SUPPORT FOR SUSTAINABLE DEVELOPMENT

Strengthening Drought Resilience (SDR-1) of the Pastoral and Agro-Pastoral Livelihoods in Afar, Ethiopia

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Field Assessment Draft Report on Rangeland Management & Natural Resources in Afar National Regional State

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Contents

Acronyms

AISDA	Action for Integrated & Sustainable Development Agency
ANRS	Afar National Regional State
BoFED	Bureau of Finance and Economic Development
CSA	Central Statistical Authority
DA	Development Agent
DSFR	Dry Season Forage Reserve
FGD	Focus Group Discussion
FAO	Food and Agriculture Organization
GITEC	German Integrated Technology
KA	Kebele Administration
KII	Key Informants Interview
LUT	Land Use Types
NGO	Non-Governmental Organization
NRM	Natural Resource Management
OSD	Organizational Sustainable Development
PRA	Participatory Rural Appraisal
RL	Rangeland
RPLRP	Regional Pastoral Livelihood Resilience Project
SDR	Strengthening Drought Resilience
SSD	Support for Sustainable Development
SWC	Soil and Water Conservation

Executive SUMMARY

Administratively structured in to five zones and 35 woredas, the Afar region is bordered on the south by Somalia and Oromiya regions, on the Northwest by Amhara and Tigray regions while sharing international borders with Eritrea and Djibouti (Afar, 2018). On the basis of projection made by the Central Statistics Authority (2018), the region has an estimated total livestock population of about 13.4million, which covers around 7% of the national's total livestock. As far as herd composition is concerned, pastoralists in the area keep about five types of livestock to support their livelihood. These include camels, cattle, goats, and sheep being the main species. For herders, livestock production is a major source of foods, income, and also provides self-insurance assets against shocks and risks. Also, livestock like camels are essentially kept to indicate the wealth status of the Afar pastoralists.

Communities in the project-targeted woredas are predominantly pastoralists and are characterized by diversified socio-cultural set ups. The settlement pattern with many of the surveyed woredas is very scattered. But most of the target groups in the selected woredas more or less share similar mode of livelihoods. They have strong social ties and still today exhibit a communal kind of lifestyles. In all villages, access to social services is very limited. Housing conditions is very poor. Conflict is frequent and everywhere. Poverty is rife. Food shortage is worse and common. During data collection, high level of malnutrition is observed among children. From the FGDs, it was learnt that there is presently serious food shortage, extended drought, scarcity of water and shortage of pasture.

Despite the presence of huge potential in livestock production, the sector doesn't support herders to produce enough to feed their families round the year due to a number of constraints including shortage of pasture, scarcity of water, livestock diseases, shortage of feed, frequent drought, and prosopis invasion in to rangeland. In response to these challenges, a project 'Strengthening drought resilience of the pastoral and agro-pastoral livelihoods in the low- lands (Afar) of Ethiopia (SDR-1)'has been initiated in the region in March 2021 with a view to enhancing communities' resilience for improved livestock production and productivity thereby people's livelihoods.

A team of experts drawn from SSD and GITEC was fielded to project woredas to conduct field assessment with respect to rangeland management and natural resources development. This report is therefore meant to present the findings of the assessment that the team has carried out over the course of the field assessment period which took place from 9June through 2July, 2022. Focus group discussions (FGDs), resource mapping, key informant interview, field observation and document review were major tools employed to collect the data.

Based on the findings of the assessment, four major land use types were identified and estimated as rangeland (57%), natural forest (17%), settlement (20%), and irrigated farm land (6%). Though large amount of land has been used for rangeland, FGDs participants raised several times in the discussion that their critical resources has been put under serious damage due to the spread of invasive prosopis juliflora (locally named as "woyane") into rangeland

areas which potentially resulted in reduced pasture available for livestock. Based on the estimate of the FGD participants, on average, more than half (53%) of the available rangeland area in the prosopis affected kebeles has been taken up by the shrub, shrinking available grazing land and its pasture. Pastoralists' efforts in controlling the invasion of the shrub over the grazing land have been very limited and unable to reverse the current trend.

Estimates by FGDs and key informants indicated that up to 60% of households in the surveyed area are said to have migrated with their animals to a grazing area outside their localities during the dry season. This was mainly caused by lack of pasture and scarcity of water. Due to this and other production constraints, just over sixty percent (62.5%) of respondents said that the trend in camel population in the village has been decreasing whereas close to forty percent (37.5%) viewed this trend to be highly decreasing. Similarly, the trend in cattle population was either decreasing or highly decreasing each opinion shared equal percent of the total respondents' view (i.e fifty-fifty). On the other hand, one in eight does belief that the trend in shoat production is increasing however significant majority (>85%) viewed this trend also either decreasing or highly decreasing.

Drought, shortage of pasture, scarcity of water, shortage of rainfall, livestock disease, Invasive of prosopis, limited market access and poor livestock husbandry practices were the major constraints reported to have caused the low-level performance of the livestock sector in the study kebeles. Due to the scarcity of water, substantial livestock are affected and many families regularly move out of their major settlement area. Water usually begins to become scarce as early as November and pastoralists have to walk long distances to get water. Of all, women, children and the poor are the most affected. The assessment result also revealed that water and fuel wood have to be collected on daily basis. Moreover, the study indicated that the average fuel wood consumption per household in the study area is 16.17kg/day for large size, and 11.05kg/day for medium size household while a household having small family size reported to have used about 6.89kg of fuel wood per day.

In view of the above findings, controlling the invasive prosopis juliflora, training and capacity building of pastoralists on rangeland development & management, awareness raising on gender equality, repair and maintenance of non-functional water infrastructures, building the capacity of traditional institutions in rangeland management and conflict resolution, reconsidering customary rangeland management practices *(Desso)*, and consolidating the livestock extension service provision of the local government including promoting improved livestock husbandry practices of pastoralists were recommended as a way forward.

1. Introduction

1.1. General

The Afar National Regional State (ANRS) is located in the northeast part of Ethiopia between 390 34' and 420 28' East Longitude and 80 49' to 140 30' North Latitude (Afar, Atlas 2019). Bordering with Amhara and Tigray regions in the Northwest and by Oromiya and Somali region in the Southwest, ANRS is administratively divided into 5 Zones, and 35 Woredas.

With nearly 185 million heads, Ethiopia ranks first in Africa and tenth in the world in terms of its livestock population (CSA, 2018). Whereas the total livestock population of Afar, the study region is estimated to be 13.4million, which covers around 7% of the country's total livestock as projected by the Central Statistics Authority in 2018. As far as herd composition is concerned, people keep mixed types of livestock with a combination of large and small animals where camels, cattle, goats, and sheep being the main species. Livestock husbandry is a major source of foods, cash income, and also provides self-insurance assets against shocks and risks.

In the study area, the mode of livelihood is predominantly pastoralists having placed significant values in the livestock they keep. Livestock has a pronounced economic and socio-cultural significance for the pastoral communities in the area. In the project sites, it supports the life of the majority of pastoral and agro-pastoral communities, making a greater share of contribution to people's livelihoods. In the traditional Afar wealth ranking system, livestock possession is also used as an indicator of wealth status.

Funded through the Federal Livestock, Agriculture and Natural Resource Bureau (FLA&NRB), a project *'Strengthening drought resilience of the pastoral and agro-pastoral livelihoods in the low- lands (Afar) of Ethiopia (SDR-1)*'has been initiated in the region in March 2021 with the overall objective of enhancing communities' resilience for improved livelihoods. The objective of the project is to be achieved through implementing different components within the SDR-1 framework. Capacity building of the pastoral and agro-pastoral communities with a specific objective of enhancing their capacities in sustainable rangeland management and natural resources development is one of the major components of the project. Under the auspice of the general project agreement, SSD has been implementing these activities in close partnership with GITEC which offers advisory services and is primarily responsible for implementing activities related to clearing of *Prosopis Juliflora* invaded rangelands and reseeding it with improved grass species.

As part of and in accordance to the implementation plan of these project activities, a team of experts drawn from SSD and GITEC was fielded to project sites and target woredas to conduct field assessment with respect to rangeland management and natural resources development. This progress report is therefore meant to provide a brief overview of the field-based activities that the team has carried out over the course of the field assessment period which took place from 9June through 2July, 2022.

1.2. Objectives of the field assessment

- To explore available community resources with respect to rangeland and other natural resources that the local communities use
- To identify key stakeholders working in this space in the project area, along with relevant plans, strategies, and programs/projects that support rangeland management and natural resources development
- To assess and review existing social institutions as well as their roles in regulating rangeland management practices

2. Methodology

Data were collected both from primary and secondary sources. The data gathered for this study were more of qualitative in nature. A variety of tools and methods were used. The steps and procedures followed during the assessment have been briefly discussed as follows.

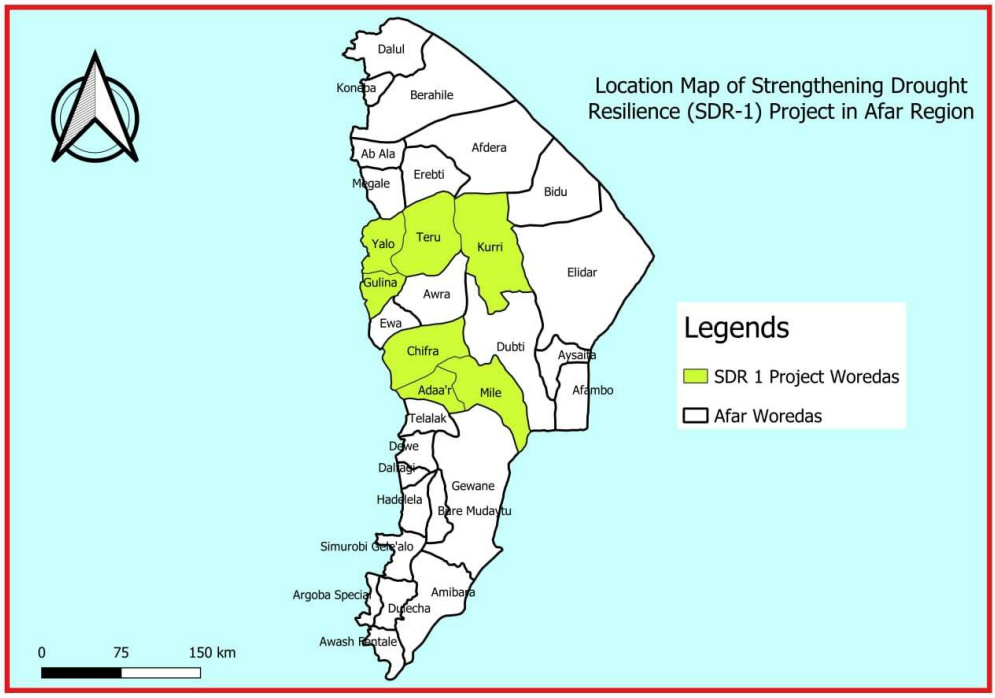
2.1. Who involved?

A team composed of a project lead, a senior expert, and three field-based staff from SSD, as well as GITEC project coordinator (on an *on-and-off* basis) have taken part in the fieldwork to carry out the field level data collection activities which took place from June 9, to July 2, 2022. In each sites visited, the team was accompanied by the respective woreda Livestock Experts, and NRM Experts who are conversant with respect to the thematic issues being studied and have engaged in the data collection activities made at their respective woredas. Also, local facilitators (pastoralists and local experts) who have the technical knowledge and linguistic capabilities were used for translating the interviews. Fortunately, few members in the assessment team can also speak a bit of the local language which helped us probe more information. All these together provided the team an opportunity to have in-depth discussions with and among target communities.

2.2. Study Woredas and kebeles

In the seven woredas where SSD-1 project is implemented, eight kebeles were systematically selected for the study. These were Eli Wuha, Yaldi, 01Mille, Wanaba, Wanasana Harigerbu, Udaíli, Deboha, and Digdiga. Selection of the sample kebeles was made on the basis of the gravity of the problems, significance of the technical themes under study, accessibility, and security situation. The woredas from which these sample kebeles were drawn included: Adaár, Millie, Chifra, Golina, Yallo, and Teru.

Figure 1. Location of Afar region and project-targeted woredas (SSD-1 Project, 2021)



2.3. Data collection tools

The data collection process was simple and participatory. In preparing for conducting the assessment, a checklist was developed to guide the field-level data collection process. A half-day long briefing session on the checklist was held for the assessment team by Chris Annen, GITEC manager, who developed the checklist as well. It was with the help of these guiding questions that the FGDs and KIIs made with communities and experts were made. During the course of the data collection process made with each pastoral community, a short briefing about the objective of the assessment, thematic issues to be focused, and on interview procedures was often provided as an entry point to set the tone for effective and interactive discussion. This introductory note was usually delivered by SSD-community facilitator and woreda experts.

Below were the major tools and techniques used to collect data from the field

- Focus group discussions, and key informant interview with pastoralists, local leaders, and woreda experts
- Ranking and Scoring tools such as preference ranking, pair-wise ranking, wealth ranking, and proportional piling using small gravel stones
- Participatory mapping, field observation (transect method) and triangulation

- GPS references and readings of key features were also taken to describe the available natural and institutional resources and opportunities

Eight FGDs (one in each kebele) involving about ninety-five pastoralists and agro-pastoralists were conducted. Twenty three (24%) of the discussants of the FGDs were females. Moreover, key informant interviews with 23(1female) community representatives were made to get in-depth understanding of the topics under study. Likewise, a total of 19 woreda experts and officials were also interviewed to collect primary data. Secondary data collected from government offices with the help of these experts were also used to triangulate information obtained through FGDs and key informant interviews. Moreover, participatory mapping was used to identify key natural resources, rangeland areas, physical features, infrastructures, administrative boundaries, migratory routes; *prosopis* invaded areas as well as available land use types.

Table1. Distribution of FGDs participants across the eight sampled kebeles.

Kebeles	Woredas	FGD participants		
		Male	Female	Total
Millie 01	Millie	10	3	13
Eli Wuha	Adaár	8	3	11
Yaldi	Adaár	10	3	13
Wanaba	Chifra	11	4	15
W &H	Gulina	10	0	10
Udaili	Yallo	7	3	10
Debaho	Teru	8	3	11
Digdiga	Teru	8	4	12
Total		**72**	**23**	**95**
Percent		**76%**	**24%**	**100%**

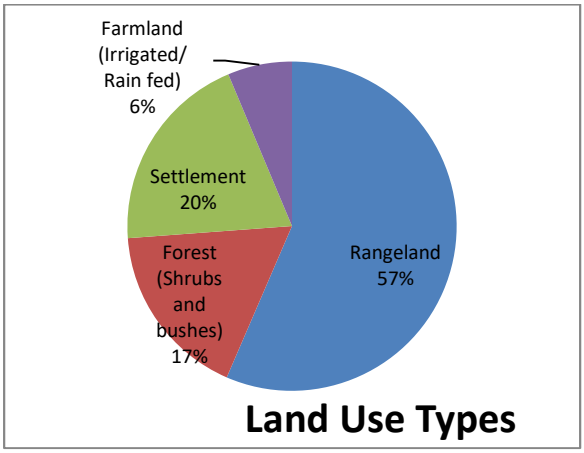
Source: Field Assessment (2022).

3. Findings

3.1. Land Use and Vegetation Cover

The livelihoods assets exist in the surveyed villages constitute a stock of resources ranging from rangeland, forage, large uncultivated land, livestock, water resources, and forest. With regard to the rangeland resources, the project kebeles are endowed with different forage species, trees and shrubs which are serving as sources of feed for livestock, fuel wood, food in the form of edible fruits and roots, forest honey and income, especially for the subsistence pastoralists. The relative importance of these livelihood assets might vary by geographical locations across the Afar region. The result of the current field assessment however highlights that all pastoral communities in the studied kebeles more or less have similar land use arrangements. The eight studied kebeles with a semi-arid ecological characteristic are dominated by bush and shrub vegetation. Various short shrubs, acacia trees, and prosopis in six of the eight kebeles cover large proportion of the studied area's landscape

The interactive FGDs and key informants interview held in each kebele have been used to identify the different land use types practiced in the study area. The discussants participated in the FGDs then identified four major types and their responses included rangeland (57%), natural forest (17%), settlement (20%), and a very small portion of irrigated farm land (6%). In doing so, local materials (100 small pieces of stones) were used where FGD participants allocate the first larger piles of stones on the type of land use that shares larger portions of the total land area compared to the others. The second larger piles of stones to the next larger land use type, and so on. Then, land use percentage for each feature was calculated against the total as indicated in the pie chart below.



Source: FGDs (2022)

As seen from the chart above, larger portion of the land area was used for rangeland and on average, estimated at about 57% of the total land area. Though large amount of land has been used for rangeland, focus group participants raised several times in the discussion that this resources has been put under critical hazard since the introduction of the invasive prosopis juliflora (locally named as *"woyane"*) in to the area. Pastoralists in the study area have had negative experiences of prosopis juliflora over the past two decades. There is little variation among the sampled kebeles with respect to prosopis's impact on grazing land. It was regarded to have a huge potential to damage pasture lands and has caused danger on pastoralists' livestock assets as well. Through time, the rangeland potential of the area has reported to be

significantly deteriorating on top of the sparsely dispersed seasonal grasses, and large portion has already been converted into exposed surface land.

> *"In the past, draught and water shortage were perceived to have caused more danger on livestock production and productivity. Now, the impact of Prosopis juliflora is more devastating for our livestock and natural resources, which may potentially leading to the complete loss of our livelihood,"* as stated by Mohammed Seid, elder and former chairperson of Udaili kebele.

As was mentioned during the discussion, informants noticed that the percentage share of grazing land has been decreased mainly due to the spread of this invasive species. The plant is fast expanding. Based on the estimate of the FGD participants, on average, more than half (53%) of the available rangeland area in the five prosopis affected kebeles has been taken up by the shrub as of this survey reference period. FGDs participants also observed that within a decade and so, there has been a dramatic depletion in the trend of grazing land as a result of which its status has declined in both quality and quantity. Free movements of livestock and communal grazing system have also accelerated the spread of this species as was noted by key informant interview participants.

Though the communal control by pastoralists over natural resources is officially recognized, individual user rights on common grazing lands are not clearly defined in the area (Afar region NRM, 2020). In the absence of secure ownership and clear user rights, pastoralists' efforts in controlling the invasion of the shrub over the grazing land has ended up nowhere and none have reversed the current trend. A skill and capacity gap was also identified among pastoralists to prevent and reverse the trend of prosopis expansion in the area. Thus, unclear user rights and weak institutional set up were clearly hampering effective community-led natural resource regeneration activities. Indeed, a user right over natural resources including grazing land appears to be a policy issue too large for a brief project to get engaged in.

Photo 1. Estimation of land use type Exercise

3.1.1. Resource maps

Major natural resources, infrastructures, physical features, and resources use that are shown in the map drawn by the FGD participants in each kebele are presented below.

Figure 3. Resource maps of kebeles

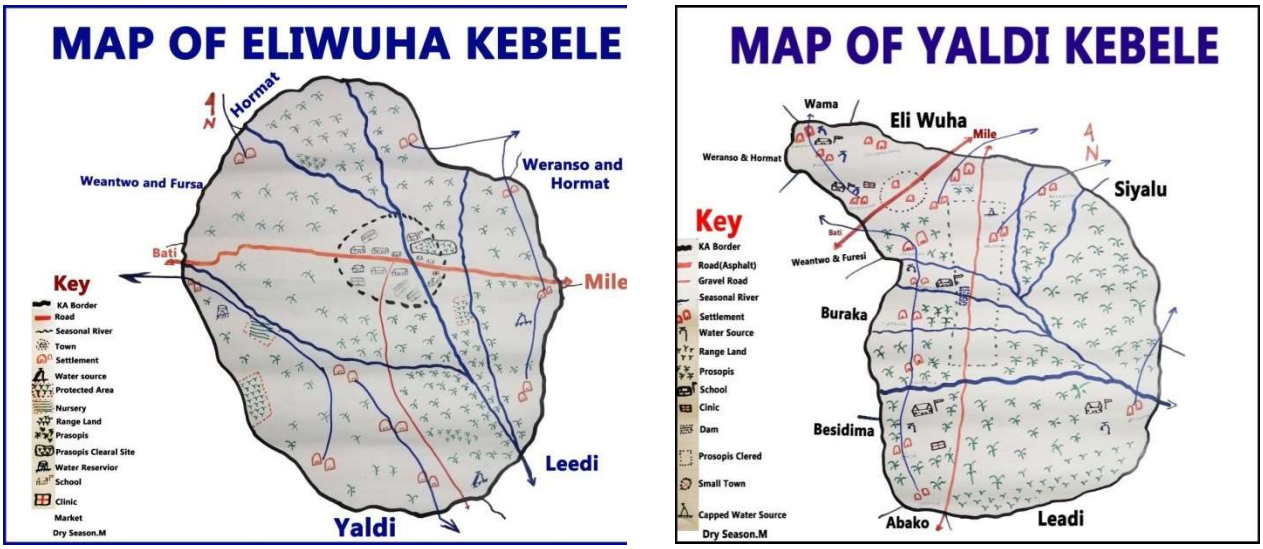


Photo 2. FGD participants discussing over the map of their villages

3.2. Rangeland Management & Utilization

3.2.1. *Desso* Management

In the words of pastoralists, 'Desso' is an enclosed communal rangeland designed to make pasture regeneration easier and quick during the wet season grazing period. It was a community-initiated and community-managed rangeland improvement system. In the study area, pastoralists used to manage communal grazing land in a traditional system called *"desso".* The desso management doesn't tolerate complete use of pasture. So, the system, as stated by elders, used to delineate, protect and control tracts of the intensively used common grazing land until sufficient grass has regrown. During the *desso* period, access to protected rangeland was restricted, both outsiders and villagers were not allowed to graze their livestock inside. Pastoralists used clan-leaders as a bridge to handle issues and conflicts that might arise within their members and the community at large. Such practice of setting aside protected rangeland had been going on until the local government started discouraging the system some decades ago. The government with the intention of, the key informants presumed, avoiding conflicts that were arisen whilst protecting the desso rangeland has stifling the practice since then. The local government by doing so had in deed contributed to further misuse of pastureland and marginalized the role of indigenous institutions in natural resource management.

As far as the key informants and focus group participants know, desso management system is no longer in existence in the study area now except few initiatives being undertaken by some NGOs. Save the Children, for instance has tried the approach for one & half years in 2015 at Haridora village of Golina Woreda on 1ha of communal rangeland. From the discussion made with woreda experts, it was learnt that their opinion on the outcome of the current initiative attempted by the Save wasn't positive. Regardless of the claim provided by the government, all respondents thought that desso management system can still be used to protect or regenerate rangelands if pastoralists' institutions were properly incorporated with modern administrative system.

3.2.2. Rangeland (RL), Dry Season Forage Reserve (DSFR)

In the study area, the main feed resource available for livestock is communal grazing land. As discussed by the FGD participants, there has been a general decreasing trend with respect to this communal rangeland coverage in all the villages under study. Both the FGDs and key informants unanimously expressed the significance of the problem for the diminishing coverage of the grazing land in the area. During the transect walk made with key informants, it has been also observed that significant portion of the grazing land has been taken up by the spread of prosopis juliflora and none of the natural vegetation in the area is under any form of natural resource management except the recently started soil and water conservation practices in few areas.

Through time, the rangeland potential of the area has reported to be significantly deteriorating. The vegetation cover has left with scattered shrubs & dwarf trees, sparsely dispersed seasonal grasses, and large portion has already been converted into exposed surface land. In six out of eight studied kebeles, significant portion of pasture land has been invaded by invasive prosopis

juliflora. Though no comprehensive data regarding the distribution of the invasive species across kebeles is available, FGD participants estimated that, on average, more than half (53%) of the rangeland area in the five prosopis affected kebeles has been taken up by the shrub, reducing the available pasture for livestock.

Asked about the status of forage production on rangeland, majority of the key informants (62.5%) viewed that there has been a moderate efforts in terms of the quantitative forage production on rangeland while significant majority (75%) perceived that the quality of forage production on rangeland is very low (Table 2. and Table 3.). When explaining their view, some important palatable grass species such as bilta, junfita, adodoita, durfa, keselto, gersa, huida, and ado hara have been decreasing in number and some of them were replaced by invasive species (prosopis) whereas the efforts made to rehabilitate them has been very limited. Some grass species disappear due to recurrent drought. Taken together, all informants in all sampled kebeles agreed that the current trend in forage production in general is decreasing as less number of grass and tree species are available now.

Table 2. Status of forage production (Qt)

Quantitative	Frequency	%
High	1	12.5%
Medium	5	62.5%
Low	2	25.0%
Total	8	100.0%

Source: Field Assessment (2022)

Table 3. Status of forage production (Qualitative)

Qualitative	Frequency	%
High	1	12.5%
Medium	1	12.5%
Low	6	75.0%
Total	8	100.0%

Source: Field Assessment (2022)

Seasonality of utilization: As stated by the respondents, there are 201 grazing days during the dry season and about 111 grazing days during the rainy season. As discussed in the migration section of the report, pastoralists move away to other areas during dry season in search of pasture and water for their livestock. Throughout the dry season (Sugum and Hagay) which is now started as early as December, herders sustain mobility in search of pasture and water until the next main rainy season (kerma) comes to get back home. It is only for 3 to 5 months that they stay at their major settlement area after which they have to leave for other areas to find feed and water for their livestock. So, literally speaking, pastoralists are trapped into a vicious circle of migratory pattern.

Depending on the conditions of the animals & livestock holding, a household keeps about 2 camels, 3 cattle and 7 shoats with him during dry season while the number may increase to 8camels, 20cattle, and 50 shoats during rainy season. During seasonal mobility, camels and cattle are first animals to migrate, and then sheep and goats follow. There is little practice of feeding the non-migratory animals (especially pregnant & weak animals) with 'concentrates and agro-industrial byproducts' by pastoralists. This case was reported from Mile and Teru woredas.

In Table 4 below, information whether rangeland /DSFR was used by other livestock herds from other pastoral communities is summarized. As can be seen from the Table, the RL/DSFR is used regularly by other livestock herds from other pastoral communities in 5 of the surveyed kebeles during rainy season whereas in three kebels pastoral communities from other areas sporadically come in to graze their livestock herds. The sampled kebeles which are occasionally visited by other pastoral communities include Wanasana Harigerbu, Udaili and Digdiga. On contrary, pastoralists rarely come from other areas to graze their livestock in to the targeted kebeles during dry season. Only the two kebeles (Yaldi & Debaho) reported that other pastoral communities to have come to their villages regularly with their livestock herds during dry season. As stated by key informants, pastoralists from neighboring woredas (Yallo, Logiya, Ab Ala) and Digdiga kebele usually headed to Debaho kebele for pasture during dry season.

Table 4. Is RL/DSFR used by other livestock herds from other pastoral communities?

Table 4.1 During Rainy Season

During rainy season	Frequency	%
Regularly	5	62.5%
Sporadically	3	37.5%
Rarely	0	0.0%
Total	8	100.0%

Source: Field Assessment (2022)

Table 4.2. During Dry Season

During dry season	Frequency	%
Regularly	2	25.0%
Sporadically	0	0.0%
Rarely	6	75.0%
Total	8	100.0%

Source: Field Assessment (2022

As explained by informants, within the Debaho kebele enough pasture land is available for the time being and there is also some surface water supply to attract additional pastoralists with their livestock during dry season. The informants however estimated the general trend of livestock herds coming to their kebele to be reducing due to decreasing availability of pasture and water as a result of the effect of the recurrent drought. On the other hand, regenerating rangeland with exclusion of livestock is rarely practiced in the area. As was reported by key informants, only one or two individuals per kebele sometimes try this practice.

Table 5. Degree of depletion of forage resources as reflected by key informants

Degree of depletion of forage grasses on RL	High	Medium	Low	None	Total
Frequency	7	1	0	0	8
%	87.5%	12.5%	0.0%	0.0%	100.0%
Degree of depletion of forage shrubs in DSFR					
Frequency	5	3	0	0	8
%	62.5%	37.5%	0.0%	0.0%	100.0%
Soil erosion on DSFR or RL					
Frequency	1	4	3	0	8
%	12.5%	50.0%	37.5%	0.0%	100.0%

Source: Field Assessment (2022)

In Table 5, the degree of forage resources usage status of the sampled kebeles is presented. Key informants were asked to estimate the degree of depletion of the forage resource status in their kebele. Accordingly, 7 kebeles (87.5%) said that the degree of depletion of forage grasses on rangeland has been high. Likewise, about 5 kebeles (62.5%) believed that the degree of depletion of forage shrubs and trees in their villages was high while 3 kebeles (37.5%) yet believed that the degree of depletion of shrubs and trees was medium. Regarding soil erosion on DSFR or rangeland, half of the surveyed kebeles said medium while about 37.5% perceived the erosion on rangeland was low. Respondents who acknowledged the presence of soil erosion claimed the depletion of indigenous trees (Acacia, Huda, Mekmita, tiklbiho, merkato) for accelerated and increased erosion.

3.2.3. Communal Grazing Management

The practice of communal grazing management system in the target villages is mainly governed by clan leaders, community elders, and religion representatives. As explained by the FGDs and key informants, communal grazing lands are managed with the help of clan leaders and a group of elders. In Afar, communities are known for their strong social ties and share resources in common and fairly manner. As the Debaho kebele manager puts *"It's only my home compound that is private. All others are owned in common".*

Structurally, communities are organized into clans and each clan has its own hereditary clan leader (*kedo Abba*), and a law implementer (famia abba) as well as a group of elders. They have a customary law or "Afar adda" by which conflicts and disputes within and between clans are managed. Based on key informants, 'mataro' is a permanent village and may have 100-150hhs. Under each mataro, there are about 5 villages and 25 to 30 "*kushets*" which are addressed by clan leader and a group of elders. Each clan settled in the same area has its own "metaro" or residential area. Each mataro has its own grazing land and water which is managed by its own clan leader. Most of the rules and restrictions are often enacted by these group leaders. When restrictions were introduced, according to the key informants, most of those restrictions were enacted by the kedo abba. Even though there are such control and restrictions to common grazing lands, all households in a given mataro have a right to get access to use or rarely need to seek permission to access either a wet or dry grazing areas. Customary leaders are most likely to impose restrictions on issues associated with shortage of water. And it is other clans that need to get permission to use from the clan leader that controls the pasture.

Theft of livestock, misuse of water resource, dispute over borderline, conflict over grazing land and cutting down of protected trees are some of the major issues involving disputes and conflict among pastoralists. In most cases, communities with the command of their clan leader organize meetings to settle disputes according to customary laws.

Information from the FGDs indicated that "kalos" is known by majority of the communities though few individuals do practice kelo rangeland management system. In fact, kelo is undertaken on private basis and recently showing an increasing trend. As per key informants, kelo is practiced during rainy season and only three to four households per kebele that are

currently practicing this system each on average 0.5 to 1ha of land. With regard to hay making, the results of both FGDs and key informant interview indicated that nearly all pastoralists had no experience in hay making practices.

3.2.4. Current Practices & Intervention in P. Juliflora Invasion Control in the study area

Analyzing the trend of prosopis juliflora invasion and its cause and consequence on rangeland as well as on the environment has become a matter of high priority concern for sustainable development and management of natural resource in Afar region. P. juliflora was identified as important cause of risk in livestock production and have emerged as a primary issue of natural disaster in pastoralists' livelihoods.

Photo 4. Prosopis juliflora covering up rangeland (June 2022)

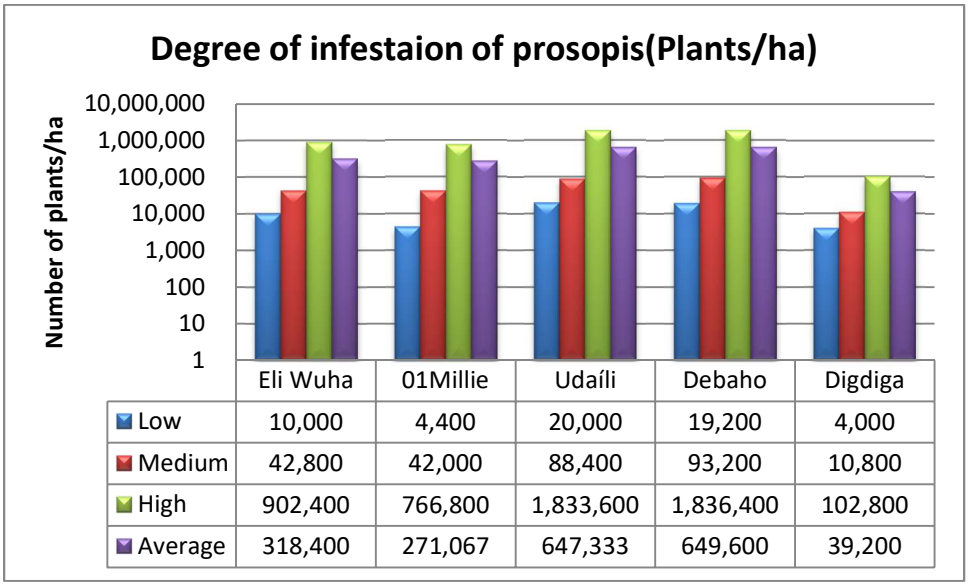
As has been noted from the pastoralists, prosopis can be used for firewood and source of feed for animals particularly during the dry season. But the shrub is thorny and not palatable especially for non-ruminant animals. As key informants noted animals are not willing to feed on this shrub unless it is under extremely harsh conditions. Apart from this, stomach-aches and bloating on animals particularly on donkeys due to its excessive consumption have been reported by FGDs participants.

As it was observed right in the field, this tree species has been expanding rapidly in all project woredas visited except Chifra and Golina, invading significant portion of rangeland areas. Prosopis is widely distributed in Yello, Teru, Mille, and Adaar woredas. In Mile 01 kebele of Mille woreda, the invasive prosopis has been highly spread along the course of the mile river affecting the activities of pastoralists and their livestock particularly during water collecting. It is a much-branched evergreen shrub and remains deep green during the dry season. In order to understand the degree of invasion of prosopis juliflora on rangeland area, samples showing the density of its population were taken from five kebeles. Since no invasion of prosopis was reported in Chifra and Golina woredas and GITECH with the help of its SDR-1 project

intervention has recently cleared out all prosopis from Yaldi kebele, no samples were taken from these three sites and hence omitted from the analysis. In each kebele, samples were taken from three sites (high populated, medium and less populated). The selected study area was 5m x 5m ($25m^2$). Measures on the number of individual plants of prosopis in each selected study area were taken and the result was converted in to hectare. The details of the sample data collected from five kebeles are presented as shown in Figure 4 below.

Despite their difference in the level of emphasis, pastoralists across all FGDs raise several times in the discussions that the rapid expansion of prosopis juliflora into rangeland has largely reduced pasture lands available for animal grazing, posing a serious threat to the livestock rearing activities of pastoralists and by extension to their livelihoods. A study conducted on rangeland management by Johan H. (2015) in Afar area has reached similar conclusion when he said that the loss of high quality rangelands has been further exacerbated by bush encroachment, in particular by Prosopis juliflora. He went on saying that one major effect of the loss of rangeland resources seems to have been a shift away from cattle to greater reliance on goats and camels.

Figure 4: Degree of infestation of prosopis as distributed by project kebeles



	Eli Wuha	01Millie	Udaíli	Debaho	Digdiga
Low	10,000	4,400	20,000	19,200	4,000
Medium	42,800	42,000	88,400	93,200	10,800
High	902,400	766,800	1,833,600	1,836,400	102,800
Average	318,400	271,067	647,333	649,600	39,200

Source: Field Assessment (June 2022)

Mean comparison of the average population of prosopis per hectare revealed that Udaili and Debaho kebeles are highly populated or invaded by this invasive species requiring urgent steps to be taken to control its further expansion in to more rangeland. In Digdiga, the population density shows low compared to others.

In regard to the strategy to control prosopis, discussants in most FGDs expressed that they were very much interested with the plans GITEC intends to bring but have expressed their reservation on the delay in implementation. The local government through its PSNP has attempted to clear some prosopis especially around roadside and water sources. When gauged against the magnitude of the problems caused by the invasive plant, little has been achieved so far. Besides, communities' effort to control prosopis expansion has been disappointing.

Photo 5. GITECH cleared prosopis invaded area

3.2.5. Migration

In Afar, mobility has been a life-saving strategy being practiced for long years now. It has been also a common pattern of pastoralism often made in the dry season. As has been learnt from the field, migration is a regular pattern being undertaken by pastoralists. Today, a great deal of pastoralists are said to have deployed this strategy when there is shortage of water and pasture for their livestock. Information from the FGDs and elders in key informants indicated that every year from the visited areas, up to 60% of households (estimates of KIIs) move their animals to a grazing area outside their localities during the dry season. Of the eight kebeles interviewed, pastoralists across the seven of the target kebeles are involved in out-migration, both inside and outside the region. It was only in one kebele (Debaho) that out-migration was not reported at all. At the time of migration, cattle, and camels are first animals to migrate, and then sheep and goats follow, respectively.

Lack of water and shortage of forage for livestock are the principal reasons causing pastoralists to migrate to other areas in the study area. This usually occurs during the months of February until Mid-June. Asked about the patterns of migration, participants of key informants interview explained that the ever increasing effect of climate change that are affecting the livelihood basis of pastoralists has been leading to persistent migration. Moreover, the numbers of households involved in out-migration are varying from one kebele to another. Basically, temporal migration has been a common phenomenon in the lives of pastoral communities in Afar. Despite this, out migration in such large number has been declining from time to time due to the increasing risks like cross-border instability, ethnic politics as well as diseases. Today, villagers in the studied areas often engaged in constant conflicts with host communities due to competition over meager resources. As a result, pastoralists are refraining to the extent possible from taking migration as a strategy to their livelihood.

Table 6. Seasons and description of migration pattern

Seasons	Mid June	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Kerma (Kiremt)												
Main rainy season												
Better rains	*	****	**									
Good pasture	**	***	****									
Herders back home	x	XXX	XXX									
Gillal (Belg)												
Pasture decreases				***	**	**	*	*				
plan for migration							x	X				
Range scouting activities						++	++	+				
Sugum (Tseday)												
Shortage of feed and water									*	*		
Migrate (camel, cattle,)								>	>>	>>		
Milking cows and young animals @ home								oo	oo	oo		
Occasional showers in past									...	.....		
Hagay (Bega)												
No pasture and water												
Very harsh, sunny, and dry											<>	<>)
No rain											?	??
Death of weak animals											&	&
Herders away home												

Source: KIIs & FGDs (June 2022)

Movement

As indicated in the Table 6, the year in the studied area is characterized by four distinct seasons. These are locally known as Kerma, Gillal, Sugum, and Hagay. As frequently the case with other parts of the country, the seasons are divided following the distinguished rainfall pattern of the year and one differs from the other by special climate conditions.

Kerma is the main rainy season of the year and covers the period from Mid-June to August. The amount of rainfall is higher as compared to the other seasons and is associated with good availability of pasture. During this wet season, pastoralists who migrated out with their livestock to escape from the rigours of the dry season get back. The end of Gillal and the period in Sugum are critical times where herders move out to other areas where they can get pasture and water. When disaggregated by type of village, herders from Chifra, Golina, Yallo, and Teru area move to Amhara region of Werebabu and Gordoma area whereas those villagers in Mille

and Adaár woreda move to Bati woreda of Amhara region and Oromia region (particularly in Awash area where they could get water). Moreover, Yangudi and Asayita areas in Afar region have been the main destination where majority of herders from Chifra and Teru area reported to have moved to. Throughout the dry season (Sugum and Hagay), herders stay away in those areas and get back home in the wet season (Kerma).

Migratory herders in Afar carry out their work in a well-planned manner. Participants of the key informants' interview explained that rangeland scouts have been used in arranging the movement pattern of the herds that should be followed. As has been narrated by informants in Chifra woreda, rangeland scouts are sent ahead of the main herds so as to gather information about the migratory routes, a place in transit, the availability of adequate pasture and water at the final destination. In performing this specific task, the scouts used a traditional information communication exchange system locally known as *"Dagu"*. As pointed out by interviewed woreda experts, people in the study area usually use Dagu/word-of-mouth as the most important means of access to information related to current issues, updates and any local news and/or developments. There are also independent group of elders and clan leaders who are being consulted and advises are sought from about migrating livestock during the dry season.

As indicated earlier, small ruminants, lactating, weak and sick animals don't move with the herds. Women, children and the old stay at home with the family around major settlement area and look after these animals. Adults, the young and boys are more likely to migrate with herds compared to the old and women.

3.2.6. Conflict Management

Conflict is one of the most important risk factors in the Afar region particularly in woredas that share borders with other regions. In the study area, conflict triggering factors are multiple and frequently occur within and among targeted kebeles. These include conflict over grazing land, over boundary, water sources, livestock raids, and cases related to quarrels among herdsmen. Most participants in the key informants interview felt that disputes over the grazing land has been the main risk destabilizing livelihood among pastoral communities. Although reduced in frequency and magnitude, there have been also conflicts among inter-ethnic groups and woredas over bordering areas within the region causing huge upheavals, displacement and damages to property. This challenge has been pronounced in Golina, Teru, and Yallo woredas of the project sites and is currently counterbalanced by administrative measures taken by the local government. Previous study also confirmed that this factor has significantly impacted on the lives of communities in the Afar region (Gebremedhin, 2021). Similarly, it was understood from the FGDs that conflicts particularly over bordering regions would likely continue to affect people's livelihood.

In many cases, conflicts related to livestock and rangeland management in the surveyed kebeles are resolved through cultural authorities and with the help of clan leaders. Members of the community are expected to present their cases to clan-leaders of their village. Interestingly,

anyone in the village has a right to access the available grazing lands in both during dry and a wet season.

In all project kebeles surveyed, unwritten cultural bylaws are referred in mediating conflicts and making decisions. Clan leaders are expected to serve all members strictly according to the bylaws. Members are also expected to respect bylaws, which are based on cultural norms and sanctions. All in all, these clan leaders handle different types of conflicts at different levels. Asked about the enforceability of the decision, the key informants interviewed stated that almost all decisions made by clan leaders are not expected to be opposed. No one in the village dare to object the decision made by these leaders due to fear of social sanctions. Moreover, clan leaders are very powerful and influential over the lives of the community and would ostracize anyone who tends to challenge their decision. According to all of the key informants, the clan leaders are also responsible for mediating conflicts that may arise with the bordering regions to discuss and settle disputes. Surprisingly, one of the strategies the pastoralists use to avoid further conflict is also to run away (move) from conflict prone areas.

SWOT analysis of Clan-led Conflict Management System in the study area is presented in the box below

Strengths

- Almost all community members abide by it
- Well known and respected at least by majority villagers for years and now
- Access by all villagers and the decisions are more or less accepted by all parties involved
- Quick and provide reasonably fair and healing decision
- Uses a locally known traditional communication system called "Dagu" which is trusted source of information in the area

Weakness

- No written bylaw, orally pass down generation to generation
- Women don't directly engage in the process
- Only few elders and leaders serve for their lifetimes
- Appeal is not welcome if one is dissatisfied with the decision

Opportunity

- Presence of clan-led communal resource management practices
- Recognition by the government
- Presence of close ties within and among communities
- More or less homogenous livelihoods

Threat

- Being challenged by formal government administration structure when conflict is arise between bordering region and neighboring woredas
- Frequent conflict between regions and external bodies pose a threat to the very legitimacy and existence of the system

3.3. Fuel wood Consumption

3.3.1. Sources of fuel wood

In the context of rural Afar where there is little or no access to improved technologies, fuel wood has remained a very important energy source for pastoral households both during dry and wet season. Nearly all households in the study Kebeles stated that they depend on forest for firewood. Trees and shrubs are also important sources of fuel wood for villagers. Few households also reported to have made charcoal though the primarily purpose is for sale to augment their meager household income, a strategy chiefly employed by resource poor household.

As has been discussed during the FGDs, the poor pastoralists have increased firewood and charcoal production as a strategy and sell it along main roads (Bati-mille and Chifra-Woldia) in order to counteract the ever deteriorating living conditions. By doing so, however they cut down indigenous trees accelerating the natural resource degradation problem of the area. Key informants in Wanaba, Wanasa Harigerbu, and Udaili Kebeles bitterly complained that they are losing indigenous trees of high value due to such uncontrolled practices. “Keselito, Acacia, Hidaar, Pleana asgerbo, kuseren are some of the indigenous trees and grass types currently under threat. Elders and clan leaders usually advise communities to collect firewood from cut down trees, old and tree species of less quality. But, such genuine advice offered from elders is rarely observed by some needy pastoralists.

3.3.2. Household fuel wood consumption

In quantifying the general information about the amount of fuel wood consumed daily, an interview was made with selected households of different family size stratified as large, medium and small. A fuel wood consumption data was taken for 18 households across the six sampled Kebeles (See Table 7 below). Most of the data were provided in women’s load and then converted into its kilograms equivalent. In two villages, however actual measurement of the amount of fuel wood used per day per household was taken using a digital scale. Moreover, discussions made with key informants were used to triangulate the individual households’ data.

When data on amount of fuel wood use was collected, the family size of each household in each stratum was also estimated. Accordingly, a large size household, on average reported to have a family size of 11, whereas a household with medium and small size reported 8, and 4 persons, respectively. It was also estimated that a bundle of fuel wood weighs between 20 and 30kg while its cost per kg was estimated at 5ETB.

Photo 6. Weighing the amount of fuel wood used per day

Table 7. Estimated fuel wood consumption of sampled households (kg/day)

Household size	Sampled HHs estimated fuel wood consumption(kg/day)							
	01Mille	Wanaba	W&H	Udaili	Debaho	Digdiga	Total	Average
a) large	4	15	25	23	10	20	97	16.17
b) medium	5	7	17	20	7.5	9.8	66.3	11.05
c) small	4	4	12	10	4.33	7	41.33	6.89

Source: Field Assessment (2022)

The assessment result revealed that the average fuel wood consumption per household in the study area is 16.17kg/day for large size, and 11.05kg/day for medium size household while a household having small family size reported to have used about 6.89kg of fuel wood per day. As expected, there were variations among households with regard to the amount and daily fuel wood consumption pattern of household in the target area. Obviously, the nexus between family size and household fuel wood demand is very positive. As a result, households with large number of members tend to use more fuel wood to maintain the required level of consumption.

Data gathered from the contacted sampled respondents and key informants also revealed that fuel wood in the study area is mainly used for cooking, heating, and lighting. Also, we were told during the interviews that baking *"Mufe"* – traditional pancake-like bread in Afar, is the most fuel-consuming activity and noted that more fuel wood is needed the day this activity is performed. Time consumed by individual households for firewood collection was also included during key informants' interviews. The average time required to collect firewood from an open access forest area was estimated at 3 to 4 hour for round trip. From the households, it was learnt as well that fuel wood for household consumption was collected on daily basis or at least every other day. This is frequently the case with households having large family size. Badly, the encroachment of the invasive prosopis shrubs in to forestland and roadside makes the fuel collection environment very risky and unsafe for women.

Table 8. Is there fuel wood shortage in the kebele? If yes,…

Degree of fuel wood Shortage	Kebeles	
	Frequency	%
Minor	2	25%
Medium	4	50%
High	2	25%
Total	**8**	**100%**

Source: Field Assessment (2022)

According to the results of the key informants' interviews, fuel wood shortage has been well acknowledged in all sample kebeles surveyed. Asked about the significance of the problem, 4 (50%) out of the 8 kebeles reported there was a medium fuel wood shortage problem in their village. These include Wanaba, Wanasana Harigerbu, Udaili, and Digdiga. While two kebeles-Eli Wuha and Mile 01 (25%) reported high, the remaining two kebeles (25% of the total) which includes Yeldi and Debaho replied to have a minor fuel wood shortage as indicated in Table 8 above.

Moreover, the key informants were asked if there are external people using wood from their Kebeles and to rate their number as minor, moderate or if they are many. Based on the responses of the key informants, only in 3 kebeles including Wanaba, Udaili & Debaho (37.5%) that other external people came in to use or collect firewood from their village while 5(62.5%) reported otherwise. From the three Kebeles that reported external people to use wood from their village, Wanaba and Debaho (67%) rated the number as few while the other Kebele estimated a moderate number of external people using fuel wood from their village (See Table 9).

Table 9. Incidences of external people using wood from your kebele?

Are external people using fuel wood from your kebele?	Kebeles	
	Frequency	**%**
No	5	62.5%
Yes	3	37.5%
Total	**8**	**100.0%**
If yes, rate the number of users as		
-Many	0	0%
-Moderate (Udaili)	1	33%
-Few	2	67%
Total	**3**	**100%**

Source: Field assessment (2022)

As has been hinted out earlier, charcoal production has increased over time in the studied villages. Key informants pointed out that the indigenous trees have been depleted over the years and little control has been made so far to regulate the activity. The narrative provided by Wanaba kebele elders' representative, Ato Dato Woday, is worth noting: *The worst part of it is that most of high value indigenous tree species such as acacia, keseleito, Megelitu, Gedayitu etc, which are used for traditional medicines and food, are most preferred for charcoal production due to their quality and preference by consumers*.

Information from the assessment indicated that charcoal production has been practiced in seven of the eight surveyed kebeles. On average, about 10 to 15 households per kebele are currently undertaking this activity mainly as a source of income to supplement their livelihood.

3.4. Livestock Production

3.4.1. Livestock Population

As expected, livestock husbandry forms an important source of livelihood for the pastoral and agro-pastoral communities in the project targeted area. Pastoralists in the surveyed area keep about five types of livestock to support their livelihood. Based on the secondary data extracted from the government offices, the total number of livestock in the sampled kebeles is estimated to be 294,822. The major livestock types kept in each sampled kebele is presented in Table 10 below. As illustrated in the table 10 below, about forty percent (40.1%, N=118,411) are goats followed by sheep (30.69%, N=90,487) in which the two livestock types together make just over seventy percent (70.8%) of the total livestock heads. As was noted from the data, cattle with close to eighteen percent(17.85%) makes considerable number of livestock whereas camels surprisingly accounted for only less than ten percent(9.65%, N=28,465) of the total livestock population reared by the target communities. While the number of donkeys are so small (1.64%), its contribution and demand for transportation is getting high as has been explained during the FGDs.

Table 10. Number of livestock population in sampled kebeles (June 2022)

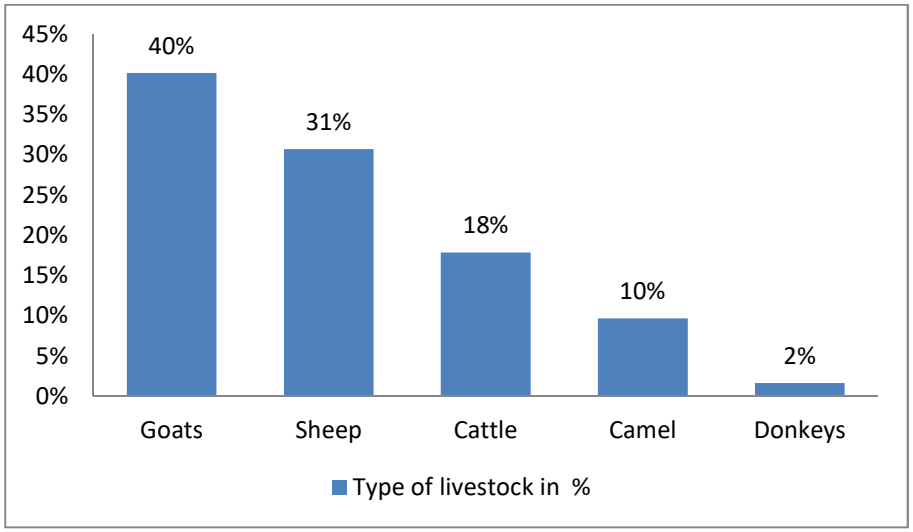
S/N	Type of Livestock	Sample Kebeles									% from Total
		Eli Wuha	Yaldi	Millie	Wanaba	Wanasana Harigerbu	Udaili	Debaho	Digdiga	Total	
1	Camel	2138	3181	300	7980	3271	2107	2072	7416	28,465	9.65%
2	Cattle	1920	2117	600	25035	2419	281	9427	10820	52,619	17.85%
3	Sheep	9919	13941	1300	21284	13937	2825	15208	12073	90,487	30.69%
4	Goats	11283	15322	2200	20413	15371	9020	24133	20669	118,411	40.1%
5	Donkeys	1037	1828	50	144	121	373	565	722	4,840	1.64%
	Total	**26297**	**36389**	**4450**	**74856**	**35119**	**14606**	**51405**	**51700**	**294,822**	**100%**

Source: Respective Woreda LANRD[1] offices (2022)

As was mentioned during the FGDs and key informants, livestock rearing as the first main economic activity in the study area is primarily undertaken for food, income and transport services. Female camels, goats and cows are raised chiefly for dairy products (mainly milk). Milk is important source of food and income among pastoral communities in the project Woredas. The income derived from the sale of dairy products (mainly milk) is almost entirely managed by women of which large portion is spent on the purchase of household utilities. However, milk is not sold at local market in Eli Wuha, Yeldi, Mille, and Chifra woredas and has very limited monetary value in these areas. Milk is consumed by the herdsmen at the herding site as well. Camels and donkeys are important animals to provide transport services. Since recently, donkey is becoming the most important equine available in all the project kebeles. As has been noted during the focus group discussion, donkeys are replacing camels and the demand for keeping this animal as a means of transport among the poor is on the rise as a result. On the other hand, goats and sheep are the first animals to be sold at the time of risk to cope up with disasters.

[1] *Livestock Agriculture & Natural Resources Development offices*

Figure 5. Types of livestock as distributed by percentage



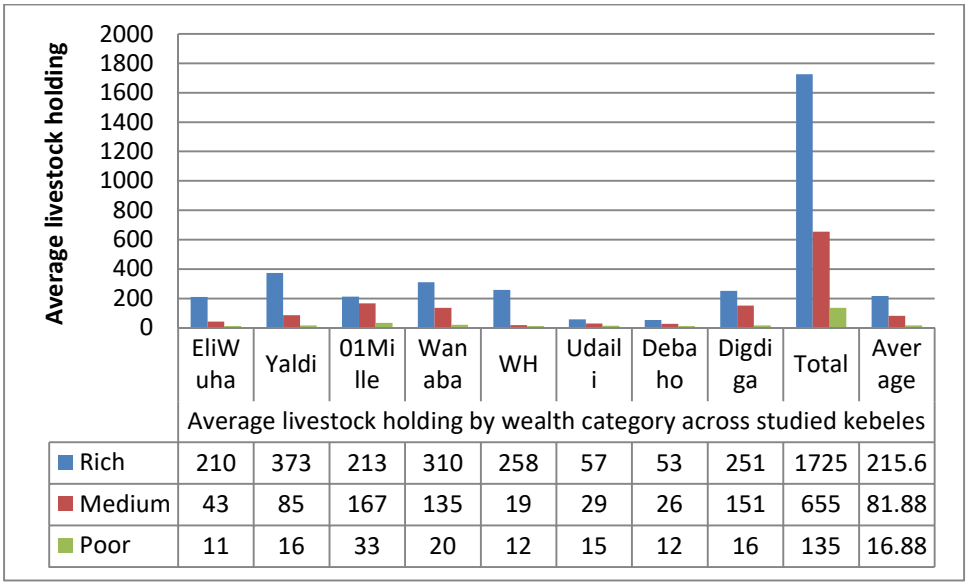
Source: Field Assessment (2022)

3.4.2. Livestock Based Wealth Ranking

In order to measure the wealth status of the pastoral households in the study sites, an assessment of livestock ownership of the communities was investigated. This was actually a simple and crude wealth ranking exercise used to establish the proportion of households to different wealth categories based on livestock assets owned by target pastoralists. As can be understood from all key informants interviewed, livestock holding specifically of camel and cattle, in Afar pastoralism is by all account a key variable to distinguish different aspects of wealth status of a household. Also, all key informants felt comfortable with the three major categories of rank viz. rich, medium and poor so these classifications were adopted and applied across all sites surveyed. During each focus group, informants were asked to discuss characteristics (indicators) of livestock possession for each wealth category. Next, participants of the key informant groups were then asked to classify pastoralist and agro-pastoralist households and estimated the proportion of their respective kebele's households that belong to each group of wealth classification. In Figure 6, the estimated average livestock holding corresponding to each wealth category across the eight surveyed kebeles is provided. In order to ease comparison among the three wealth groups, the estimated livestock holding of the households in each kebele was converted into Tropical Livestock Unit (TLU) using FAO's conversion factor which assigns 1.0 for camels, 0.7 for cattle, 0.5 for donkeys and 0.1 for goats and sheep (FAO, 2018). Table 11 presents the average holdings of each livestock type across the three wealth category. On the basis of this estimate, a typical household in the rich wealth category, on average, owns a total of 76 different mix (at least 5types) of livestock in TLU while a household in the corresponding medium group category possesses 22.58. As expected, households in the poor wealth group category possess, on average, significantly less number of livestock than the households in the other two better-off groups. The respective figure for this

group is only 3.39 TLU (Table 11). Across all Kebeles, livestock holding for the poor wealth group is considerably small. Indeed, the poor households possessed no camel at all based on the estimate of the key informants.

Figure 6. Distribution of average livestock holding by wealth category & across studied Kebeles



Source: FGD and KIIs (June 2022)

Table 11. Distribution of average livestock holding in TLU by wealth category

Types of Livestock	Average livestock holding by wealth category					
	Rich		Medium		Poor	
	X̄ number (N=8KAs)*	TLU	X̄ number (N=8KAs)*	TLU	X̄ number (N=8KAs)*	TLU
Camel	39.06	39.06	8.31	8.31	0	0
Cattle	30	21	18.87	13.21	1.87	1.3
Shoat	142.5	14.25	52.5	5,25	13.4	1.34
Donkeys	4	2	2.12	1.06	1.5	0.75
Total	**215.56**	**76.31**	**81.8**	**22.58**	**16.77**	**3.39**

Source: Field Assessment (2022)

*(N=8KA) indicates the number of livestock possession is averaged from 8 sampled Kebeles

When the three wealth category groups are compared in light of their average livestock possession, the figures indicate large variations with significant numbers of pastoralists having small number of livestock whereas a minority of households endowed with relatively large livestock holdings. As can be extracted from the data, the poor on average have only few livestock to support the family life. Not only this, the substantial standard deviations (Std. Dev), reflect considerable variability within each wealth category group (Table 12).

Table 12. Wealth category of sample households distributed by livestock holding in TLU

Wealth Category	Estimated no of HHs	Mean	Std. Deviation
Rich	663	76.31	70.55
Medium	1045	22.58	23.6
Poor	7313	3.39	1.38

Source: Own Computation (2022)

Inequality of livestock distribution across the different social strata appears to be increasing and may be driven by poverty related factors such as forced sales due to family emergencies or natural disasters. The poor often resort to sell animals for cheap at the time of difficult situation and take longer time to recover. During the FGDs meetings in Digdiga and Debaho kebeles of Teru woreda, for instance, the kebele managers were complaining about the current prolonged drought that results in the death of many livestock (sheep and goats in particular) affecting people's livelihood and of all the poor are most affected.

As was revealed through key informant interviewees, majority of the Kebele residents have been beneficiaries of the government run productive safety net programme, of which significant portions of households were from this poor wealth group. In the face of these very critical livelihood assets, it can be argued that the poverty situation among pastoralists in the poor group category of the project targeted area might be extremely high, commanding the need for building resilience and the poor's ability to adapt and recover quickly from shocks such as this.

It was on the basis of this indicator that households in the study areas were classified into three wealth groups as indicated in Table 13 below. In this case, pastoralists whose livestock holdings are not large enough to meet the household's consumption needs (i.e. having 3.39 TLU on average) round the year with limited capacity to resist shocks are poor. Pastoralists with enough livestock to meet their family consumption needs, but probably not enough to support the household without some supplementary income at the time of difficult period fall under medium wealth category. With medium wealth capacity, informants in the FGDs argued that the practice of raising livestock is sufficient only for one's own household consumption, without any surplus for trade. Whereas those pastoralists having large livestock holdings (roughly 76.3.TLU on average in our case) and capable of meeting their household's consumption needs as well as surplus to extend support to other kinship even during difficult period fall under rich wealth group.

Based on the results of the assessment, about 81% (7313) of the pastoral households in the studied Kebeles is estimated to be poor, while about 12% (1045), and 7% (663) of households, respectively are said to fall under medium, and rich wealth group (See Table 13 below).

Table 13. Distribution of household wealth category by sampled Kebeles

S/N	Sampled Kebeles	Number of households by Wealth Category			
		Rich	Medium	Poor	Total
1	Eliwuha	3	10	853	866
2	Yaldi	50	150	300	500
3	01Mille	115	170	845	1130
4	Wanaba	215	325	548	1088
5	Wanasana Harigerbu	40	60	490	590
6	Udaili	30	40	720	790
7	Debaho	200	240	961	1401
8	Digdiga	10	50	2596	2656
	Total	663	1045	7313	9021
	Percent	7%	12%	81%	100%

Source: KIIs (June 2022)

3.4.3. Trends in Livestock Production

Table 14. Livestock trend within the community as estimated by KII and FGDs (N=8KAs)

Type of Livestock	Trend			
	Stable	Increasing	Decreasing	Highly Decreasing
Camel				
Count	0	0	5	3
%	0%	0%	62.5%	37.5%
Cattle				
Count	0	0	4	4
%	0%	0%	50%	50%
Sheep				
Count	0	1	6	1
%	0%	12.5%	75%	12.5%
Goats				
Count	0	1	5	2
%	0%	12.5%	62.5%	25%
Donkeys				
Count	6	1	1	0
%	75%	12.5%	12.5%	0

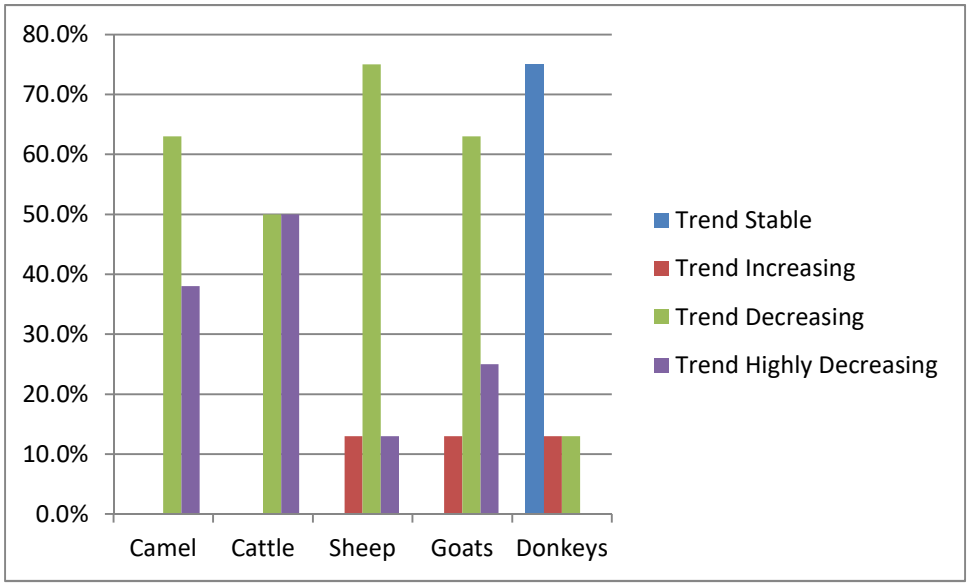
Source: FGDs and KIIs(2022)

The participants of the key informant interviews were also asked to explain if there is any change in livestock trend within their community. Likert scale technique like approach was used to organize the responses of the participants: 1 being stable, 2=increasing, 3=decreasing, and 4

being highly decreasing. The responses of the participants were presented as illustrated in the Table 14 above.

As can be read from the Table above, just over sixty percent (62.5%) of participants said the trend in camel population is decreasing whereas close to forty percent (37.5%) viewed this trend to be highly decreasing. Like manner, the trend in cattle population was either decreasing or highly decreasing each opinion shares equal percent of the total respondents' view (i.e. fifty-fifty). In the result that emerges from our field work, the trend in sheep and goats production as well as the situation for donkeys mirrors a slightly different picture. As seen in Table 44 above, one in eight does belief that the trend in shoat production is increasing compared to other livestock kept by the pastoralists whereas significant majority (>85%) viewed this trend also either decreasing or highly decreasing. Contrary to other livestock, three quarter (75%) of the key informants expressed the trend in donkey keeping remains to be stable though discussants in one kebele (Digdiga) yet noticed that the number of donkeys in their village has decreased this year due to disease.

Figure 7. Livestock trend within the community (June 2022)



Source: Field Assessment (2022)

The small positive changes being noticed around goats and sheep may be driven, according to key informants, by the very nature of these animals. The higher reproductive rate, quick growth, low inputs needs, and greater resilience to climate change underpin the importance of these small ruminants. The results of the qualitative information from the field indicate that most pastoralists reported wanting to expand their herd composition with sheep and goats dominance in response to the challenges in climate change.

In general, the trend in livestock production across all assessment sites has been a decreasing one despite few positive events. Reasons given were the ever increasing impact of extended

drought, feed shortage, diseases and scarcity of water. On the day of data collection (on June 27, 2022), for instance, discussants in Debaho kebele of Teru woreda have informed us that some members in the village unusual to past years migrated to other neighboring areas with their livestock in search of water and pasture due to the current extended drought. As mentioned by the case herders, the effect of draught has been serious this year.

> *"Every year in Debaho, lack of rainfall causes severe damage on rangelands, and livestock. This year, conflict, lack of rainfall and extended drought combine, causing huge humanitarian crisis, affecting grazing land, destruction of livestock assets, and by extension erosion of our livelihoods."* Hussen Kedir, the kebele manager cried.

3.4.4. Livestock Market

As has been discussed during the field work, a large number of pastoralists participate in marketing of livestock and livestock products. The most frequently sold livestock are goats and sheep followed by cattle in the entire project-targeted woredas. Goats and sheep are widely supplied to the nearby local markets, most of which are located in their respective woreda capital or nearby towns. This included "Yello" market, Digdiga market, Chifra, Millie, Asayita, and Logiya market. Pastoralists also used to participate in markets found in neighboring regions of Amhara (Bati town) and Tigray particularly in the sale and purchase of large animals (cattle and camels). The market transactions with Tigray region, however has been disrupted by the current erupt of conflict between Tigray and the federal government. Moreover, milk is another livestock product seemingly supplied to the local market since recently. Surprisingly, the sale of all types of milk (Camel's, cow and goat) are not common among pastoralists in Eli Wuha, Yaldi, Mille and Chifra.

During the reporting period both productive and reproductive performances of livestock have been generally poor due to prolonged dry season, limited feed and shortage of water. Because of these inadequacies, the livestock body conformation and their productivity were poor, earning poor market prices for the herders. The below photo demonstrates the desperate herder carrying back home his drought-weakened goat.

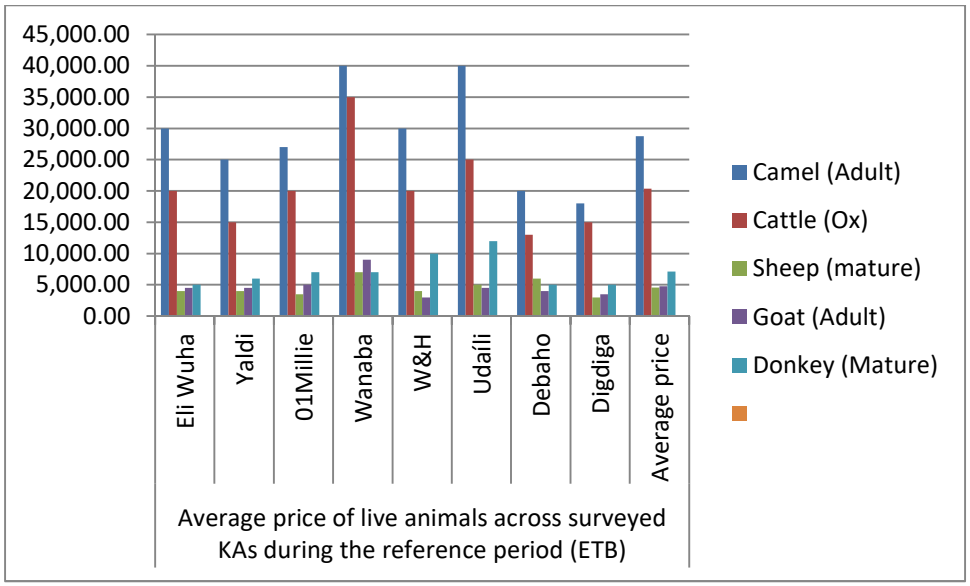
Table 15. Average market price of livestock & livestock products in surveyed Kebeles (June 2022)

Live animals/Livestock products	Unit	Average market price during the reference period (ETB)								Average price (ETB)
		Eli Wuha	Yaldi	01Millie	Wanaba	W&H	Udaíli	Debaho	Digdiga	
Camel (Adult)	No	30,000.00	25,000.00	27,000.00	40,000.00	30,000.00	40,000.00	20,000.00	18,000.00	28750.00
Cattle (Ox)	No	20,000.00	15,000.00	20,000.00	35,000.00	20,000.00	25,000.00	13,000.00	15,000.00	20375.00
Sheep (mature)	No	4,000.00	4,000.00	3,500.00	7,000.00	4,000.00	5,000.00	6,000.00	3,000.00	4562.50
Goat (Adult)	No	4,500.00	4,500.00	5,000.00	9,000.00	3,000.00	4,500.00	4,000.00	3,500.00	4750.00
Donkey (Mature)	No	5,000.00	6,000.00	7,000.00	7,000.00	10,000.00	12,000.00	5,000.00	5,000.00	7125.00
Milk (Camel)	Lit	*	*	*	*	40.00	50.00	40.00	75.00	51.25
Milk(Cow)	Lit	*	*	*	*	75.00	50.00	100.00	50.00	68.75
Milk(Goat)	Lit	*	*	*	*	50.00	50.00	60.00	80.00	60.00

Source: Own Survey (June 2022)

*indicates milk is not sold in these woredas and no price information was obtained

Figure 8. Average market price of live animals (June 2022)



Source: Own Survey (June 2022)

With the intention of capturing the opinion and perception of pastoralists towards market access and local market price of livestock, participants of the KIIs in the FGDs were asked to explain their thoughts and feelings about the aforementioned market variables. A three-point scale ranging from “Good” to “poor”, and from “High” to “low” were used, respectively for measuring and organizing the responses of pastoralists on market access, and livestock prices. Table 16 details the views of respondents that they have about these two items. Approximately two third (62.5%) of the participants perceive that they have a moderate access to markets whereas a quarter of them have a feeling that access to market among pastoral communities in

the study area is poor. The remaining twelve and half percent of the respondents have a positive feeling about market access and gave it good. These are survey participants in Wanaba kebele of Chifra woreda. Likewise, half of the respondents (50%) who participated in this interview have a moderate view on the market prices that they receive for their livestock and livestock related products. On contrary, yet significant proportion of pastoral respondents particularly those in Mille, Deboha, and Digdiga kebeles, forming almost forty percent (38%) of the total interviewed households have complaints about the livestock market prices of their area and feel that the price that is offered to them is often lower than the general market price by regional standards.

Table 16. Percentage of responses on perception of market access, and local market price of livestock as expressed by selected pastoralists (N=8FGDs)

Market Variables	Count	Percent	Remark
Market access			
➢ Good	1	12.5%	
➢ Moderate	5	62.5%	
➢ Poor	2	25.0%	
Livestock market prices			
➢ High	1	12.50%	
➢ Moderate	4	50%	
➢ Low	3	37.50%	

Source: KIIs (June, 2022)

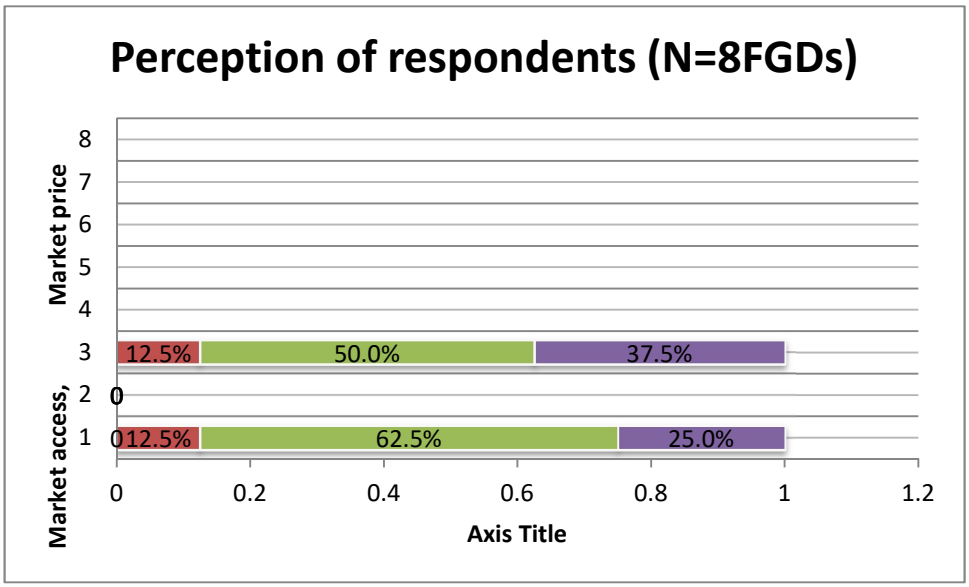


Figure 9. % of respondents on perception of market access and market price

Table 17. Productivity of livestock by project kebeles

Type	Studied kebeles								Total	Average
	Eli Wuha	Yaldi	01Millie	Wanaba	WH	Udaíli	Debaho	Digdiga		
Milk(Lit/camel/day)										
During rainy season	10	10.15	6	10	12	3	7	4	62.15	7.77
During dry season	*	*	3	4	1	1	4	1	14	2.33
Milk(Lit/cow/day)										
During rainy season	3	6	4	7	2	2	2	2	28	3.50
During dry season	*	*	2	3	0.5	0.5	1	0.5	7.5	1.25
Milk(Lit/sheep/day)										
During rainy season	0.5	1	0.5	2	0.5	0.5	0.5	0.5	6	0.75
During dry season	*	*	0	0.5	0	0	0	0	0.5	0.08
Milk(Lit/goat/day)										
During rainy season	1	1	1	3	0.5	0.5	0.5	0.5	8	1.00
During dry season	*	*	0.5	0	0	0	0.25	0	0.75	0.13
Number of births over total lifespan										
Camel	8	10	9	12	6	12	12	10	79	9.88
Cow	6	8	8	11	6	10	10	9	68	8.50
Sheep	8	12	12	7	7	10	8	10	74	9.25
Goat	8	14	12	8	8	15	8	12	85	10.63
Donkey	6	8	8	9	7	11	5	8	62	7.75

Source: Field Assessment (June 2022) *Data wasn't collected for dry season

Due to considerable variation in seasonality, milk yield data across all studied kebeles was collected separately for dry and rainy season except for Eli Wuha and Yaldi. The average milk per camel per day is about 7.77 liters and 2.33 liters during the rainy and dry season, respectively. Keeping other factors constant, the overall assessment result suggests a higher milk productivity of camel in the selected kebeles during the reference period as compared to the national average, which is 2.79lit/camel/day (CSA, 2018). It should be noted here however that there is substantial difference in productivity when variation in seasonality is taken in to account. Hence, the national average daily milk production of camel is well above that of the average daily milk production of the study area (2.33lit/day) that can be milked during dry season (See Table 17 above). Similar trend has been observed with regard to cow milk productivity. The local cow in the study kebeles gives on average 3.5 liters per day during rainy season, which is greater than that of the national average (1.482litres/cow/day) whereas the corresponding average yield during dry season (1.25litre/cow/day) is slightly lower than that of the national average (ibid). During rainy season, the productivity of goat's milk averages 1litre per day while about 0.75litre per day can be harvested from a sheep. However, the average milk yield both from the goat and sheep during the dry season is virtually nil as illustrated in Table 17 above.

Despite the many challenges constraining livestock production, goats and sheep have very good potential in the kebeles under study. They can give birth up to 10 off springs over the life of their lifespan, and are more resilient to moisture deficit areas.

Table 17.1 Livestock Production parameters in the target kebeles

Type of animals	Total Average lifespan(Years) (Average life expectancy)	Age at 1st birth	Incidence of twins (h/m/l)	Juvenile mortality rate (High/medium/ low)	Lactation period (months)	Incidence of diseases (h/m/l)
Camel	18	3	No	Low	9	Medium
Cattle	15	2.6	No	Low	7	Medium
Sheep	9	1.7	Medium	Medium	-	Medium
Goat	10	1.5	high	Medium	3	Medium
Donkey	16	3.9	No	low	-	Low

Source: Field Assessment (June 2022)

3.4.5. Major Livestock Production Constraints

In Afar, the livestock sector has been suffered from multitude of problems and constraints. Drought, shortage of feed and water, shortage of rainfall, livestock disease, Invasive of prosopis, limited market access and poor livestock husbandry practices including poor feeding, poor rangeland management, and poor livestock housing conditions were the major constraints reported to have caused the low-level performance of the livestock sector in the study sites.

After identifying out the main production constraints of their respective villages, each FGD participants in each kebele were asked to put down the problem list in their order of importance. Pair-wise ranking exercise was adopted to help villagers easily rank the problems in their order of priority. In Table 18, pair-wise ranking of problems for Digdiga kebele was tabulated. Using similar procedure, the pair-wise ranking exercises for the other four kebeles were carried out but for the purpose of this report only the summary of the rank is shown here (See Table 19).

Table 18. Pair-Wise Ranking of Livestock Production Constraints by FGDs (Digdiga kebele).

Problems	Diseases	Forage	Water	Drought	Rainfall	Poor husbandry	Prosopis	Score	Rank
Diseases		Forage	Water	Drought	Rainfall	Diseases	Prosopis	1	6th
Forage			Forage	Drought	Rainfall	Forage	Prosopis	3	4th
Water				Drought	Water	Water	Water	4	2nd
Drought					Drought	Drought	Drought	6	1st
Rainfall						Poor husbandry	Prosopis	2	5th
Poor husbandry							Prosopis	1	6th
prosopis								4	2nd

Source: FGD (2022)

Table 19. Pair-wise Ranking of Livestock Production Constraints by sample kebeles taken from the target areas (June 2022)

Constraints	Ranking by kebeles					Remark
	Wanaba	W&H	Udaíli	Debaho	Digdiga	
Forage shortage	1st	1st	3rd	3rd	4th	
Livestock diseases	3rd	5th	4th	5th	6th	
Water shortage	2nd	3rd	2nd	3rd	2nd	
Drought	*	2nd	*	2nd	1st	
Rainfall shortage	*	3rd	*	*	5th	
Prosopis Invasion	*	*	1st	1st	2nd	
Poor Livestock Husbandry	5th	5th	5th	*	6th	
Poor market	4th	*	6th	*	*	

***indicates the problem wasn't raised during FGDs but it doesn't necessary mean that the problem doesn't exist in that kebele at all.**

As can be seen from the sample kebeles taken from the target area, about five to seven problems were identified in general in each kebele. Although most problems are prevalent in all project kebeles, the magnitude of the problems is somewhat different from kebele to kebele as can be noted from pair-wise ranking in Table 19. Despite this, a closer look at the pair wise ranking indicates that drought, water, and forage shortage aggravated by invasion of prosopis occupy the first three major constraints of livestock production. Forage shortage was ranked first in Wanaba and Wanasana Harigerbu kebeles while prosopis invasion was rated first in Udai'li and Debaho whereas drought was considered second in two of these kebeles (Wanasana Harigerbu and Debaho). Of the first top three constraints, water shortage was ranked second by three kebeles while the remaining two kebeles placed it on the third place.

In fact, the constraints are very much inter-related each other, one reinforcing the other. As has been discussed earlier, the trend in livestock holdings among the surveyed pastoralists was picturing a very grey image due to the successive drought that was experienced in the region followed by the frequent failure of rains both in the short and long seasons. The effect of this was reduced pasture, scarcity of water, massive death of livestock and outmigration. During the field work exercise, the impact of the invasive prosopis juliflora on reduced rangeland has been highly pronounced synonymously across all the FGDs. Prosopis is a fast-growing bush encroaching into customary rangeland, taking away valuable and much needed grazing land, leaving little grass for animals to graze on. Forage shortage can be caused by many factors including drought, shortage of rainfall, lack of water, and prosopis invasion, potentially affecting the amount and quality of grazing land available for livestock. The challenges caused by variability and scarcity of rainfall are also equally interrelated with other issues of drought, forage and water resources so to speak. So, the interviewed pastoralists perceived these factors as the most critical constraints having mutually reinforcing effects on livestock production.

Livestock disease seems to stand in the next line in limiting this sector. The prevalence of animal diseases was also frequently raised by respondents, wiping out considerable number of livestock resources. Camel pox, anthrax, diarrhea, cough, FMD, Ovine Pasteurellosis, tick infestation, and bloating are some of the commonly mentioned diseases affecting the health of livestock in the area. The extended list of the diseases is detailed in Table 22 below. The list of

livestock production constraints goes on to include poor market access, and poor livestock husbandry practices. These are also the other two potential constraints which negatively affect production and income of pastoralists. Of course, these two problems weren't raised in some of the sampled kebeles. But, the discussions made with woreda experts rather gave a greater deal of emphasis to the challenges imposed by these problems. Improved livestock husbandry such as proper feeding and watering, feed management, disease control; good housing & sheltering are important skills to harvest the potential benefits of the sector in the area. The woreda experts asserted that these necessary skills are all lacking and rarely applied to boost production. The interviewed experts also added that a lot of efforts have been made by the government to improve market access but there has been still a problem which rather deteriorated further due to the current conflict.

3.4.5.1. Fodder Shortage

In the surveyed area, fodder shortage is caused by several factors of which natural pasture which is mainly available during the rainy season is not adequate to support animal production round the year. Moreover, the practice of fodder production to supplement the shortage and low-quality feed is very rare. As was stated by the majority of the experts interviewed, forage production in this area is backward type and animals are left to graze openly with minimum supervision from the herdsmen. The traditional grazing pasture appears to be somewhat adequate during rainy season but reported to be insufficient during the dry season. During this seasonal feed shortage period, livestock are adversely affected with varying degree of impacts. Some animals may be troubled most than others. In some visited kebeles, livestock start to suffer from feed shortage as early as October and November. Forced ranking scale was used for prioritizing the type of livestock most affected by fodder shortage where 1 being the first most affected and 5 is the least affected of all.

The results of the fodder shortage period occurred in the year and the type of livestock most affected are presented in Table 20. From this Table, we can see that cattle are obviously the most vulnerable livestock to feed shortage during the dry season followed by sheep. Goats are the third most affected animals during this period, and then come camels and donkeys, respectively. Vulnerability to fodder shortage problems can be generally associated to the very nature of the animals. Part of the explanation provided by key informants was that cattle are weak to survive on trees and shrubs during dry season. Moreover, unlike camels and goats, the feed diversity and preference of cattle is very limited to make the maximum use of the existing and available pasture in the area. Cattle to some extent sheep as well are very much dependent on surface grass, which is often scarce during dry season. On contrary, camels and goats find their own feed by themselves from leaves and shrubs in the forest. They are browsers and can feed on different parts of woody vegetation such as acacia, 'keseleito', `habala' and "*prosopis*". Pastoralists in the study area were used to rely on many indigenous trees to get some additional feed to their livestock in times of drought. This time around however, many of these indigenous shrubs and trees are disappearing due to the negative effect of prosopis jiluflora, a recently introduced invasive shrub that is abundantly found on rangeland area.

Prosopis is widely spread in Yello, Teru, Mille, and Ada'ar woreda. It is a much-branched evergreen shrub and remains deep green during the dry season. But the shrub is thorny and not palatable especially for non-ruminant animals. Key informants also noted that animals are not willing to feed on this shrub unless it is under extremely harsh conditions. Apart from this, stomach-aches and bloating on animals particularly on donkeys due to its excessive consumption have been reported by FGDs participants.

Table 20. Fodder shortage period in the year indicated by sample kebeles (June, 2022)

Kebeles	**EliWuh**	**Yaldi**	**01Millie**	**Wanaba**	**W&H**	**Udaíli**	**Debaho**	**Digdiga**	**Total**	**Rank**
Fodder shortage Period (Months):	Nov to June	Feb to June	Jan to June	Dec to July	Dec to June	Oct to July15	Jan to July	Nov to July		
Livestock	**Rating livestock most affected (1=being the 1st most affected; 2=2nd most affected; 5=least affected)**									
a) camel	3	4	2	5	4	4	3	3	28	3
b) Cattle	1	1	1	2	2	1	1	1	10	1
c) Sheep	2	2	3	1	1	2	2	2	15	2
d) Goats	4	3	4	4	3	3	4	4	29	4
e) Donkeys	5	5	5	3	5	5	5	5	38	5

Source: KIIs(June, 2022)

On average, livestock suffer from feed shortage for about a period of 7 to 8 months in a year. The feed shortage period usually occurs from November through Mid-July. The core reason of the feed shortage is the absence of rains which impedes the growth of pasture. Changes in climate have caused variability in rains and seasons of the areas, affecting the growth of pasture for animals. As Asdeto, a chairperson of Wanaba kebele in Chifra woreda rightly puts it

"We used to have two rainy seasons in a year-a long (Kerma) and short (Sugum) rainy seasons. A sugum short rainy season which usually runs from March to April failed since some years ago. We now have only one rainy season and hence an extended dry season."

3.4.5.2. Water shortage

Shortage of water is a common and one of the most critical factors which most pastoralists are complaining about in the target kebeles of Northwestern Afar. Due to the scarcity of water, substantial livestock are affected and many families regularly move from their temporary settlement. Water usually begins to become scarce as early as November. In all of the surveyed kebeles, water shortage has been reported to have extended up to July until the next rain is received. Informants also reported acute water shortage usually faces pastoralists in the months of April and May. Reported cases from key informant interviews again indicated that in some kebeles such as Digdiga and Udaili, people are watering their livestock every three days during acute water shortage period and have to walk long distances to get water (50km) specially when the traditional ground water wells, '*ellas'* gets dried up.

Similar to the case with fodder shortage discussed above, a forced ranking scale technique was used to organize the responses of the key informant interview participants in prioritizing the

livestock that are affected most. Accordingly, the results of the assessment show that sheep and goats are the first animals to be affected by shortage of water. As per the FGDs and key informants, sheep and goats are very much vulnerable to shocks due to scarcity of water and need to get watered at least every other day. Cattle are considered in the second place to be affected most by lack of water in the area. According to reports from the FGDs, shortage of water is also a serious constraint to cattle production and estimated that cattle can live for at most five to seven days if not supplied with water.

Based on the results of the ranking exercise as indicated in the Table 21, herders view donkeys to resist scarcity of water more than cattle and shoat and put them at third place in terms of priority. Camels are the last and least affected animals by shortage of water as has been estimated by herders during the focus group discussions. The qualitative data from FGDs also revealed that camels can endure without water for more than two weeks.

The majority of pastoralists move (migrate) to other places where they can get water and pasture for their livestock during this shortage period. The other striking strategy taken by the herders in times of water scarcity is to allow livestock to drink in cycle. The cycle for watering livestock is in the following order: Sheep and goat including calves first; cattle, and then camels. This strategy was deployed based on the vulnerability of livestock to shortage of water.

Table 21. Water shortage period of the year as indicated by sample kebeles (June 2022)

Sample Kebeles	**Eli Wuha**	**Yaldi**	**01Millie**	**Wanaba**	**W&H**	**Udaíli**	**Debaho**	**Digdiga**	Total	Rank
Water shortage Period(Months):	Nov to Mid-June	Feb to June	Jan to June	Dec to July	Dec to Jul	Sep to July15	Nov to July	Feb to July		
Livestock	**Ranking livestock most affected (1=being the 1st most affected; 2=2nd most affected….4=least affected)**									
a) camel	4	4	4	4	4	4	4	4	32	4
b) Cattle	1	1	2	2	2	2	2	1	13	2
c) Shoat	2	2	1	1	1	1	1	2	11	1
d) Donkeys	3	3	3	3	3	3	3	3	24	3

Source: KIIs (2022)

3.4.5.3. Livestock diseases

From the discussions held with the key informants and FGD participants, it was learnt that pastoralists face important risks from animal diseases like anthrax, foot and mouth, intestinal worms, tick, diarrhea etc. The key informants' interviews conducted for the purpose of this assessment identified some important diseases of cattle, camels, goat and sheep, and donkeys. The list of diseases as distributed by their level of severity was portrayed in Table 22. below. The types of diseases prevailing in the area were first identified by key informant pastoralists and then reviewed and approved in the key informant interviews held with woreda experts.

According to woreda experts anthrax, paramphistomiasis, ovine pasteurellosis, Contagious, Caprine pleuro pneumonia (CCPP) and Peste-des Petites Ruminantes (PPR) in goats, coughing,

bloating, tick infestation, and mange are rampant in many parts of the villages under visited and have been reported to have occurred frequently. Experts also mentioned that during dry season when water stress and shortage of pasture associated with drought, livestock become more susceptible to opportunistic diseases that normally would not affect health animals. Due to the prevalence of these diseases, all experts in the key informants' interviews asserted that herders lose considerable number of livestock resources each year.

For pastoralists in the surveyed villages, the situation looks more uncertain given poor vet service coverage and weak livestock management and control practices. The idea of experts was also in favor of this view. One of the most significant challenges about which most experts have complained is the poor veterinary services of the government. Most vet posts constructed at kebele level are not functional and have neither medicine nor medical equipment to extend proper veterinary services to pastoralists. A desperate pastoralist who was met at Debaho village (only a ten minute walk to the vet post station) carrying back home his sick goat illustrated the seriousness of the situation in the area. The team visited two vet posts in Debaho, and Digdiga kebele. Both of them didn't start providing services since they were constructed.

Table 22. Distribution of Animal Diseases by type of livestock and level of severity (June, 2022)

Type of Livestock	Livestock diseases distributed based on level of severity		
	Sever	**Moderate**	**Minor**
Camels	Anthrax	Wound	"Prosopis"-Toxic plant
	Camel pox	cough	Tick infestation
		Mange	
		"Gedadu"	
Cattle	Foot & month	cough	Cough
	Anthrax	Paramphistomiasis	Tick infestation
	CBPP	Bloating	Internal parasites
		Ovine Pasteurellosis	Diarrhea
Shoat	Suspected tick paralysis	cough	Swelling
	Diarrhea	Tick infestation	FMD
	PPR	Shoat pox	
	Wound	Swelling	
	CCPP	Paramphistomiasis	
	Pasteurellosis		
Donkeys		Bloating	Parafilariass
		Gaseous bloat	"Bloating (Prosopis)
			Nasal discharge

Source: KIIs (June, 2022)

3.5. Water Development Infrastructures

3.5.1. Institutional set up regulating water use and resolving water use disputes

Water in lowland areas of the study kebeles is very scarce, requiring wise management of the scarce resources to make the maximum use of the available water. As was listed in the Table 23, there are different rural water infrastructures built across the eight kebeles despite the limited availability of drinking water sources. However, a good number of the schemes were reported non-functional and fallen in to disrepair due to technical and managerial limitation. The Digdiga kebele chairperson told the team that there are water infrastructures in the village that haven't started functioning since they have been constructed. So, quality of the construction work also deserves required attention. Based on the discussions made with target respondents, communities have also developed their own water schemes of which the water sources are mostly rivers, boreholes or shallow and open wells, which are in many cases unsafe and contaminated.

A discussion made on the status and management of the existing schemes has also revealed the involvement of local institutions and customary laws. Asked about the institutional set up regulating water use and resolving water use disputes, all key informants in all studied kebeles pointed out that there is clan leader in each village locally called as *kedo abbaa* who is responsible for much of the important decisions made around water schemes and its management. The elders' council is in the second tier in the hierarchy making the next most important decisions. Respondents also mentioned other players in the community who have important roles in managing water schemes. These include the migration leader *(duwa abba)*, and rule enforcer. As can be understood from the FGDs and key informants, most of the existing water infrastructures are managed in compatible with local traditions such as the engagement of the ethnic, elderly and clan leaders.

Regarding means of access, discussants explained that most of the villagers get access to water through their existing *ellas,* ponds as wells as community wells followed by deep wells constructed by local government. In some kebeles such as Mille, chifra, and Golina area, communities also access to water through buying water from local suppliers. The team observed water being sold at the outlets in jerry cans, and containers. Majority of pastoralists in the visited villages still depend on local water sources (wells, hand pumps, river), which are in many cases contaminated. This is most likely a common challenge with all community water schemes using ponds and unprotected wells as their main water sources. So, contacted villagers perceived that they don't have enough and safe drinking water supply. The development of water schemes in the study area has indeed improved accessibility, but the single-village and a very scattered settlement pattern such as in the project area requires great deal of investment and institutional arrangement to ensure its sustainable services to mobile pastoralists.

Few transboundary rivers are crossing some of the kebeles of the target area providing water for human and livestock. Water for pasture and livestock mainly comes from rain. However, due to recurrent drought, the amount and distribution of rain has become very limited and unpredictable as a result of which rivers are drying up early.

Table 23. List of seasonal rivers available across the study kebeles (June, 2022)

2.2. Seasonal rivers	(# of days /months with water)	Remark
Ada'ar woreda		
Kebar	1 to 2 days	
Dubra	1 to3	
Geleha	3 days	
Metaámitoli	2days	
Yeldi Woreda		
Yaldi river	3 months	
Mille Woreda		
Bedena	3 to 4 days	
Kiraro	1days	
Woranso	3days	
Golina woreda		
Golina	6 to 7 months	
Aleina	3 days	
Bekeru	5 to 7 days	
Yello Woreda		
Goriso	2 to 3 months	

Source: Field Assessment (2022)

Table 24. List of available water points and their current status (June, 2022)

Inventory of Communal Water Resources (Water Points)				Current Status
1.1. Ellias (Traditional ground water wells)	**# of days/months with water**	**# of user HHs**	**Location by woreda/kebele**	
Dubra	365 days	50	Eli Wuha/Dubra village	Functional
Geno Ella			Golina woreda	
Erolle	2 months	55HHs	Golina/Erole 1	
Galikoma	2months	60HHs	Golina woreda	
2 Ellas in Horiye				
Horiye 1	50 days	40HHs	Yallo woreda	
Horiye 2	35 days	40HHS	Yallo woreda	
Ella	120 days	100hhs	Debaho kebele	

Hiru		30HHs	Digdiga Kebele	
Desayitu		30HHs	Digdiga kebele	
Iroli		20HHs	Digdiga Kebele	
Umadilie		30HHs	Digdiga Kebele	
Batawura		100HHs	Digdiga Kebele	4 human and livestock
1.2. Birka (Run-off water harvesting pond with masonary walls, covered with iron sheet)	**# of days/months with water**	**# of user HHs**	**Location by woreda/kebele**	**Current Status**
One Birka support by tanker			Diebaho	
Tetademu		160HHs	Digdiga KA	
Sifam		100HHs	Digdiga KA	
1.3. water harvesting ponds (# of days with water)	**# of days/months with water**	**# of user HHs**	**Location by woreda/kebele**	**Current Status**
Yaldi 1	365days	400HHs	Yaldi woreda	Functional
Yaldi 2			Yaldi woreda	Not functional
Yaldi 3			Yaldi woreda	Not functional
Debayyira	60days	400HHs	Wanansa	Not functional
Harigerbu		153HH	Harigerbu	Functional
Fertina		100HHs	Harigerbu	Functional
Hari Dori pond	120days		Yallo woreda	Functional
Galihuda pond	90days		Yallo woreda	Functional
pond reserviour	150days	150hh	Debaho kebele	Functional
Muge eleirebi horye pond			Digdiga kebele	Functional
1.4. Deep wells	**# of days with water**	**# of user HHs**	**Location by woreda/kebele**	**Current Status**
Elie 1	90days	100HH	Eli Wuha woreda	Rarely functional
Yaldi 1	200days	50HHs	Yaldi Woreda	Functional
Yaldi 2			Yaldi Woreda	Not functional
2deep wells/pump water	90days	150HHs	Mille woreda	Not well developed
Closed (Unfunctional Water Tap			Mile woreda	not functional
Tap Water	365days	100hhs	Mile woreda	Functional
Active water Tap			Mile woreda	Functional
Closed water (Yewayidayine site)			Chifra woreda	Not functional
Closed water (Geri Site)			Chifra woreda	Not functional
Closed water point			Chifra woreda	Not functional
Geri closed water point			Chifra woreda	Not functional
Fentina water point			Golina woreda	Functional
Solar water (Dibira Station)			Golina woreda	Functional

Kusrare solar water			Golina woreda	Functional
Kusrali motor pump		50HHs	Golina woreda	Functional
Hari Dori wtare tanker station			Yaldi Woreda	Not functional
Water Bono right to LLRP site			Debaho kebele	Rarely functional
Derella (Closed water) station			Debaho kebele	Not functional
Closed water1			Digdiga kebele	Not functional
Closed water2			Digdiga Kebele	Functional
Kebele water tanker			Digdiga Kebele	Not functional

Source: Field Assessment (2022)

*16 schemes excluding ellas don't provide water

3.6. Gender Analysis

In order to capture the contribution of women, men and children in livestock production, respondents in key informant interviews were asked to explain the roles that each household members play. It was noted that both women and men do participate in herding and livestock husbandry practices. However, the existing gender-based division of labour has still overburdened women in terms of shouldering various responsibilities. As a result, women and children play a significant role in managing livestock especially when they are around home area while men tend to attend the herd when they move away from place to place in search of water and pasture

Nearly all interviewed key informants reported that fetching water for daily household consumption is the primary task of women in the area. Girls and children are sharing important roles in collecting water for household use. Due to the existing biased gender division of labor, again, women seem to spend more time in undertaking this routine activity. Moreover, fuel wood collection is other routine task often set aside for women and girls. It takes woman on average three to four hour to collect fuel wood.

According to key informants, these activities are undertaken almost on a daily basis and quite realistic cases with women across all target woredas. Despite these contributions, women in the area suffer from livelihood challenges in terms of time, access to and control over resources facing gender and other socio-economic inequalities. Literally, women work for 20-22 hours a day in the area visited. Below are major tasks performed on daily basis by women, men, girls and boys as tallied out by key informants.

Table 25. Daily Activities performed by women, men, girls and boys across the sampled KAs (2022)

Major Activities	Time needed	Women	Girls	Men	Boys
Breakfast	1hour	XXXXX	XX		
Milking (Morning)	00:30hr	Goats and cow		Camel	
Making coffee	1hr	XXXX	XX		

Fetching water	3hr	XXXXX	XX		X
Cleaning barns/pen	1hr	XXXX	XXX		
Collecting fuel wood	3hrs	XXXXX	XXX		X
Herding animals (Young, Shoat)	*	XXX	XXX		XX
Herding large animals (Cattle, camels)	*			XXXXX	XX
Grinding cereals	2hrs	XXXX	XX		
Going to grinding mills	*	Xx	X		
Wash clothes	3hrs	XXX	XX		
Mowing grass for calves	2hrs	XXX	XX	XX	XX
Marketing (once/twice/week)	*	XXXX	X		
Looking after children	*	XXX	XX		
Mobile house(Ärri")construction) once in a 2/3months	*	XXXXX	Xx		
Making Lunch/super	1hr	XXXXX	X		
Milking (Night)	1hr	XXXXX		XX	

* are activities may not be undertaken on daily basis but require more time and effort when they come

3.7. Stakeholders Analysis

In order to create possible collaboration and avoid duplication of efforts, stakeholder's analysis was conducted to identify potential partners working in similar areas of interest. The Regional Pastoral Livelihood Resilience Project (RPLRP), GITEC, GiZ, VSF-German, Islamic Relief, Goal Ethiopia, WFP, Save, Action for Integrated & Sustainable Development Agency (AISDA), Organization for Sustainable Development, GCF, and Coopi are NGOs along with government partners identified as major stakeholders across the six project-targeted woredas.

RPLRP, which is a government affiliated project and financed by WFP, has a wider coverage and reaches many parts of the project targeted woredas. As indicated by the participants in key informants, many of them have experiences of working with pastoralists and agro-pastoralists which can be used as partners as appropriate. Yet, respondents of the FGDs felt that except few NGOs (such as GiZ and SSD) considerable number of them fails to sustain their development initiatives or handicapped in delivering tangible development outcomes to the communities.

3.8. Description of Relevant ongoing or planned development initiatives

Table 26. Description relevant ongoing or planned development activities by implementing agencies

S/N	Stakeholders	Main thematic areas	Location and outreach	Project period	Relevance (High, medium, low)
1	RPLRP/Reginal Pastoral Lowland Resilience Program	➢ Rangeland/NRM, Soil & water conservation (SWC), Nursery site, water development, tree seedling, ➢ Livelihood support (LS), and income ➢ Training on risk management	In all target woredas and covers whole woreda	5 years	High
2	SAVE	Nutrition, Rangeland management	Chifra, and Golina		Medium
3	Goal Ethiopia	-Logistic support to local government in nutrition intervention at Golina			Low
4	GITEC	-Clearance of prosopis and reseeding with improved grass spp, & fodder seeds	-In all 6 woredas		High
5	GiZ	SWC(Wear) and rehabilitation via grass (Alfa alfa), training on masonry	-Golina and Yallo	Phased out	High buy-in
6	VSF-German	Rehabilitation of rangeland (now stopped)	-Chifra		Medium
7	Islamic Relief	-Livestock health, Coops and DRR in Golina, nutritious food items including meat distribution on Mawlid at Yallo,	-Golina -Yallo		Poor relevance
8	AISDA	-Solar water development for rangeland too -Solar water, hand pump, Latrine, DRR, *Moringa* tree	-Kelewan,	3yrs	High
9	Org. Sust. Dev't (OSD)	-Water harvesting for seedling, and forage production in Golina, Humanitarian at Yallo	-Golina, -Yallo	Still working	Medium
10	GCF	-SWC, Nursery for forage tree production,	-Yallo	Active	High
11	Coopi	-Humanitarian training for coop committee	-Yallo		Low
12	VSF	Livestock health (Vaccination)	Teru		Medium
13	CARE	Early Warning and training of Rangeland council	-Chifra		Medium
14	WFP	-Humanitarian at planning stage in Chifra -Nutrition via food distribution in Golina	-Chifra	6 months	Low
15	SSD	-Rangeland and capacity building	-6 woredas	1year	High
16	PSNP	-SWC, Prosopis clearance, Road maintenance, nursery -Planned 1.5m Seedling production in Chifra	Mille, 14623 targeted, seedling	5yrs project	High
17	Federal Irrigation	Small scale irrigation development for crop production	-Chifra		High
18	Local Woreda gov't	-In Golina, area closure was planned but not implemented), 5ha was sown with grass seeds (Rodhes, & Sudan grass) but failed due to shortage of water -At Yallo woreda, 150 ha area closure was planned in 3kebeles (Udaili, Rakuda, Koli Gawe) of which 75ha closed so far	-Golina -Yallo		High

3.9. Development Plan

The community planning exercises undertaken for a development were made in dialogue with the pastoralists and experts from local level government. Accordingly, discussions and meetings were held with target groups in organizing the plan, where major problems along with their causes were identified and possible solutions were suggested. The main activities of the community development plan revolve around agriculture, rangeland and livestock development and are summarized in the Table 27 below.

During this exercise, opportunities to improve the livestock sector were also identified by the target groups. Hence, large livestock resources with grazing land and pasture, and good road access to different regions and foreign export market (Djibouti port) are few existing opportunities in the area. With these factors at hand, there are ample opportunities to commercialize Afar's livestock sector. The sector can be linked as well to parastatal development organizations such as World Bank, IGAD, USAID, etc for support to initiate and get access to regional markets. In the livestock value-chain, capacity building of pastoralists (for example through market and value chain training) may be necessitated to help them play the required roles.

Table 27. Indicative development plan of the target communities

Problems	Causes	Solutions	Contributions by community
Drought	-Shortage of rainfall -When water in the rivers, lakes, oceans and other surface water dry -Change in climate -Deforestation and soil erosion	-Water harvesting during rainy seasons -Grass and tree planting -Initiate early warning systems and preparedness in relation to drought, water and feed supply -Raising and planting drought-resilient tree & grass species	-Free labor -Free locally available materials -Free land for nursery site establishment
Shortage of water for both human and livestock consumption	-Shortage of rainfall -Dryness of surface and ground waters -Lack of adequate perennial rivers and water sources	- Water and moisture conservation practices -Water development (such as "*Ella*", water wells, hand dug well, pump, etc.) -Pond construction -Sensitizing of the pastoralists on efficient utilization of scarce water resources	-Mobilization and coordination roles -Free labor -Free locally available materials -Protecting, safeguard, maintenance, and repair of water infrastructures
Shortage of	-Free grazing and poor	-Introduction of improved rangeland	-Pastoralists have

pasture and fodder for livestock	rangelands management practices -The grazing lands are generally the sole feed sources of livestock in the study kebeles, and feeding almost invariably on natural grazing, exposing it to complete overall grazing and misuse -Shortage of rainfall -Invasion of prosopis juliflora in to rangeland and is presently becoming a potential threat -Conflicts over grazing land	management (such as rotational grazing, Desso management system, -Clearing out and check on uncontrolled expansion of prosopis -Application of the customary law as for the promotion and protection of indigenous shrubs and fodder species including plantations - Introduce improved fodder crops (oats, triticale, alfalfa, mixed fodders, shrubs, cactus, etc. -To consolidate traditional institutions, elders and committees of rangeland technically supported by livestock experts - Develop bylaws and local norms -Training and education on improved rangeland management	customary laws by which they can manage and handle conflicts over resources -Elders and clan leaders can be used to protect useful indigenous grass species, and trees
Shortage of rainfall	-Deforestation -Climate change -Soil erosion and land degradation	-Water harvesting technologies should be used for irrigated feed production - Introduce short-seasoned fodder species in water deficit areas such as Teru woreda -improve the feeding quality of crop residues, and crop residue-based ratio formulation for dry season forage supply in agro-pastoral areas such as Adaár, Chifra, etc.	-Free labor mobilization -Free locally available materials -Skill labor on construction, repair and maintenance work
Poor Livestock Health	- High disease burden and high death of young animals, and livestock -Drug supplies do not last long -Disease preventive service (vaccination) does not cover all important diseases and areas - Vet posts are ill-equipped and drugs are not available in many occasions -Kebele health posts do not seem accessible to all pastoralists easily	-Most vet posts are in short supply of drugs, so good to build their capacity via good supply and quality of veterinary drugs, vaccines and equipment - Train community-based animal health workers (CAHWs) to provide minor village level livestock health services such as vaccination, castration, hoofing, etc. -Consolidate the kebele level animal health services such as center for vaccination (Eg. Digdiga and Debaho KAs) -Improve pastoralists' kid management in areas like kidding seasons, kid rearing, kid housing, feeding kids, health care, &	-Select CAHWs from among the communities -Let elders and community members participate in the monitoring and supervision of the provision of livestock health services -CAHWs serve the community for

	-Trainings of the pastoralists on livestock health	weaning	free with minimum incentives
Poor livestock husbandry practices	- Communal, free and uncontrolled grazing system -Poor production and handling/keeping animal feed -Poor animals supplementary feed, -Lack of skills to formulate and mix animals feed	- Strengthening grazing land improvement interventions (eg. enclosures, Desso, rotational grazing, etc.) -Demonstration activities on improved husbandry practices including hay making, feed storage, mating systems and techniques, selection and culling, etc. -Engage kebele administrators, clan leaders, and elders in every sensitization, mobilization and awareness creating to be organized at community levels	-Grazing land for demonstrations -Free labor and demo materials
Poor market access	- Poor source of price information and is mainly limited with neighbors - Poor access to livestock (domestic and export) markets information - Theft and raid of livestock	-Create access to marketing centers - Promotion of information on livestock marketing including most demanded animals and price -Provide market extension services to explore the marketing possibility, production and the milk producer-value chain - There are no commercial feed suppliers in any of the woredas surveyed. Formulated feeds could be used for conditioning marketed animals in the absence of other locally available supplementary feeds, so encourage private commercial feed supply system	-Place for marketing centres -Labor and locally available construction materials -Community members can serve in various steering committees, and technical working groups

4. Conclusion and recommendations

4.1. Conclusion

Results of the field based rangeland management and NR development assessment revealed that significant number of pastoralists in the studied project kebeles have faced a number of livestock production constraints. Drought, shortage of pasture, scarcity of water, shortage of rainfall, livestock disease, Invasive of prosopis, limited market access and poor livestock husbandry practices were the major constraints reported to have caused the low-level performance of the livestock sector in the study sites. Free grazing and lack of communal or private property rights are also considered other drivers of rangeland management challenges and contributed to communities' limited efforts of prosopis control and SWC activities. Due to long-held cultural and social belief, women's participation, access to and control over resources are very poor. This might also have a limiting effect in its own right to narrow down gender gap in development in the study area. Conflict over pasture and scarce water resources has been also a regular & critical challenge affecting the livelihoods of many pastoralists.

Due to the combined negative effects of the aforementioned constraints, the trend in livestock production across all assessment kebeles has been a decreasing one, up to 60% of herders had to migrate to other neighboring areas with their livestock in search of water and pasture, and many remained poor unable to produce enough as a result of which pastoralists' family members suffer from some form of food shortage and hunger.

4.2. Recommendations

On the basis of the key findings discussed in the main body of the assessment report, the following recommendations are forwarded for consideration.

***Controlling the invasion of Prosopis juliflora*:** Even though the rangeland resource potential of the area appears to be well-off in most parts, the current uncontrolled expansion of prosopis juliflora into rangeland would adversely affected the future prospects for livestock production and by extension people's livelihood. Intervention in such area should focus on rehabilitation of prosopis invaded rangelands, planting of new & improved forage species and trees, protecting and conservation of the existing rangeland resources and raising the awareness level of the general communities on the *'pros and cons'* of P. juliflora on pastoralists' livelihood.

Building the capacity of traditional institutions in rangeland management and conflict resolution: Pastoralists have better knowledge of their local situations; have strong customary rules and regulations through which they have managed natural resources, and institutions & procedures through which conflicts over resources have been managed. These customary institutions and rules in the study area still have a strong buy-in from the communities and

should be an integral part of any rangeland and natural resource management interventions. Cautious amendments may be required here to ensure fair participation of women and the poor without violating the years-long cultural and social belief.

Training and capacity building of pastoralists: Raising the knowledge and skills of pastoralists on improved rangeland management along with the practical application of improved livestock husbandry practices should remain a central strategy in building the capacity of communities in disaster resilience and response. In addition, helping pastoralists with some critical inputs such as improved forage seeds, farm implements, and small scale technologies that can improve forage production will support pastoralists to increase their livestock production and productivity.

Awareness raising on gender equality: As has been identified in the assessment, the status of women and girls in the community is very disappointing. In the study area, women are highly overloaded with work compared to their men counterparts, their rights over resources are not well defined, and women participation in development work is very low. Needless to say, a woman works more than 20 hours a day and takes a full responsibility of managing a household when her husband moves away with livestock in search of pasture and water. Therefore, there is a strong need for gender awareness raising campaigns in every intervention to ensure that development efforts are equally targeted to address women's and men's challenges.

Repair and maintenance of non-functional water infrastructures: Considering the magnitude of the problem, many rural water infrastructures have been developed in the past by the government in many of the project-targeted kebeles. This has increased pastoralists access to water for human and livestock consumption. Despite this positive initiative however, a great number of the infrastructures are presently non-functional and technically ill-managed commanding frequent repair and maintenance works.

Consolidating the livestock extension service provision of the local government: Key informant interviews made with experts across all the study woredas revealed that the capacity of the local government was highly constrained by budget limitation. The problem has become more sever particularly over the past two years since the eruption of the current conflict between the Tigray region and the federal government. The expression made by one of the key informants in Yallo woreda was well narrated here: "*Many of the office equipment and furniture were looted, recent data and information were damaged, staffs were planning to leave for other (non-conflict prone) areas, and those in office are unsettled".* Even the available meager resources are now focused towards maintaining the local peace and security. With all these challenges, the woredas' capacities to promote livestock development and natural resource management activities have been handicapped. It is therefore imperative to design strategies by which the capacity of the woredas is consolidated to provide the required extension services provision to target pastoralists.

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Annex 1. List of Rural Infrastructures available in the project-targeted sample kebeles

S/N	Type of rural infrastructure	Location (Kebele)	Elevation	GPS location	Remark
1	Mille woreda	01 Mille			
	Rangelange		482masl	11^0 25′ 37″ N; 40^0 46′ 45″ E	
	Closed Water Tap		488masl	11^0 25′ 27″ N; 40^0 46′ 30″ E	Functional
	Tap Water		491 masl	11^0 25′ 08″ N; 40^0 45′ 57″ E	
	Active water Tap		483 masl	11^0 21′ 43″ N; 40^0 45′ 38″ E	
	Nursery Site		483 masl	11^0 24′ 44″ N; 40^0 45′ 37″ E	
2	Chifra Woreda	Wanaba			
	Boarder to North		900masl	11^0 24′ 45″ N; 40^0 8′ 14″ E	
	Closed water (Yewayidayine site)		843masl	11^0 35′ 49″N; 40^0 11′ 05″ E	
	Closed water (Geri Site)		819masl	11^0 34′ 07″ N; 40^0 18′ 01″ E	
	Degraded land (Burka side)		782masl	11^0 29′ 48″ N; 40^0 25′ 33″E	
	Wama River: Farm Area				
	Dintabono Tabiya		953masl	11^0 20′ 15″ N; 40^0 6′ 13″ E	
	Kalifora Tabiya		940masl	11^0 29′ 49″ N; 40^0 6′ 24″ E	
	Kelele Tabiya		897 masl	11^0 31′ 05″ N; 40^0 6′ 30″ E	
	Farm land site (4corners)				GITECH's site
	Rangeland C-1		920masl	11^0 31′ 49″ N; 40^0 8′ 15″ E	
	Rangeland C-2		915masl	11^0 31′ 49″ N; 40^0 8′ 12″E	
	Rangeland C-3		914masl	11^0 35′ 55″ N; 40^0 8′ 17″ E	
	Rangeland C-4		904masl	11^0 35′ 16″ N; 40^0 8′ 15″E	
	River pond		938masl	11^0 30′ 33″ N; 40^0 70′ 58″E	
	KA border (Haji Ahmad area		873masl	11^0 35′ 3″ N; 40^0 8′ 53″ E	
	Closed water point		839masl	11^0 35′ 40″ N; 40^0 1′ 60″ E	
	Geri closed water point station		817masl	11^0 35′ 7″ N; 40^0 18′ 01″ E	
	Semsem KA border		937masl	11^0 24′ 45″ N; 40^0 8′ 14″ E	
3	Golina Woreda	W&H			
	Fentina water point		838 masl	12^0 13′ 1″ N; 39^0 58′ 47″ E	
	Solar water (Dibira Station)		792masl	12^0 13′ 55″ N; 40^0 02′ 17″ E	
	Bekero Reasonal River		817 masl	12^0 13′ 24″ N; 39^0 59′ 26″ E	
	Kusrare solar water		867masl	12^0 12′ 49″ N; 39^0 56 ′ 37″ E	
	Border to Yello woreda		968 masl	12^0 19′ 32″ N; 39^0 55′ 30″ E	
	GITEC Rangeland site		800masl	12^0 13′ 50″ N; 40^0 1′ 35″ E	
	Fentina communal rangeland		802masl	12^0 12′ 45″ N; 39^0 58′ 32″ E	Irrigated by the communities
	Geno river (Harigerbu station)				
	Ella		815masl	12^0 11′ 03″ N; 39^0 58′ 35″ E	50HH use this

				water
	Communal rangeland (GITEC)	820masl	12^0 10′ 53″ N; 39^0 58′ 37″ E	GITEC selected this site
4	Yallo woreda Udaili			
	Hari Dori wtare tanker station	824 masl	12^0 23′ 12″ N; 39^0 55′ 12″ E	
	Cleared prosopis by GITEC via labor	802masl	12^0 23′ 14″ N; 39^0 55′ 14″ E	sample site for GITEC cleared using 10 manpower's
	Hari Dori pond	802masl	12^0 22′ 55″ N; 39^0 54′ 59″ E	can stay for 3 to 4 months
	Galihuda pond	820masl	12^0 23′ 41″ N ; 39^0 55′ 59″ E	can stay for 3 months and only for livestock
	GITEC's selected rangeland site	812masl	12^0 29′ 1″ N ; 39^0 55′ 04″ E	
	Hari Dori Health centre	800masl	12^0 23′ 37″ N; 39^0 55′ 20″ E	
5	Teru Woreda			
5.1	Debaho kebele Debaho			
	Gravel road to hot water area to kore direction)	260masl	12^0 35′ 46″ N; 40^0 22′ 20″ E	
	Ella	338masl	13^0 34′ 59″ N; 40^0 22′ 56″ E	100hhs use it for 4 months
	pond reserviour	345masl	12^0 33′ 07″ N; 40^0 21′ 20″ E	150hhs use it for5 months
	LLRP rangeland site	364masl	12^0 30′ 32″ N; 40^0 20′ 12″ E	
	Water Bono right to LLRP site	345masl	12^0 30′ 12″ N ; 40^0 20′ 4″E	
	Derella (Closed water) station	382masl	12^0 29′ 15″ N; 40^0 18′ 48″ E	
	Alelu KA border to Debaho	355masl	12^0 29′ 1″ N; 40^0 18′ 57″ E	
	GITEC Rangeland site	359masl	12^0 33′ 3″ N; 40^0 21′ 39″ E	
	GITEC office centre	359masl	12^0 29′ 58″ N; 40^0 20′ 11″ E	GITEC has established field office at this site
	Debaho Health centre	368masl	12^0 29′ 51″ N; 40^0 20′ 6″ E	
5.2	Digdiga kebele Digdiga			
	Muge eleirebi horye pond	605masl	12^0 24′ 48″ N; 40^0 18′ 52″ E	
	Water point	631masl	12^0 22′ 24″ N; 40^0 18′ 57″ E	
	GITECH rangeland site	627masl	12^0 22′ 12″ N; 40^0 18′ 45″ E	
	Animal health centre	649masl	12^0 19′ 40″ N; 40^0 16′ 28″ E	not providing services
	Closed water1	646masl	12^0 19′ 4″ N; 40^0 15′ 34″ E	No service
	Closed water 2	649masl	12^0 19′ 40 N; 40^0 16′ 28″ E	No service
	Kebele water tanker	666masl	12^0 19′ 52″ N; 40^0 16′ 20″ E	not functional