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Assessment on Acacia Woodland Degradation in Dire-Dawa Administration, Eastern Ethiopia

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Abstract

Dry woodlands are vegetation formations which comprise of shrubs, bush lands, thickets, wooded grasslands and dense woodlands. The largest share of Ethiopia's landmass is categorized as dryland, experiencing moisture stress during most days of the year. Beyond the socio-economic and ecological importance of forests Ethiopia experienced rapid loss of woodland vegetation annually. At country level the loss is attributed to low level of standard of living of farming community and their close dependency on forest and woodlands. Dire-Dawa administration which is located in the eastern part of the Ethiopia has a dense acacia woodland species occupying a total area of at 12250 ha mainly found in Hurso, Jeldessa, Gerba-Anano and Chiri-miti kebelles. As there has been no study on site specific, this study was conducted to assess the recent degradation of dry land forest in Jeldessa, Gerba-Anano and Chiri-miti kebelles of Dire-Dawa administration. The study has employed questionnaire, interview, group discussions and field observation. The findings of the study shows acacia woodland vegetation of the administration has been subjected to degradation due to charcoal production, livestock pressure, recurrent drought and prosopis juliflora invasion. Therefore, the cumulative negative effect of the above factors has contributed to the fast deterioration of acacia woodland coverage. To this end, all concerned bodies like local customary institutions, agricultural and police departments have to work in harmony in

preserving woodland vegetation. Furthermore, further study on sustainable usage of grazing and woodland forest is very mandatory.

Keywords: Acacia Woodland, Woodland Degradation, Charcoal Production, Overgrazing

1. Introduction

Dry woodlands are vegetation formations which comprise of scrubs, bush lands, thickets, wooded grasslands and dense woodlands (Chidumayo, 2010). They occur in climates with annual rainfall of 300 to 1200 mm and a dry period of five to ten months (FAO, 2000). These woodlands are an important source of ecosystem services to the agro-pastoral and pastoral communities living within and around them (Maass, Balvanera, & Castillo, 2005).

In Africa forests plays a great role in the livelihood of both rural households and urban dwellers, and they contribute significantly to the economic development of many countries, particularly in Western, Eastern and Central Africa, where there is considerable forest cover (UNEP, 2006). The African savanna woodlands provide the habitat for a large number of endemic plant and animal species, but are also the home of agro and silvo-agropastoral communities and their cattle. The trees are used for fuel wood and construction timber, and also serve as valuable bee, human and animal fodder. Some species are used in traditional medicine, for tanning hides, and harvesting for gum and incense, thus providing an important source of income (Reusing, 2017). Hence, dryland woodlands are an important source of ecosystem services to the agro-pastoral and pastoral communities living within and around them (Sedano et al., 2016).

The dry forests and woodlands are the dominant vegetation type in sub-Saharan Africa, covering over 17.3 million Km^2 in a total of 31 countries (Chidumayo & Marunda, 2010). Beside their wide rage importance, dry land woodlands are degraded due to charcoal production for urban energy consumption is a main driver of forest degradation in sub-Saharan Africa (Ndegwa, Nehren, Grüninger, Iiyama, & Anhuf, 2016).

About 75% percent of Ethiopia's landmass is categorized as dryland, experiencing moisture stress during most days of the year (Giorgis, 2014). Hence, lowland woodlands are the largest remaining forests in Ethiopia, covering an estimated 55 million ha (48.6 %) of land (WBISPP, 2004). Here, the Acacia-Commiphora small leaved deciduous woodland is found mainly in southern and eastern parts of the country and the Rift Valley with altitudinal range of 900 and 1900 meter above sea level. The characteristics of plant species in this vegetation type include drought tolerant trees and shrubs: *Acacia tortilis, A. mellifera, Balanites aegyptiaca,* species of *Acalypha, Aerva, Barleria, Capparis, Combretum, Terminalia*, etc.

The main causes of deforestation in tropical Africa are the expansion of subsistence agriculture, extraction of fuel wood, commercial crop cultivation, and poverty (Boahene, 1996). Ethiopia lost over 2 million ha of her forests, with an annual average loss of 140 000 ha (FAO, 2010). The loss is attributed to low level of standard of living of farming community and their close dependency on forest and woodlands have led to clearing of trees for agricultural land expansion, fuel wood extraction, charcoal, constructional material and overgrazing (MNRCDEP, 1994). Similarly, according (Reusing, 2017) Ethiopia's forest and

woodland resources are continuously diminishing year by year as a consequence of increasing population and an associated increasing demand for agricultural and pastoral land. Ethiopia's natural high forests and woodlands are already under severe pressure, and may be lost within the next decades.

In Dire-Dawa administration dense acacia woodland species, open shrub land and open shrub land with Prosopis Juliflora plantation occupies a total of 12250 ha. In particular, the dense shrub or acacia woodland species occupying a total area of 777 ha which is 0.58 % of the total area and is located in Hurso, Jeldessa, Gerba-Anano and Chiri-miti kebelles (Note 1). The dry forest which was home and source of forage to wildlife and potential sources seasonal grazing and browsing to pastoral communities is dwindling from time to time. As there has been no study on site specific this study was conducted to assess the recent degradation of dry land forest in Jeldessa, Gerba-Anano and Chiri-miti kebelles of Dire-Dawa administration.

2. Methods and Materials

Jeldessa, Gerba-Anano and Chiri-miti kebelles of Dire-Dawa administration are located in the eastern part of the Ethiopia. Geographically it located in latitude and longitude of $9^0$38'05" and $9^0$50'10" North and $42^0$02'30" and $42^0$25'15" East respectively (Figure 1). The administration in characterized with relatively low rainfall and high temperature where the mean annual rainfall is about 649 mm and mean temperature is 29^0c.

According to central statistical report of Dire-Dawa branch on 2014/15 the study areas Jeldessa, Garba Anano, and Chiri-mitti kebelles inhabited with a total population of 11781 and the population density is 22/km^2. Pastoralism and agro-pastoralism dominates the livelihood of the study area. The total areal extent is estimated to be 537.8 km^2.

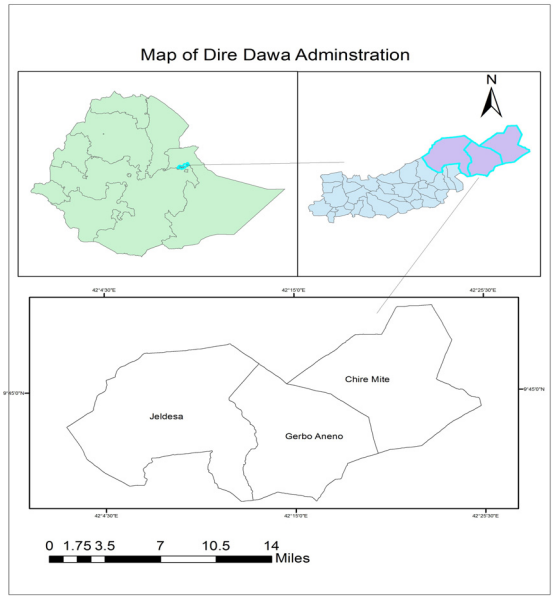


Figure 1. Study area map

In order to reveal the realities regarding the woodland degradation, various data collection

instruments like interview, focus group discussions (FGD) and questionnaire were employed. A total of 15 elders were interviewed. Additionally, information about the previous and current status of woodland vegetation was collected through FGD. Six FGD sessions having eight to ten participants two in each study site were conducted. FGD participants were selected from various segments of the society including elders, women, and clan leaders. Besides, an extensive field observation was carried out to support and enhance the interpretations of the interviewee and focus group attendee remarks. During observation, field notes and photographs of some important sites and practices were taken.

Table 1. Population & housing units of sample size

Kebelle	Total Population	Total Household	Sample Size
Jaldesa	4540	858	134
Gerba Aneno	3020	512	81
Cherimite	4224	766	121
Total	11781	2136	336

The rural areas being studied have a total population of 11781 living under the umbrella of 2136 households. Of this number, we have used 336 households as sample (Table 1), determined based on a sampling formula of $n=N/1+N(e)^2$. A structured questionnaire was administered to samples respondents. But after scrutinizing the data quality, we are forced to retain only 277 responses as valid samples and hence used in our analysis. Depending on the nature of data, qualitative data was analyzed by descriptive analysis whereas quantitative data was thematically narrated.

3. Result and Discussion

Despite the great actual and potential socio-economic and ecological benefits dryland forests of Ethiopia are threatened as a consequence of gradual degradation and deforestation. They are highly fragmented and the risk of extinction of the rich biodiversity they hold is increasing (Muys, 2015). Analysis made from interviews and discussions participants has noted prolonged dry season, fuel wood and charcoal selling, and livestock pressure respectively as major problems to the woodland resources which are discussed below.

3.1 Charcoal Production

Globally, the use of wood fuels has been growing in line with population growth, so that the annual growth in demand is between 3 and 4 percent depending on the country (Amous, 2000). The acacia dominated dry-woodland and shrub land areas, which cover over 60% of the total landmass of Ethiopia, constitute the largest source of wood for the bulk of charcoal coming to urban centers in the country (Girmay, 2013). Ethiopia meets 96 percent of its energy needs with biomass such as charcoal, wood, dung and plant residues from farming and forestry (Gebremedhin, 2002). Private households consume by far the greatest proportion of the energy generated for cooking and baking purposes.

In line to the above facts, majority of the questionnaire respondents has replied charcoal production, fuel wood selling, livestock pressure, and settlement expansion as major

problems observed to the woodland degradation (Table 2).

Table 2. Perceived causes and severity of woodland degradation

Factors	Severity			
	High	Medium	Low	insignificant
Charcoal Production	131(47%)	77(28.8%)	45(16.85%)	26(9%)
Fuel wood selling	121(45%)	71(26%)	38(14%)	44(15%)
Livestock pressure	174(63%)	49(18%)	37(13.7%)	17(6.3%)
Settlement expansion	118(43%)	67(24.2%)	73(26%)	19(7.08)
Invasive Species	96(35%)	89(32%)	51(18%)	41(15%)
Farmland expansion	52(19.6%)	109(39%)	78(28%)	37(13.4%)

These charcoal makers are principally involved in charcoal production due to the following pull factors.

Firstly, the study areas have become more accessible recently. Gerba-anano and Chiri-miti are the farthest kebelles located at 68 and 83 km respectively from Dire Dawa city which is market center for charcoal trading. Consequently, few years back due to road inaccessibility and the distance factor charcoal was rarely produced on the nearest study site at Jeldesa which is 37km distant from Dire Dawa. However, recently, all weather roads have constructed all along the kebelles and moreover the nearby state and national highways that connects Ethiopia and Djibouti abled trucks to carry or fetch charcoal even from distant areas of the kebbeles.

Secondly, localities were involved in the production and sale of fuel wood and charcoal as easy means of money making to cope up to the impacts of prolonged dry seasons. This is mainly because of charcoal making is free of charge, easy and unhindered delivery to charcoal traders. Particularly, traditional earth mound and or earth method of charcoal production has decimated natural woodland resources which were feed, shelter and breeding ground to wild and domestic animals in a very short period of time.

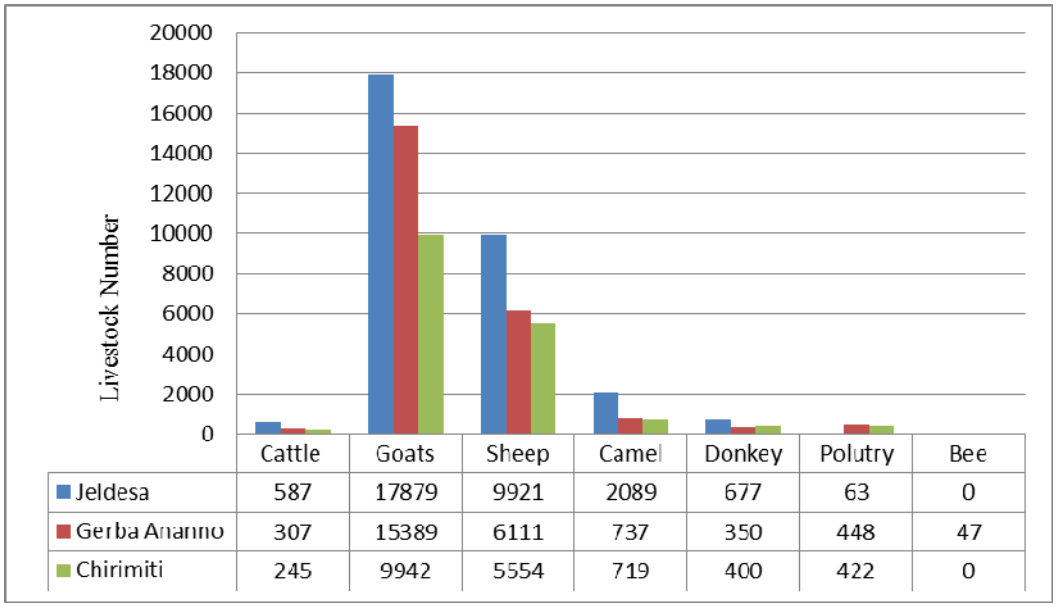
Last but not least, in the light of charcoal economy, the price of charcoal has attracted poor and landless peoples as it was sold 80-120 and 150-180 Eth Birr (Note 2) per sack in the study sites and Dire-Dawa city respectively. Additionally, charcoal is transported and supplied to Djibouti at a better price than to Dire-Dawa.

Furthermore, currently commercial sale of charcoal and firewood from *Acacia* and many other woody species is and triggered after prolonged dry seasons as a coping strategy to drought induced shocks. Therefore, the above discussed facts have accentuated the degradation rate of woodland vegetation (Figure 2).

Figure 2. Charcoal production in study sites

3.2 Livestock Pressure and Overgrazing

Since, majority of the localities are pastoral and agro-pastoralists, animal husbandry is the principal means of livelihood in the study sites. Pastoralism is widely practiced in the prior mentioned kebelles due to better pasture availability, dense acacia woodland coverage and wide territorial extent kebelles. The study areas have a total of 70890 livestock population with a density of 1335/km^2 (Figure 3). Hence, dryland forests and trees play an important role as sources of feed for the animals.



	Cattle	Goats	Sheep	Camel	Donkey	Polutry	Bee
Jeldesa	587	17879	9921	2089	677	63	0
Gerba Anannno	307	15389	6111	737	350	448	47
Chirimiti	245	9942	5554	719	400	422	0

Figure 3. Livestock population

In the study sites pasture lands and acacia woodland forest are communal open access resources, therefore unrestricted access has been triggered depletion of the resources. According to Key informant past experience, in dry season seasonal migration was practiced to reduce the concentration of livestock on a confined area for a longer time and thereby averts the risk of overgrazing, because, seasonal movement allows the herd owners to utilize the available resources in a rotational custom and enables the vegetation on grazing lands to regenerate.

However, currently these practices have been almost disrupted as competition for forage and

water has increased due to population growth, occurrences of conflict and neighbor areas were affected by similar drought. Consequently, acacia species as fodder for livestock has been increased and beyond serve as an outlet to drought induced shocks. Therefore, increased dependence on woody trees and their destruction was much higher after prolonged dry seasons because, pastorals feed their cattle particularly small ruminants by chopping the head and branches of woodland trees which in turn affect the biological succession of the tree species (Figure 4).

Figure 4. Goats feeding on head chopped trees

Additionally, woodlands are under intense pressure mainly because the pastoralists are now adapting sedentary agriculture, which resulted in permanent settlement and led to clearing of shrubs and overgrazing. The local people are well aware of the neat threat of woodland trees and other useful shrubs are at the edge of disappearance. Accordingly, the endangered woody plant species which have profound valuable as animal fodder are listed below (Table 3).

Table 3. Rarely seen or depleted tree species

Tree name/Higher plant species	
Local Name	**Scientific Name**
Kulene	*Balanites aegyptiaca*
Kidi	*B. rotundifolia*
Kohh	-
Kumbush	-
De'en	*Dodonea angustifolia*
Qura	*Acacia tortlis*
Medmed	*Grewia bicolor*

3.3 Invasion of Prosopis Juliflora

Prosopis juliflora belongs to the family Fabaceae (Leguminosae), subfamily Mimosoideae and genus Prosopis (Asfaw and Tilahun, 1989). The most important reasons for its fast invasion into semiarid and arid ecosystems are due to the role of livestock, deer, rabbits, and rodents in dispersal of the seeds (Asfaw and Tilahun, 1989). Prosopis is salt tolerant, growing near water holes and along wades at low altitude in Southeast and northeast lowlands of Ethiopia (Asfaw and Tilahun, 1989).

The invasion has resulted in a decline in biodiversity loss caused by displacement of indigenous flora, loss of habitat for wild fauna, and blockage of water sources and walking trails (Berhanu, A. & Tesfaye, 2006). During field visit, dense and intensified prosopis vegetation coverage was observed at nearby distant of the study area along the way to Djibouti highway vicinity to *Harmokale* village town. Therefore, beyond its benefit to the localities has to patrol prosopis expansion towards the major woodland area.

4. Conclusion

Despite their importance, acacia dominated woodland vegetation in the study areas have been subjected to degradation. The recent constructed roads have paved a way to fetch charcoal even from remote parts of the study area. Besides, easy money making from charcoal and its rising price has anticipated poor peoples as a means of livelihood. On the other hand, concentration of livestock on a limited grazing areas longer time and drought and prosopis juliflora invasion has degraded the quality and quantity of pasture and woodland vegetation. Therefore, the cumulative effect of above factors has contributed to the fast deterioration of some acacia woodland species.

To this end, all concerned bodies, especially local agricultural office, security or police office departments has to work in collaboration to patrol and control illegal charcoal production. Furthermore, government induced sedentary agriculture is widely practiced along river sides of all kebelles therefore, further study on sustainable usage of grazing and woodland forest is very mandatory.

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Notes

Note 1. Kebelle: Smallest administrative unit in Ethiopia.

Note 2. Eth Birr: Ethiopian Currency

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