10.	11.	12.
	Number of working age (15-65)	Number of household members age >65	Literacy level of household head 1.Non-literate, 2.Read and write.	Education level of household members 1.grade (1-4)_____ 2.grade (5-8)_____ 3.grade (9-12)_____ 4.College _____ 5.University_____	How many of your household members aged 10 and above completed 6 years of schooling?
Answer					

	13.	14.	15.	16.	17.
	How many school-age children are not attending grade (1 to 8)	Were any of household members absent from school last month for more than a week? 1.Yes 2.No **If No (➢Q16)**	If your answer for **Q14 is 'yes'**, what was the main reason for being absent from school? **Multiple responses are possible.**	During the past 12 months, what did your household spend on school fees? **Birr**	During the past 12 months, what did your household spend on school books, uniforms, stationary etc. for school? **Birr**
Answer					

Codes for Q4

Head.....1
Spouse.....2
Son/Daughter.....3
Grandchild.....4
Father/Mother……5
Sister/Brother …… 6
Niece/Nephew.....7
Uncle/Aunt..... 8
Son/Daughter In-Law... 9
Father/Mother In-Law.. 10
Brother/Sister In-aw……..11
Grandparents……....12
Non Relatives..... ……..13

Codes for Q15

Sick ----------1
Death in the Family----------2
Had to work----------3
Had to keep cattle----------4
Had to keep goats----------5
Had to keep calves----------6
Had to water livestock----------7
To collect hay----------8

[III]. Social asset

	1.	2.	3.	4.	5.	6.	7.
	Have you and/or other HH members had skill training to engage in more	If your answer for **Q1 is yes,** who gave you the training? 1.NGOs 2.Government	What was the training about? **Multiple responses are possible.** 1.Livelihood improvement	What are the benefits of having such training? **Multiple responses are possible.** 1.skill development 2.learns new coping	Are there any micro-finance institutions in your kebele? 1.Yes	If your answer for **Q5 is yes,** do you and your household member	What benefits did you gain from this credit? 1.No

	returning livelihood strategies 1.Yes 2.No **If No (➢Q5)**		2.destocking 3.livestock disease 4.water 5.rangeland management 6.cooperatives 7.education 8.different social issues	mechanisms 3.opportunity to engage in more returning LS	2.No **If No (➢Q8)**	have access to rural credit? 1.Yes 2.No	benefit 2.bought hay for livestock 3.Bought grain 4.assist others 5.pay school fees
Answer							

	8.	9.	10.	11.	12.
	Does you and your household members are members of the cooperative union? 1.Yes 2.No **If No (➢Q10)**	If your answer for **Q8 is yes,** what are the benefits you gained? 1.No benefit 2.credit 3.training	Is your household is a member of institutions for mutual assistance? 1.Yes 2.No **If No (➢Next section)**	If your answer for **Q10 is yes,** how your household participate in mutual assistance? **Multiple responses are possible.** 1.Lending dabare 2.receiving dabare 3.Buusa-gonofa 4.Marroo	If your HH lends dabare, in what form? **Multiple responses are possible.** 1.Oxen 2.Milk cow
Answer					

	13.	14.	15.	16.
	If your HH receives dabare, in what form? **Multiple responses are possible.** 1.Oxen 2.Milk cow	If your HH participates in buusa-gonofa at what level? 1.warra/family 2.subclan/miiloo 3.clan/gosa 4.village 5.Cluster/reera 6.Madda/water points 7.Dheeda/Grazing units 8.Boorana wise	If your households participate in buusa-gonofa what you offer to others? **Multiple responses are possible.** 1.milk 2.Oxen 3.Milk cow 4.Grain	If your households participate in buusa-gonofa what you receive from others? **Multiple responses are possible** 1.milk 2.Oxen 3.Milk cow 4.Grain
Answer				

[IV]. Household access to health

	1.	2.	3.	4.	5.
	Have you and any other members of the household consulted any medical assistance from health institutions during the last 2 months? 1.Yes 2. No **If No (➢Q4)**	Have you and any other members of the household consulted any medical assistance from traditional healers during the last 2 months? 1.Yes 2. No **If No (➢Q5)**	If your answer **Q1 is 'yes',** where did you or others received or consulted medical assistance primarily? **Multiple responses are possible.** 1.Hospital 2.Health center 3.Clinics 4.Pharmacy	If your answer for **Q1 is 'No',** what was the main reason? **Multiple responses are possible.** 1.Lack of money 2.Expensive 3.Too far 4.Do not believe in medicine 5.Lack of health Professional 5.Poor quality/ service 6.Did not require medical Assistance 7.No body was sick	If your answer for **Q2 is 'No',** what was the main reason? **Multiple responses are possible.** 1.Do not believe 2.Poor quality 3.they do not exist 4.too far
Answer					

	6.	7.	8.	9.	10.	11.
	Have you and any other member of the household faced any health problem during the last one year? 1.Yes 2. No **If No (➢Q9)**	If your answer **Q6 is 'yes'** what was the sickness/injury you or others faced? 1.Malaria 2.Diarrhea 3.Injury 4.Dental 5.Eye disease 6.Skin Disease 7.Ear/Nose/Throat 8.Tuberculosis	For how many days were you or others absent from the usual activity due to the health problem during the last 2 months? **Numbers of days**	How do you rate the quality of health services in your kebele? 1.Very high 2.High 3.Moderate 4.Poor 5.Very poor	Has any child has died in the family in the five-year period preceding the survey? 1.Yes 2. No	What is the amount of expenditure of your household for health in the last one year (12 months)? in **Birr**
Answer						

[V]. Standard of living

	1.	2.	3.	4.
	Do your household have access to electricity? 1.Yes 2.No **If Yes (➢Q3)**	If your answer **Q1 is 'No'** what is the main source of light for the household? 1.Firewood 2.Kerosene light Lamp (fanos) 3.Local lamp (Kuraz)	What is the main source of drinking water during the rainy season? 1.Piped water 2.Public tap 3.Borehole/pump 4.Protected well /spring 5.Unprotected well/spring. 6.River/lake/pound 7.Rainwater	What is the main source of drinking water during the dry season? 1.Piped water 2.Public tap 3.Borehole/pump 4.Protected well /spring 5.Unprotected well/spring. 6.River/lake/pound

Answer				

	5.	6.	7.	8.
	What is the average walking distance from home to a water source (in minutes)? (single trip) Dry season _____ Rainy season _____	What is the habit of a household to purify water before drinking? 1.No habit 2.Boiling 3.Chemicals 4.Rely on bottled water	What type of toilet facilities does the household use? 1.Pit latrine private 2.Pit latrine shared 2.Field/forest	What are the materials the walls of the main dwelling made of? 1.Wood and mud 2.Wood and thatch 3.Wood only 4.wood, mud, and cement 5.Blocks, plastered with cement
Answer				

	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
	What are the materials the roof of the main dwelling is made of? 1.Corrugated iron sheet 2.Thatch 3.Wood and grass 4.Wood and mud	What are the materials the floor of the main dwelling is made of? 1.Natural/earth 2.Mud/dung 3.Cement	What type of kitchen does the household use? 1.No kitchen 2.traditional kitchen inside the house 3.traditional kitchen outside the house	What are material you used for cooking? 1.Dung 2.wood, 3.charcoal or coal.	Is your household receiving food aid? 1.Yes 2.No **If No (➢Q14)**	If your answer for **Q12 is 'yes'** from whom do you receive food aid? 1.Gov't 2.PSNP 3.NGOs 3.Relatives	Is your household is participating in PSNP currently? 1.Yes 2.No	What is the distance from your home to the center (district town) in km?	What is the distance from your home to the road (asphalt) in km?	What is the distance from your home to the market in km?
Answer										

[VI]. Households Natural Assets and Others

	1.	2.				3.	4.	5.
	What is the total size of cultivated land your household had in a **hectares**?	What is your households' previous year production of main crops in a quantal per hectare?				How do you have access to communal land? 1. freely 2.through customary law	What is the number of live animals your household had? 1.Ox_____ 2.Bull _____ 3.Cow_____ 4.Heifer_____ 5.Calf_____ 6.Goat_____ 7.Sheep_____ 8. Camel_____ 9.horse/mule/____ 10.Donkey_____ 11.Chicken_____	What type of livestock diversity your household had? 1.Cattles only 2.Cattes + Goat 3.Cattles + goat + sheep 4.Cattle + goat + sheep + Camel 5.Cattle + goat + sheep + Camel + equines
		Maize	Teff	Wheat	Beans			
		Sorghum	Barley					
Answer								

	6.				7.	8.
	In your perception what is the condition of the price of livestock in four seasons of the year? 1.Increasing 2.Decreasing				Is your household participates in socio-economic and political activities that concern you? 1.Yes 2.No	What type of means of communication your household had? 1.Cell phone 2.home phone .
	Ganna	Hagayya	Birra	Adoolessa		
Answer						

[VII]. Household durable asset

No.	Item names	1.	2.	3.	No.	Item names	1.	2.	3.
		How many of these items does your household own? **If none record 0**	When did you buy the asset? **Year**	How much did you buy the asset? **Birr**			How many of these items does your household own? **If none record 0**	When did you buy the asset? **Year**	How much did you buy the asset? **Birr**
1.	Blanket/baddoo				8.	Cart (animal-drawn)			
2.	Mattress				9.	Car			
3.	Wristwatch/clock				10.	Water storage pit			
4.	Mobile				11.	Mofer and kember			
5.	Radio				12.	Pickaxe			
6.	Motorcycle				13.	Ox plow			
7.	Bicycle				14.	Shovel			

[VIII]. **Livelihood activities and outcomes**

	1.	2.		3.	4.
	What are/is the main livelihood activities of your household? **Multiple responses are possible.**	What are the primary and secondary activities from your households' livelihood strategy? **Multiple responses are possible.**		Who owns/owned the activities listed under **Q1** in the household? 1.Household head 2. Elder son 3.All family 4.Father 5.Mother	Why your household is practicing livelihood activities listed under **Q1**? 1.to get more income 2.to send children to school 3.to buy grain 4.to by hay
		Primary	Secondary		
Answer					

	5.	6.	7.	8.
	Are livelihood activities listed under **Q1** improved your household's income? 1.Yes 2.No **If No (➢Q8)**	Are livelihood activities listed under **Q1 i**mproved your households well-being? 1.Yes 2.No **If No (➢Q8)**	Are livelihood activities listed under **Q1** reduced your households vulnerability? 1.Yes 2.No **If No (➢Q8)**	If your answer for **Q5, 6 &7 are No,** what are the main constraints to your livelihood strategy?
Answer				

Codes for Q1 & 2

destocking and fattening for market ----------1
intensive rain fed farming + Non-farm----------2
small business in urban centers ----------3
diversification ----------4
rural trade (livestock and its output) ----------5
mobility ----------6
trading chicken and eggs ----------7
selling livestock products to market ----------8
hired as herder ----------9
blacksmithing ----------10
timber production ----------11
petty trade ----------12
motor bike transport services --------13
charcoal making ----------14
buying and selling grain ----------15
broker in livestock market ----------16
renting oxen ----------17
butter trading ----------18
Labour works ----------19
pastoralism ----------20

Code for Q8

Recurrent drought ----------1
Erratic rainfall ----------2
High temperature ----------3
Climate change ----------4
Lack of education ----------5
Lack of adequate labour ----------6
Low skills ----------7
Low infrastructure ----------8
Lack of access to microfinance ----------9

[IX]. Perceptions of Poverty

	1.	2.	3.	4.	5.	6.
	Do you think that there is poverty in your area? 1.Yes 2.No **If No (➢Next Section)**	If your answer for **Q1 is yes,** what do you think are the level of poverty? 1.Very high 2.High 3.Medium 4.Low 5.Very low	In the future, what do you think will happen to this poverty level will? 1.Increases 2.Decreases 3.Stay the same 4.I don't know	What do you think are the root causes of poverty? 1.unemployment 2.poor resource management 3.lack of education 4.reccurent drought 5.price fall for livestock 6.Death of livestock 7. inadequate access to clean water 8. inadequate access to nutritious food 9.conflict 10.Lack of infrastructure	Who do you think is responsible to reduce poverty? 1.Government 2.NGOs 3.Abba Gadaas 4.Community 5.Household	What would you suggest on poverty reduction? 1.Creation of jobs 2.Youth empowerment 3.Destocking 4.Shifting to drought-resistant livestock 5.Improved access to basic services 6. Non-farm activities 7. Engagement in farming activities
Answers						

[X]. Rangeland degradation

	1.	2.				3.			
	Have you observed the problems of rangeland degradation in your area? 1.Yes 2.No **If No (➢Q4)**	If your answer for question **Q1 is 'yes'** what was/are the rate/degree of rangeland degradation during these four Abba Gadaas[31]? 1.highly degraded 2.moderately degraded 3.slightly degraded 4.improved 5.No change				If your answer to **Q1 is 'yes',** what are the trends of rangeland degradation from Boru Madha? 1.Increased 2.Decreased 3.Improved 4.No Change			
		Boru Madha	Liban Jaldesa	Guyo Gobba	Kura Jarso	Boru Madha	Liban Jaldesa	Guyo Gobba	Kura Jarso
Answer									

[31] Gadaa period for Abbaa Gadaas; Boru Madha (1992-2000), Liban Jaldessa (2000-2008), Guyo Gobba (2008-2016) and Kura Jarso (2017-present)

	4.	5.	6.	7.
	What are the main sources of water for livestock during the rainy season? **Multiple responses are possible.** 1.Small pond 2.Shallow wells/adaadi 3.Tulaa/deep wells 4.Small lakes 5.Natural pool/dambalaa	What are the main sources of water for livestock during the dry season? **Multiple responses are possible.** 1.Small pond 2.Shallow wells/adaadi 3.Tulaa/deep wells 4.Small lakes 5.Natural poor/dambalaa	What is the average walking distance from home to watering points in minutes? 1.Small pond_____ 2.Shallow wells_____ 3.Tulaa/deep wells_____ 4.Small lakes_____ 5.Natural pool/dambalaa____	What is the average walking distance to grazing heads in minutes? During rainy season _____ During the dry season _____
Answer				

	8.	9.	10.
	During time of severe rangeland degradation, what do you do to overcome the threats? **You can choose more than one answer.**	If you practice mobility, how you categorize your herds? 1.Mobile herds/Loon foora 2.Homestead herds/Loon warra 3.Cows/Haawicha	What are the levels of institutions for rangeland management? **Multiple responses are possible.** 1.Gadaa 2.Raaba 3.Yaa'a 4. Ardaa 5.Reera 6.Dheeda 7.Ollaa 8.Warraa
Answer			

Codes for Q8

Mobility ----------1
Institutions at different levels ---------2
Reserve closure ----------3
Migration ----------4
Making and reserving hay ----------5
Sell livestock ----------6
Herd diversification ---------- 7
Splitting cattle into different categories ---------- 8
Seek for relief ---------- 9
Cut and carry forages for livestock ---------- 10
Collection and storing stalks of grain ----------11
Shifting to more resistant livestock species --------12

No.	Indicators of rangeland degradation	11. What are the indicators of rangeland degradation during the period of four Abbaa Gadaa? **Put '✓' mark if indicators listed are there during the period of Abba Gadaa?**				12. What is the severity of these indicators of rangeland degradation? 1.Increased 2.Decreased 3.No Change			
		Boru Madha	Liban Jaldesa	Guyo Goba	Kura Jarso	Boru Madha	Liban Jardesa	Guyo Goba	Kura Jarso
Vegetation									
1.	Loss of palatable plant								
2.	Proliferation of unpalatable species								
3.	Loss of vegetation								
4.	Loss of litter								
5.	Decline in plant density								
6.	Bush encroachment								
Biodiversity									
7.	Loss of biodiversity								
Rangeland production									
8.	Decline in forage production								
9.	Low grazing capacity of rangeland								
10.	Overgrazing								
11.	Increased distance to grazing head								
12.	Livestock population pressure								
Human									

Impacts of rangeland degradation	13. What are the impacts of rangeland degradation during the period of four Abbaa Gadaa? **Put '✓' mark if impacts listed are there during the period of Abba Gadaa?**			
	Boru Madha	Liban Jardesa	Guyo Goba	Kura Jarso
Livestock production				
1. Reduced animal production				
2. Outbreak of livestock disease				
3. Death of livestock				
4. Livestock emaciation				
5. Rapid fall in livestock price				
Rangeland productivity				
6. Reduced rangeland productivity				
7. Reduced grass cover				
Human impacts				
8. Social network weakened				
9. Decline in traditional coping mechanism				
10. Conflicts				
11. Food insecurity				
12. Increased poverty				
13. Dependency on food				

											aid				
13.	Privatization of grazing land										Environmental				
14.	Human population pressure										14. Prolonged Drought				
15.	Deterioration of water points										15. Climate-related disease				
16.	Conversion of pastureland to farmland										16. Increased dryness				
Climatic															
17.	Extreme temperature														
18.	Drying up of wells and ponds														
19.	Lack of water for livestock														
20.	Changes in average rainfall														
Environmental															
21.	Increase of soil erosion and runoff														
22.	Bare soil														

[XI]. Shocks

No.	**Shocks**	1.	2.				3.		1.
		Was your household affected negatively by [SHOCK]? 1.Yes 2.No **If No (➢Next shocks)**	What happened to the below items as a result of these shocks 1.Increase 2.Decrease 3.Not Changed				Rank the three most significant shocks you experienced 1.first most severe 2.Second most severe 3.Third most severe		How many livestock are dead due to drought?
			Income	Asset	Food stock	Food purchase			1.Oxe_____ 2.bull_____ 3.cow _____ 4.heifer _____ 5.Calf _____ 6.Goat _____ 7.Sheep_____ 8. Camel_____ 9.horse/mule/_____ 10.Donkey_____
1.	Death of household member (Main bread earner)								
2.	Illness/death of the household member (child <5)								
3.	Recurrent drought								
4.	Death of livestock								
5.	Outbreak of livestock disease								
6.	Crop damage								
7.	Price fall for livestock								
8.	Price rise for food items								
9.	Ethnic conflict								
10.	Food insecurity								
11.	Hunger								

Appendix E: Household Questionnaire Survey in Afaan Oromoo

Gaaffii warraa

Seensa

Nageenni badhaadha? Maqaan kiyyaa_____. Anin Yunvarsitii Finfinneetti P.h.D. barachuutti jira. Nu waan hiyyummaa, carraa hiyyoomuu, mala bultii fi barbadaa lafa marraa irratti qorannoo gegeessuutti jirra. Warri keessan qorannoo tanaaf filatame jira. Kaayoon gaaffiiwan tanaa ragaalee hiyyummaa, mala bultii fi barbadaa lafa marraa guuruudha. Gaaffii fi deebiin tun yeroo daqiiqaa 30 haga saatii 1 fudhachuu dandeetti. Deebiin teessan kaayoo qorannoo tanaatiif guddoo nu gargaarti.

Deebiin teessan nu'uma waliin turti. Waan nu itti fayyadamnu malee, waan isan gaafannee qaama biraatiif dabarsinee hin keninu.

Gargaarsa gaaffilee tana deebisuun isan nuu tolchitan goddoo ajaa'ibsiifanna. Gaaffiiwan armaan gadii tana deebisuu keessaniif horaa bulaa deebana jenna.

[I]. Background information (Ragaa bu'uuraa)

Lakkoofsa gaaffii _____ kooddii gaafataa _____

Warrii ka eennuu? _____ kooddii suparvayisaraa _____

Ganda Dharrito ☐
Harweyyu ☐
Aade Galchat ☐
Hiddii Aalle ☐

Ollaa _____

Guyyaa gaaffii _____

[II]. Demography an education attainment (Dimograafii fi haala barnoota)

	1.	2.	3.	4.	5.	6.	7.
	Warrii ka eennuu?	Warra keessan dhiira mo dhalaatti bulcha 1.Dhiira 2.Dhalaa	Ganni nama warra keessan bulchu hagamii?	Ati warra kanaa maan taata?	Haala fuudha 1.Hin fuune 2.Ya fuudhe 3.Lamaa ol fuudhe 4.Gursummaa 5.Addaan baane	Baayyinnaa warra kana	Namii gannaa 15 gadii hagamii?
Deebii							

	8.	9.	10.	11.	12.
	Namii gannaa **15-65** hagamii?	Namii ganna **65 olii** hagamii?	Sadarka barnoota nama warra bulchuu 1.Hin baranne 2.Dubbisuu fi barreessuu	Sadarkaa barnoota miseensota maatii. 1.kutaa (1-4)_____ 2.kutaa (5-8)_____ 3.kutaa (9-12)_____ 4.koolejjii _____ 5.yunivarsitii_____	Maatii tana keessaa namii ganna 10 fi achii olii hagamiitti **kuta 6** fixe?
Deebii					

	13.	14.	15.	16.	17.
	Ijjoolleen gannii barnoota gahee hagamiitti **kutaa (1 haga 8)** hordofuutti hin jirre? ***Yo warri ijjoollee barnoota geette hin qabnee bira dabri***	Ji'aa dabree keessaa maatii teessan keessa, namii torbaan tokkoo oli barumsa irraa hafe jira? 1.Eeye 2.Iyyoo **Yo Iyyoo (➢G16)**	Yoo deebiin **G14, eeyee taatee** sababii barumsaa hafaniif maan? **Deebii tokkoo oli deebisu dandeetta**	Ji'aa 12 keessatti wannii maatiin teessan galmee (baasii) barnootaaf baafte birrii hagamii? **Birrii**	Ji'aa 12 keessatti wannii maatiin teessan kitaaba, yunifoormii fi dabtaraaf baafte birrii hagamii? **Birrii**
Deebii					

Kooddii Gaaffii 4ffaa

Nama warraa bulchu.....1
Abba/Haadha warraa.....2
Ilma/Intala.....3
Akaaku/grandchild.....4
Abbaa/Haadha…….5
Obboleessa/leettii……..6
Abboo diqqaa.....7
Abbuyyaa/Areera.....8
Muca sodda/Niiti Ilma.. 9
Abbaa/Haadha Soddaa 10
Soddaa……..11
Akaaku/grandparents…….12
Omaa hin ta'u..... ……..13

Kooddii Gaaffii 15ffaa

Fayyaa dhabe----------1
Namatti nurraa jaare----------2
Hojii hojachuuf----------3
Loon tisse----------4
Re'ee tisse ----------5
Yabbii tisse ----------6
Horii oba dhahe ----------7
Okaa haamuu dhaqe ----------8

[III]. Social asset (Qabeenna Hawaasaa)

	1.	2.	3.	4.	5.	6.	7.
	Warra keessan keessaa namuu leenjii waan mala	Yo deebiin **gaafii 1 eeyee**, **taatee** eenuutti leenjii isanii kenne? 1.NGO	Leenjii akkamii fudhatan? **Deebii tokkoo oli deebisu dandeetta** 1.Fooya'iinsa bultii 2.Horii diqqeessu	Leenjii akkana fudhachuun faayidaa maali qabdi? **Deebii tokkoo oli deebisu dandeetta**	Waldaan liqee fi qusannaa ganda keessan keessa jira?	Yo deebiin **gaafii 5, eeye taatee**, warrii keessan waldaa	Liqee fi qusannaa irraa faayidaa maalii argattan? 1.Omaa

	bultii fudhatee? 1.Eeye 2.Iyyoo **Yo Iyyoo (➢G5)**	2.Mootummaa	3.Dhukkuba horii 4.Bishaan 5.Eegumsa lafa marraa 6.Waldaa 7.Barnoota 8.Hawaassummaa	1.Dandeettii guddifachu 2.Mala bultii haara barachuuf 3.Carra mala bultii bu'aa qabu hojachuu	1.Eeye 2.Iyyoo **Yo Iyyoo (➢G8)**	liqee fi qusannaa kana keessa jiraa? 1.Eeye 2.Iyyoo	2.Okaa looni bitanne 3.Midhaan bitanne 4.Namaan Gargaarre 5.Baasi M/barnoota baamne
Deebii							

	8.	9.	10.	11.	12.
	Warra keessan keessaa namuu waldaa hojii gamtaa keessa jiraa? 1.Eeye 2.Iyyoo **Yo Iyyoo (➢G10)**	Yo deebiin **gaafii 8 eeye taate**, faayida akkamii irraa argatan? 1.Fayida hin qabdu 2.Liqee 3.Leenjii	Warrii keessan walgargaarsa gosaa (Boorana) keessa jiraa? 1.Eeye 2.Iyyoo **Yo Iyyoo (➢Kuta itti aantu)**	Yo deebiin **gaafii 10 eeye** taate akkamiin walgargaarsa keessatti hirmaattan? **Deebii tokkoo oli deebisu dandeetta** 1.Dabaree kenina 2.Dabare fudhanna 3.Buusa-gonofa 4.Marroo	Yo dabaree kenitani maan fa'aa kenitani? **Deebii tokkoo oli deebisu dandeetta** 1.Qotiyyoo 2.Sa'a aananii
Deebii					

	13.	14.	15.	16.
	Yo dabaree fudhatanii maan fa'aa fudhattani? **Deebii tokkoo oli deebisu dandeetta** 1.Qotiyyoo 2.Sa'a aananii	Buusaa-gonofaa sadarkaa kamiitti keessa jirtani? **Deebii tokkoo oli deebisu dandeetta** 1.warra/family 2.Miiloo 3.Gosa 4.ollaa 5.Reera 6.Madda 7.Dheeda 8.Boorana	Yo buusaa-gonofaa keessa jiraattan waan akkamii kennitan? **Deebii tokkoo oli deebisu dandeetta** 1.Aanani 2.Qotiyyoo 2.Sa'aa aananii 3.Midhaani	Yo buusaa-gonofaa keessa jiraattan waan akkamii argattan? **Deebii tokkoo oli deebisu dandeetta** 1.Aanani 2.Qotiyyoo 2.Sa'aa aananii 3.Midhaani
Deebii				

[IV]. Household access to health (Tajaajila fayyaa warraa)

	1.	2.	3.	4.	5.
	J i'aa lamaan dabre keessatti warra keessan keessaa namuu mana yaala dhaqee? 1.Eeye 2.Iyyoo **Yo iyyoo (➢G4)**	Ji'aa lamaan dabre keessatti warra keessan keessaa namuu mana yaala aadaa dhaqee? 1.Eeye 2.Iyyoo **Yo iyyoo (➢G5)**	Yo deebiin **gaafii 1 eeyee taatee**, eessatti yaala argattan? **Deebii tokkoo oli deebisu dandeetta** 1.Hospitaala 2.Jiddu gala fayyaa/Extension 3.Kilinika 4.Farmaasii	Yo deebiin **gaafii 1 iyyoo** taatee, maaniif mana yaala hin dhaqin? **Deebii tokkoo oli deebisu dandeetta** 1.Birri dhabne 2.Gatiin guddoo 3.Fagoo 4.Kiniinatti hin amanu 5.Ogeessi fayyaa hin jiru 5.Tajaajilii yaraa 6.Kiniinii na hin barbaachisu 7.Namu fayya hin dhabne	Yo deebiin gaafii 2 iyyoo taatee, maaliif mana yaala aadaa hin dhaqinaa? **Deebii tokkoo oli deebisu dandeetta** 1.Itti hin amannu 2.Tajaajili yaraa 3.Warrinu hin jiru 4.Fagoo
Deebii					

	6.	7.	8.	9.	10.	11.
	Ganna tokko keessatti namuu warra keessan keessaa fayyaa dhabee? 1.Eeye 2.Iyyoo **Yo iyyoo (➢G9)**	Yo deebiin **gaafii 6 eeye taatee**, fayya dhabii maan? 1.Biinnii 2.Albaatii/garaa kaasaa 3.Madaa 4.Ilkaan 5.Dhukuba ilaa 6.Dhukuba gogaa 7.Gurra/funaan/kokkee 8.Tiibii/TB	Ji'a lamaan dabree keessatti guyyaa hagami sababa dhukubaatiin warra keessan keessaa namii hojii irraa hafe? **Guyyaa hagami?**	Qulqullinaa tajaajila fayyaa ka ganda keessanii akkamiitti laalta? 1.Akka malee guddaa 2.Guddaa 3.Jidduu galeessa 4.Yaraa 5.Akka male yaraa	Ganna shan ka dabree keessatti maatii teessan keessaa daa'imii du'ee jiraa? 1.Eeye 2.Iyyoo	Ganna tokko keessatti fayyaaf jettanii birrii hagami baaftan akka warraatti? **Birrii**
Deebii						

[V]. Standard of Living (Sadarkaa Bultii)

	1.	2.	3.	4.
	Akka warra keessaniitti ibsee elektriikaa qabduu? 1.Eeye 2.Iyyoo **Yo Eeye (➢G3)**	Yo deebiin **gaafii 1 iyyoo taatee**, mana keessatti maan ibsatan? 1.Qoraani 2.Faanosii 3.Kuraazii	Yeroo gannaa bishaan dhugaatii eessaa waraabattan? **Deebii tokkoo oli deebisu dandeetta** 1.Bishaan tuubboo 2.Boombaa uummataa 3.Bishaan paampii/borehole 4.Eela/burqaa kan eegamu 5. Eela/burqaa kan hin eegamne 6.Laga/Haroo/qabaa 7.Bishaan bokkaa	Yeroo bonaa bishaan dhugaatii eessaa waraabattan? **Deebii tokkoo oli deebisu dandeetta** 1.Bishaan tuubboo 2.Boombaa uummataa 3.Bishaan paampii/borehole 4.Eela/burqaa kan eegamu 5. Eela/burqaa kan hin eegamne 6.Laga/Haroo/qabaa
Deebii				

	5.	6.	7.	8.
	Manaa haga fula bishaan warraabattaniif **daqiiqaa** hagami deemtan? **Dhaqa qofa** Yeroo bonaa _____ Yeroo gannaa _____	Adoo hin dhuginuu akkamiin bishaan qulqulleefattan? 1.Hin qulqulleefannu 2.Hoowisuu 3.Keemikaala/bishaan gaarii 4.Aylaandii bitanna	Mana fincaanii ka akkamiitti fayyadamtan? 1.Mana fincaanii dhuunfaa 2. Mana fincaanii uummataa 2.Raasaa	Girgiddaan mana keessanii maan irraa hojjatame? 1.Mukaa fi dhoobba biyyee 2.Mukaa fi Buuyyoo 3.Mukaa qofa 4.Mukaa, dhoobbaa biyyee fi simintoo 5.Bolokeettii fi simintoo
Deebii				

	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
	Guutuun mana keessani i maan irraa hojjatame? 1.Qorqoro 2.Buuyyoo 3.Mukaa fi Buuyyoo 4.Mukaa fi biyyee	Mana keessani keessii isaa (lafa) maanin midhaaffatan? 1.Lafuma 2.Dhoobba biyyee/dhoqqee 3.Siminttoo	Mana nyaata itti bilcheefattan ka akkamii qabdan? 1.Hin qabdu 2.Mana keessatti bilcheefanna 3.Manaa alaatti bilcheefanna	Maaniini sagalee dhaabatan? 1.Dhoqqee 2.Qoraani 3.kasala	Warrii keessan gargaarsa nyaata (food aid) fudhacha jiraa? 1.Eeye 2.Iyyoo **Yo Iyyoo (➢G14)**	Yo deebiin **gaafii 12 eeye taate**, eennuutti gargaarsa nyaataa isanii kenna? 1.Mootummaa 2.Seeftii neettii 3.NGO 3.Firaa-fiixaa	Warrii keessan sagantaa seeftii neettii keessa jira? 1.Eeye 2.Iyyoo	Warrii keessan magaala aanaa irraa **KM** hagam fagaata?	Warrii keessan karaa gurraacha irraa **KM** hagam fagaata?	Warrii keessan gabbay aa irraa **KM** hagam fagaata?
Deebii										

[VI]. Households Natural Assets and Others (Qabeenna Warraa)

	1.	2.				3.	4.	5.
	Warrii keessan lafa qonnaa hectaara hagam qaba? **Hectaara**	Ganna dabre warrii keessan midhaan kana hectaara tokkoo irraa kintaala hagami argate? **Hectaara**				Lafa marraa ka waliinii akkamiin itti fayadamuu dandeettan? 1.Akka feene (free) 2.Aadaa seera Booranaatiin	Horii armaan gadii kana hagami qabdan? 1.Qotiyyo_____ 2.Korma _____ 3.Haawicha_____ 4.Goromsa_____ 5.Yabbii_____ 6.Re'ee_____ 7.Hoola_____ 8.Gaala_____ 9.Fardaa/Gaangee/____ 10.Harree_____ 11.Lukkuu_____	Gosa horii gadii kana keessa warri keessan kam qaba? 1.Loon qofa 2.Loon + Re'ee 3. Loon + Re'ee + Hoolaa 4. Loon + Re'ee + Hoolaa + Gaala 5. Loon + Re'ee + Hoolaa +
		Badallaa	xaafii	Qamadii	Halquuqa			
		Misingaa	Garbuu					

								Gaala + Gola
Deebii								

	6.				7.	8.
	Akkaa atin yaaduutti gabayaan horii tahaa waqtii gannaa abranii maan fakkaatti? 1.Guddachaa jira/Dansaa 2.Diqaachaa jira/yartuu				Warri keessan hojii hawaasaa, ikoonoomii fi siyaasaa keessatti hirmaataa? 1.Eeye 2.Iyyoo	Warrii keessan meesha koomunikeeshinii ka akkamii qaba? 1.Moobaayilii 2.Bilbila manaa .
	Ganna	Hagayya	Birra	Adoolessa		
Deebii						

[VII]. Household durable asset (Qabeennaa Dhaabataa)

Lakk	Maqaa	1.	2.	3.	Lakk	Maqaa	1.	2.	3.
		Warrii keessan waan kana hagami qaba? **Yo hin qabne 0**	Yoom bitattani? **bara**	Birrii hagamiin bittan? **Birrii**			Warrii keessan waan kana hagami qaba? **Yo hin qabne 0**	Yoom bitattani? **Bara**	Birrii hagamiin bittan? **Birrii**
8.	Baddoo				15.	Gaarii harree			
9.	Firaashii				16.	Konkolataa			
10.	Saatii				17.	Fulaa bishaan itti kuusan			
11.	Moobaayilee				18.	Qanbara			
12.	Radiyoo				19.	Agaraa			
13.	Motoorii				20.	Gindaa			
14.	Biskileettii				21.	Baawwaa			

[VIII]. Livelihood activities and outcomes (Mala bultii fi faayidaa/bu'aa)

	1.	2.		3.	4.
	Malii bultii ka warraa keessanii kami/maaniin bultan? **Deebii tokkoo oli deebisu dandeetta**	Mala bultii filatte keessaa '**ka qaraa' ykn 'ka lammeessoo'** jedhii addaan nuu baasi? **Deebii tokkoo oli deebisu dandeetta**		Mala bultii ka **gaafii 1 jalatti filattee** warra keessan keessaa eenuutti hojjata? 1. Nama warra bulchu 2. Muca hangafaa 3.Maatii guutuu 4.Abbaa warraa 5.Haadha warraa	Warrii keessan mala bultii ka **gaafii 1 jalatti filattee** maaniif hojjata? 1.Galii argachuuf 2.Ijoollee barumsa erguuf 3.Midhaan bitachuuf 4.Okaa bitachuuf
		Ka qaraa	Ka lammeessoo		
Deebii					

	5.	6.	7.	8.
	Malii bultii ka **gaafii 1 jalatti filattee** galii warra keessanii ya fooyessee? 1.Eeye 2.Iyyoo **Yo Iyyoo (➢G8)**	Malii bultii ka **gaafii 1 jalatti filattee** finna warra keessanii ya fooyessee? 1.Eeye 2.Iyyoo **Yo Iyyoo (➢G8)**	Malii bultii ka **gaafii 1 jalatti filattee** carraa hiyyoomuu warra keessanii ya dhiqqeesee? 1.Eeye 2.Iyyoo **Yo Iyyoo (➢G8)**	Yo deebiin **gaafii 5, 6 fi 7 Iyyoo** taatee, rakkoon jajjabduun akka mala bultii kana isan hin hojjane isan tolchitu maali?
Deebii				

Kooddii gaafii 1 fi 2

Horii diqqeessanii gabayaaf furdisuu --------1
Qonnaa + hoji qonnaa alaa ----------2
Daldala didiqqaa magaalaatti----------3
Mala bultii adda addaa ----------4
Daldala horii fi bu'aa isaa ----------5
Godaanuu ----------6
Daldala lukkuu fi okokaanii ----------7
Aanan gurguruu ----------8
Horii nama tissuu ----------9
Wa tumuu ----------10
Muka/mologaa hojjachuu----------11
Daldala didiqqaa----------12
Tajaajila tiraansiportii motoriin -------13
Kasala gubuu ----------14
Midhaan bituu fi gurguruu ----------15
Dalaalaa loonii ----------16
Qotiyyoo kireefachuu ----------17
Dhadhaa daldaluu ----------18
Hojii humnaa ----------19
Horii horsiisuu ----------20

Kooddii gaafii 8

Bona ----------1
Yareenna roobaa ----------2
Oowwaa hamaa ----------3
Jijjiirama qilleensaa ----------4
Barnoota dhabuu ----------5
Humna nama gahaa dhabu ----------6
Dandeetti diqqoo qabaachuu ----------7
Ijaarsa yaraa --- ----------8
Liqee dhabuu ----------9

[IX]. Perceptions of Poverty (Ilaalcha Hiyyummaa)

	1.	2.	3.	4.	5.	6.
	Akka naannoo teessaniitti hiyyummaan ni jirti jettee yaaddaa? 1.Eeye 2.Iyyoo **Yo Iyyoo (➢Kutaa itti aanu)**	Yo deebiin **gaafii 1 eeye taatee**, sadarkaan hiyyummaa naannoo teessanii akkam? 1.Akka malee guddaa 2.Guddaa 3.Jiddu galeessa 4.Diqqaa 5.Akka malee diqqaa	Fuulduraaf sadarkaan hiyyummaa ka amma kun akkam taha jettee yaadda? 1.Ol guddata 2.Gadi diqqaata 3.Haguma qara 4.Ani hin beeku	Akka naannoo teessaniitti wannii hiyyumma fida maan jettee yaadda? 1.Hojii dhabdummaa 2.Yareennaa kunuunsa qabeennaa 3.Barnoota dhabuu 4.Bona hamaa 5.Diqqeenna gatii horii 6.Du'iisa horii 7.Bishaan qulqulluu dhabuu 8.Sagalee nama finneesitu dhabuu 9.Waraana/waldhabiinsa 10.Ijaarsa gahaa dhabuu	Akka yaada keetiitti eennuutti hiyyummaa diqeessuuf hojjachuu qaba? 1.Mootummaa 2.NGO 3.Abba Gadaa 4.Uummata 5.Warraa	Hiyyummaa akkamiin diqeessuu malan jettee yaadda? 1.Hojii uumuun 2.Dargaggoo jajjabeessuun 3.Horii diqeessuun 4.Horii bona dandamachuu danda'u horisiisuu 5.Kenniisa tajaajila bu'uuraa fooyessuu 6. Hojii qonnaan alaa hojachuun 7.Hojii qonnaa
Deebii						

[X]. Rangeland degradation (Barbadaa lafa marraa)

	1.	2.				3.			
	Naannoo teessaniitti laftii marraa barbadaa qabdii? 1.Eeye 2.Iyyoo **Yo Iyyoo (➢G4)**	Yo deebiin **gaafii 1 eeye taate,** sadarkaan barbadaa lafa marraa Gadaa abba afurii maan fakkaatti? 1.Guddoo barbadaa 2.Barbadaa jidduu galeessaa 3.Barbadaa diqqoo 4.laftii inmarrite 5.Jijjiiramii hin jiru				Yo deebiin **gaafii 1 eeye taate,** Gadaa Boru Madhaatii jalqabee haali barbaadaa lafa marraa maan fakkaata? 1.Barbadaatti guddate 2.Barbadaan ni diqqaatte 3.Lafti inmarrite 4.Jijjiiramii hin jiru			
		Boru Madha	Liban Jaldesa	Guyo Gobba	Kura Jarso	Boru Madha	Liban Jaldesa	Guyo Gobba	Kura Jarso
Deebii									

	4.	5.	6.	7.
	Yeroo gannaa horiin keessan eessa dhuga? **Deebii tokkoo oli deebisu dandeetta** 1.Haroo didiqqoo 2.Eela/Adaadi 3.Tulaa 4.Haroo gugurddoo 5.Dambalaa	Yeroo bonaa horiin keessan eessa dhuga? **Deebii tokkoo oli deebisu dandeetta** 1.Haroo didiqqoo 2.Eela/Adaadi 3.Tulaa 4.Haroo gugurddoo 5.Dambalaa	Mana keessanii kaasee haga fulaa horiin dhuguu **daqiidaa** hagami deemsisa? 1.Haroo didiqqoo _____ 2.Eela/Adaadi _____ 3.Tulaa _____ 4.Haroo gugurddoo _____ 5.Dambalaa _____	Warraa keessanii haga mataa tikaa **daqiiqa** hagamii? Yeroo bonaa _____ Yeroo gannaa _____
Deebii				

	8.	9.	10.
	Yo barbadaan lafa marraa jabaattee akkamiin rakkoo barbadaa jalaa baatan? **Deebii tokkoo oli deebisu dandeetta.**	Yoo ka **godaantan taatee**, akkamiin horii fula fulaatti gargarii baaftan? 1.Loon foora 2.Loon warra 3.Haawicha	Akkaa aadaa seera Booranaatti eegumsii lafa marraa sadarkaa akka akkaa kaha akkamiitti taasifama? **Deebii tokkoo oli deebisu dandeetta.** 1.Gadaa 2.Raaba 3.Yaa'a 4. Ardaa 5.Reera 6.Dheeda 7.Ollaa 8.Warraa
Deebii			

Kooddii gaafii 8

Horii godaansifanna ----------1
Eeggumsa sadarda addaa addaa -------2
Kaloo jaaraanna ----------3
Ni godaannaa ----------4
Okaaa haamannee olkeeyyanna --------5
Horii gurguranna ----------6
Horii akka akkaa horanna ---------- 7
Horii yaasumaan gargarii baamna ---------- 8
Gargaasa fedhanna ---------- 9
Waan horiin nyaatu cirra/haamna ---------- 10
Balkii midhaanii tuulanna ----------11
Horii bona dandamachuu danda'u horsiifanna -----12

Lakk	**Indicators of rangeland degradation/Waan akka laftii marraa barbadaa mullisaa**	11. Gadaa Abbaa afurii wannii akka laftii marraa barbadaa mullisaa maan? **Yo wanni barbadaa lafa marraa mullisa/indicators/ gadaa armaan gadii tan jiraattee '✓' tolchi.**				12. Hammeennii /**severity**/ wantoota barbadaa mullisaa /**indicators**/ kana gadaa Abbaa afurii maan fakkaatti? 1.Guddachaa dhufe 2.Diqqaachaa dhufe 3.Jijjiiramii hin jiru				**Miidhaa barbadaa lafa marraa**	13. Gadaa Abbaa afurii miidhaan barbadaa lafa marraa maan? **Yo miidhaan barbadaa lafa marraa tun gadaa armaan gadii jiraattee '✓' tolchi.**			
		Boru Madha	Liban Jaldesa	Guyo Goba	Kura Jarso	Boru Madha	Liban Jardesa	Guyo Goba	Kura Jarso		Boru Madha	Liban Jardesa	Guyo Goba	Kura Jarso
Vegetation (Mukaa-buuyyoo)										Livestock production (Finna horii)				
1.	Marrii horiin fedhu baduu									17. Finnaa fi bu'aan horii diqqaachuu				
2.	Marrii horiin hin feenee baayyachuu									18. Dhukkuba horii				
3.	Mukaa-buuyyoon baduu									19. Du'a horii				
4.	Obeensii baduu									20. Haaluu/huqquu horii				
5.	Mukeeni haphachuu									21. Horiin gabayaa dhabuu				
6.	Tuseen baayyachuu									Rangeland productivity/Misa lafa marraa				
Biodiversity (Lubbuu qabeeyyii)										22. Laftii marraa finna dhabuu				
7.	Diqqeenna lubbuu qabeeyyii									23. Marrii diqqaachuu				
Rangeland production (Misa lafa marraa)										Human impacts (Miidhaa namaa)				
8.	Laftii marraa misa hin qabdu									24. Walitti dhufeenni diqqaachuu				
9.	Laftinu horii hin qabattuu (Low grazing capacity of rangeland)									25. Malii rakkoo jalaa bahanii diqaachuu				
10.	Dheedumsa humnaa olii (Overgrazing)									26. Waraanaa/Waldhabdee				
11.	Fageenna mataa tikaa									27. Finnaa yaraa (Food				

											insecurity)				
12.	Dhiibbaa baayinna horii										28. Hiyyummaa				
Human (Nam-tolchee)											29. Gargaarsa eegachuu				
13.	Kaloo dhuunfaan jaarrachu/privatization										Environmental (Haala Naannoo)				
14.	Dhiibbaa baayinna uummataa										30. Bona hamaa				
15.	Hammeenna madda bishaanii										31. Dhukkuba qilleensaa				
16.	Laftii marraa qonnaan fudhatamuuu										32. Gogiissa hamaa				
Climatic (Haala Qilleensaa)															
17.	Oowwa hamaa														
18.	Gogiisa haraa fi eela														
19.	Bishaan horiin dhugu dhabamuu														
20.	Diqqeenna roobaa														
Environmental (Haala Naannoo)															
21.	Dhiqama biyyee														
22.	Adaalaa														

[XI]. Shocks (Balaa)

Lakk.	**Shocks/balaa/rakkoo hamtuu**	1.	2.				3.	4.
		Warra keessan rakkoon/balaan armaan gadii tun mudattee? 1.Eeye 2.Iyyoo **Yo Iyyoo (➢Balaa/rakkoo itti aantu)**	Sababa rakkoo/balaa tanaa maanti waan armaan gadii irra dhaqabe? 1.Ol guddate 2.Gadi diqqaate 3.Homa hin jijiiramne				Rakkoo/balaa isan muudattee hamtuu sadii sadarkaan kaa'i. 1.Rakkoo hamtuu duraa 2.Rakkoo hamtuu itti aantuu 3.Rakkoo hamtuu sadeessoo	Sababa bonaa horii hagamiitti isan irraa du'e?
			Gal ii	Qabeen na	Midha an gootar a	Midha an bitachu u		1.Qotiyyo_____ 2.Korma _____ 3.Haawicha_____ 4.Goromsa_____ 5.Yabbii_____ 6.Re'ee_____ 7.Hoola_____ 8.Gaala_____ 9.Fardaa/Gaangee/ ____ 10.Harree_____
1.	Warraa keessa namuu jaaree							
2.	Fayya dhabaa/du'aa ijoollee gannaa 5 gadii							
3.	Bona hamaa							
4.	Du'a horii							
5.	Dhukkuba horii							
6.	Midhaani baduu							
7.	Gatiin horii diqqaachuu							
8.	Gatiin midhaanii guddachuu							
9.	Waraana/waldhabdee							
10.	Finna yaraa (Food insecurity)							
11.	Beela							

Appendix F: Interview, Focus Group Discussion and Observation Checklist

Part I: Checklist for In-Depth Interview with Case Households

Date of interview ____/_____/_____/ Place_____

A. Pastoral understanding of poverty

1. How do you perceive poverty?
2. How do you define and understand poverty?
3. What causes pastoral poverty?
4. Who are poor? How do you characterize them?
5. How do you differentiate the poor and rich?
6. What should be done to reduce poverty?
7. Who do you think is responsible to reduce poverty?
8. How do you evaluate current coping mechanisms of the community against poverty?

B. Livelihood

Shocks

1. What are the main shocks you experienced in your life?
2. What are the most severe shocks? Please rank them.
3. What are the most severe shocks since Gadaa of Boruu Madhaa?
4. What do you think are the causes of these shocks?
5. What happened to your livelihood, income, asset, food stock, and food purchase because of these shocks?

Capitals

1. Life history narratives and human capital

a. Name, age
b. Family size by sex
c. Marriage history
d. Experience and perception towards large family size
e. Labor demand and supply (who can work and who cannot among the members)
f. Literacy and participation in formal education
g. Main health problems in the community
h. Health problems experienced by household members
i. Are there any disabled persons among the household members?
j. What is your wealth status?

2. Natural capitals

a. What are the types of landholding in your area? What is your households' size of land holding?
b. How do you have had access to these lands?
c. What types of lands are communally held? What is your holding condition?
d. Do you have access to clean water for both human and livestock?
e. What are the main sources of water for both human and livestock?

3. Social capital

a. How do you participate in an informal institution (buusaa-gonofaa, dabare) and others?

b. How do you help and receives others help?
c. Are you a member of any cooperative union? How you have access to a cooperative union? What are the advantages and disadvantages of being a member of a cooperative union?
d. Are you receiving rural credit? In what conditions? What are the advantages and disadvantages of receiving rural credit?
e. Does your household receive cash and grain loan?

4. Financial capital

a. What are the size and type of livestock you own?
b. What is your sale from livestock?
c. What are constraints to livestock production?
d. What are the main crops and size of your harvest?
e. What are sales from crops

5. Physical capital

a. Do you have access to basic services [clean water, electricity, roads, schools, markets, extension services (health, agriculture, veterinary)]?
b. Do you have access to market and fair prices for your products?
c. Do you have access to veterinary service?
d. Is there adequate access to livestock medicines?

Livelihood strategy

1. What are the main livelihood activities of your household?
2. What are the primary and secondary livelihood activities?
3. Who is the main bread earner in your household?
4. What are the main outcomes of these livelihood activities?
5. What are the determinants of livelihood activities you had chosen? Are there any losses because of livelihood choices you made?
6. What are other possible promising livelihood strategies you would like to practice?

C. Rangeland degradation

1. Have you observed the problem of rangeland degradation in your area?
2. What is the status and trends of rangeland degradation from Gadaa of Boruu Madhaa to Kuraa Jaarsoo?
3. What are the main indicators of rangeland degradation in your area?
4. Could you tell us the severity of these indicators?
5. What are the major impacts of rangeland degradation from Gadaa of Boruu Madhaa to Kuraa Jaarsoo? What happened to your livelihoods?

Part II: Checklist for Key Informants [Jaarsa Argaa-Dhageettii, Local Elders (Jaarsa Biyyaa) and Village Heads (Abba Ollaa)]

A. Pastoral understanding of poverty

1. Do you think poverty exist in pastoralist contexts?
2. What is poverty? How is it defined?
3. Who are poor? How do you characterize them? How could you differentiate poor and rich?
4. What do you think are the root causes of pastoral poverty?
5. What do you think are the consequences of pastoral poverty? What should be done to reduce poverty? Who do you think is responsible to reduce pastoral poverty?
6. How do you evaluate current coping mechanisms of the community against poverty?

B. Livelihood

Shocks

1. What are the main shocks Boorana have been facing? Rank three most severe shocks.
2. What are the most severe shocks from Gadaa of Boru Madha? What do you think are the causes of these shocks?
3. What are the shocks that are currently threatening the livelihood of pastoralists?
4. What happened to the livelihood of community, income, asset, food stock, and food purchase because of these shocks?

Asset holding of different capitals

1. The literacy level of the community
2. Labour to engage in non-farm activities
3. Types of landholding in the Boorana area, means of access to land, holding condition
4. Access to clean water for both human and livestock
5. What are the main sources of water for both human and livestock?
6. Natural resources in the area, how community utilizes them?
7. Causes of resource overexploitation
8. Management of natural resources in the area?
9. What are the institutions for mutual assistance in the Boorana area (buusaa-gonofaa, dabare) and others?
10. How do Boorana help and receives others help during difficult times?
11. Are there cooperative unions and rural microfinance in pastoralist area?
12. What are the advantages and disadvantages of gaining access to cooperatives and rural microfinance?
13. What are the average size and type of livestock a Boorana household had?
14. What are wealthy condition/history of Boorana from Gadaa of Boru Madha to Kura Jarso?
15. Currently, how do you categorize Boorana into different wealthy categories? What are the criteria?
16. Livestock marker: is price fair? Do pastoralist have standard marker centers?
17. What are constraints to livestock production?

18. What are the major crops grown in the pastoralist area? and what are the average size of each harvest? How about the prices of crops
19. Does Boorana pastoralist have access to basic services [clean water, electricity, roads, schools, markets, extension services (health, agriculture, veterinary)]?
20. Is there access to veterinary service?

Livelihood strategy

1. What is the dominant livelihood systems of Boorana?
2. What are the main livelihood activities of Boorana?
3. Could you tell us three most significant livelihood activities? Why are these livelihood activities so significant? What are benefits pastoralist gained from these livelihood activities?
4. Could you tell us the major constraints of livelihood activity of Boorana pastoralist?
5. What are other possible promising livelihood strategies you would suggest?
6. What do you think are the role of stakeholders (Government, NGOs, and others)?

C. Rangeland degradation

1. In your opinion, is there any problems of rangeland degradation?
2. What are the status and trends of rangeland degradation from Gadaa of Boruu Madhaa to Kuraa Jaarsoo?
3. What are the main indicators of rangeland degradation in Boorana pastoralist?
4. Could you tell us about the severity of these indicators?
5. What are the major impacts of rangeland degradation from Gadaa of Boruu Madhaa to Kuraa Jaarsoo? What happened and has been happening to the livelihood of Boorana?
6. What are the indigenous knowledge of Boorana to overcome the impacts of rangeland degradation?

Part III: Checklist for Discussions with Leader of Gandaa (Bulcha Gandaa) and Development Agents (DA)

1. Structure of kebele, duties, and responsibilities of kebele
2. The main economic activities of kebele
3. Records of kebele administration and DA
   i. Area,
   ii. Economic activity (Livestock and crop production)
   iii. Human and livestock population size
   iv. Agro-climate
   v. Beneficiary of PSNP
   vi. Records of cooperative and rural microfinance
   vii. Land use and cover
   viii. Natural resources of kebeles
   ix. Main extension services
4. Main duties and responsibilities of DA
5. Kebele administration and DAs perceptions:

i. On poverty
   a. How do you perceive about poverty conditions of pastoralist in your kebeles
   b. What are wealthy categories of community in this kebeles? Which wealth category in dominant?
   c. Could you tell us the root causes of poverty, its consequences and coping mechanisms of community in this area?
   d. What would you suggest for poverty reduction? What do you think are the role of government, NGOs and other stokeholds?
   e. Do people are more likely to fall into poverty in the future? Why did you say so? What are the possible indications of future poverty?

ii. On rangeland degradation
   a. What are the conditions of rangeland degradation in this kebele?
   b. Tells us about the status and trends of rangeland degradation from Gadaa of Boru Madha to Kura Jarso. How about the indicators of rangeland degradation? Tell us about the severity of these indicators.

12. What are the major constraints of pastoral production?

Part IV: Checklist for Focus Group Discussions

A. Pastoral understanding of poverty

1. What is poverty? Definitions and its understanding?
2. Who are poor? What are the root causes of pastoral poverty? What are its consequences?
3. What are the main features of poverty? What are the differences between riches and poor?
4. How does pastoralist cope up with poverty?
5. Who do you think is responsible to reduce poverty? How do you evaluate the current coping mechanism of pastoralists?

B. Livelihood (socks, capitals, livelihood strategy)

1. What are the main shocks Boorana have been facing from Gadaa of Boruu Madhaa to Kuraa Jaarsoo? What are the most severe shocks? Please rank them.
2. What was and are the main impacts of these shocks? What happened to livelihood, income, asset, food stock and food purchase of the community?
   a. Is there an occurrence of drought in the past 2 years?
   b. Is there an outbreak of any livestock disease in the past five years?
3. What are wealthy categories of Boorana pastoralists? How do you categorize households into different wealthy categories? What are the criteria?
4. What is a wealthy condition of Boorana pastoralist from Gadaa of Boruu Madhaa to Kuraa Jaarsoo?
5. What are the lowest, highest and average land and livestock holding in your area? How are these holding affects poverty status of household and livelihoods? What type of crops are produced in this area? Livestock holding type?
6. What is the average size of the harvest of different crops in this area? What are the conditions of the sale of livestock and its products? How about sales from crops?
   a. Tell us whether livestock prices for four seasons of the year are increased or decreased.

Livestock price	Ganna	Hagayya	Birraa	Adoolessa
Increased **----1**				
Decreased **---2**				

7. Do this area have access to basic services [clean water, electricity, roads, schools, markets, extension services (health, agriculture, veterinary)]?
   a. What is the distance from this kebele to the center (district town) in km?
   b. What is the average distance from villages to asphalt road in km?
   c. What is the distance from this kebele to the nearest market center in km?
8. What are formal and informal institutions in Boorana? How do Boorana help each other during socks and catastrophic natural calamities?
9. Does this area have access to cooperatives and rural credit? How do you participate in cooperatives and gain access to rural credits?
10. What are the main livelihood activities of Boorana? What are the primary and secondary livelihood activities? What are the major outcomes of these livelihoods? What are the major constraints/determinants of these livelihood activities?

11. Which livelihood activity do you think are sustainable and best suited to pastoralist context? What makes them sustainable and suitable to pastoral context?
12. What the possible promising alternative livelihood strategies would you suggest?

C. Rangeland degradation

1. How do you perceive the problem of rangeland degradation in Boorana?
2. What are the status and trends of rangeland degradation from Gadaa of Boru Madha to Kura Jarso?
3. What are the main indicators of rangeland degradation in your area? Please list them. How about the severity of these indicators? Identify three to five most severe indicators of rangeland degradation
4. What are the major impacts of rangeland degradation from Gadaa of Boru Madha? What happened to your livelihoods?

Part VI: Checklist for Field Observation

1. Environment
    a. Topography (plain, mountains, slopes)
    b. Agro climate
    c. Land use and cover type
    d. Other natural resources (soil type, water resources)
2. Population and culture
    a. Settlement patterns
    b. Housing conditions
    c. Gadaa institutions, social relations
    d. Culture and values
3. Major livelihoods, wealth and poverty situations
    a. Major livelihood systems
    b. Major livestock type and raising practices
    c. Major crops that are grown in the area
    d. Constraints to livelihood systems
    e. Major coping mechanisms
    f. Situations of basic infrastructure (schools, health extensions, veterinary services, roads, electricity, water)
    g. Wealth situations and poverty status
    h. Health conditions of children and olds
    i. Kraal of pastoralists (moona loonii)
4. Rangeland degradation
    a. Status of rangeland: vegetation, species types, and richness, basal cover, density, grass cover
    b. Indicators of rangeland degradation (bush cover, bare soil, overgrazing, grazing capacity)
    c. Impacts of rangeland degradation (emaciation of livestock, dryness, drying up of water points, productivity decline, drought)

Appendix G: Lists of Informants and FGDs

A. Coded Lists of Informants

No.	Code	Status	Woreda	Kebele
1.	InHar/01	Local residents	Yaabello	Harweeyyu
2.	InHar/02	DA/Animal health	Yaabello	Harweeyyu
3.	InHar/03	Extension worker	Yaabello	Harweeyyu
4.	InHar/04	Local residents	Yaabello	Harweeyyu
5.	InHar/05	Local residents	Yaabello	Harweeyyu
6.	InDh/01	Local residents	Yaabello	Dharriito
7.	InDh/02	Local residents	Yaabello	Dharriito
8.	InDh/03	Local residents	Yaabello	Dharriito
9.	InDh/04	Local residents	Yaabello	Dharriito
10.	InDh/05	Local residents	Yaabello	Dharriito
11.	InDh/06	Local residents	Yaabello	Dharriito
12.	InDh/07	Local residents	Yaabello	Dharriito
13.	InDh/08	Local residents	Yaabello	Dharriito
14.	InAd/01	Local residents	Eelwayyee	Aadde Galchat
15.	InAd/01	Local residents	Eelwayyee	Aadde Galchat
16.	InAd/02	Local residents	Eelwayyee	Aadde Galchat
17.	InAd/03	Local residents	Eelwayyee	Aadde Galchat
18.	InAd/04	Local residents	Eelwayyee	Aadde Galchat
19.	InAd/05	Local residents	Eelwayyee	Aadde Galchat
20.	InAd/06	Local residents	Eelwayyee	Aadde Galchat
21.	InAd/07	Local residents	Eelwayyee	Aadde Galchat
22.	InHid/01	Local residents	Eelwayyee	Hiddii Aalle
23.	InHid/02	Local residents	Eelwayyee	Hiddii Aalle
24.	InHid/03	Local residents	Eelwayyee	Hiddii Aalle
25.	InHid/04	Local residents	Eelwayyee	Hiddii Aalle
26.	InHid/05	Local residents	Eelwayyee	Hiddii Aalle

B. List of FGDs Conducted

No.	Woreda	kebele	Number of FGDs conducted	Number of FGD participants
1.	Yaabello	Harweeyyu	1	8
2.	Yaabello	Dharriito	1	12
3.	Eelwayyee	Aadde Galchat	1	7
4.	Eelwayyee	Hiddii Aallee	1	9