Journal of Culture, Society and Development
ISSN 2422-8400 An International Peer-reviewed Journal
Vol.76, 2026

Pastoral Community's Perception Towards Natural Resources Management in Aura, Chifra, and Eua Districts of Afar Region; Ethiopia.

Mohammed Nuru Kemal

Socio-economics Associate Researcher

Afar Pastoral and Agro-pastoral Research Institute/APARI

e-mail: mnuru2007@gmail.com

Semera, Afar, Ethiopia

Abstract

This study aims to look in to pastoral community's perception towards the overall natural resources management experiences in Aura, Chifra, and Eua districts of Afar region. It adopts cross-sectional study design. A total of 90 individuals were participated in the study. Districts and kebele administrations were selected purposefully, whereas, sample households were selected randomly. Both qualitative & quantitative data were collected from primary & secondary data sources using survey questionnaire, key-informant interview, focus group discussion sessions, & document analysis tools. Data were analyzed using descriptive statistics. Statistical packages for social science/SPSS/ software version 20 were used for data analysis purpose.

The socio-economic situation of Afar pastoral community in the study area were very harsh in most livelihood indicators. Sociologically, the community's educational level is low, they got married at their early ages, and have high household size. In the case of economic issues, about, three-fourth of Afar community in the study area are totally pure pastoralists whose main source of income is mobility-based livestock production. Whereas, agro-pastoralists whose main income source is a combination of livestock and crop productions, account about one-fourth of the community in the study area. Generally, either of the two-production system doesn't sustain households' livelihood.

Afar pastoral communities in the study area perceived that their customary institution is the most important, effective, and widely accepted institution to manage natural resources in their area followed by government structures. The community, however, know that their customary institution doesn't as strong as previous over natural resources management at present day.

The major factors that result natural resources (vegetation) depilation in the study area are largely anthropogenic in nature. These include overgrazing, cutting trees for fuel and house construction, and producing charcoal are the main constraints that affect natural resources depilation and rangelands' loss of it carrying capacity. Furthermore, climate change and Alaine invasive species encroachment are the other treats and triggered growth of indigenous vegetation in the study area. Therefore, both Federal and Regional governments should adopt natural resources management and conservation policies and strategies that recognize pastoral customary institution and harmonize with the modern governmental structures; and strengthen traditional pastoral institutions that allow to add its contribution to manage natural resources in a sustainable manner in pastoral areas. Generally, all responsible bodies and stakeholders that are engaged in natural resources management and conservation should work together and implement various natural resources conservation and management techniques appropriate for pastoral area context that help reduce environmental degradation.

Key words: Natural resources management, Pastoral community, Customary institutions.
DOI: 10.7176/JCSD/76-04
Publication date: June 30th 2026

1. Background and Justification of the Study

Pastoralists have their indigenous (traditional) institutions that support them in their quest for survival in a harsh environment. The communities believe that the institutions create conducive environment for community socio-economic integration. This includes herding of animals, cultivation of crops and managing offensive ethnic or tribal conflicts. In addition, the traditional institutions safeguard wise use of resources. It is incumbent upon state and local governments to work with, and integrates these institutions as the basis for land management and resource tenure security (Su, Eth, Som. 2007).

Institutions are regulatory systems of formal laws, informal conventions and norms of behavior. They facilitate social interaction by allowing individuals to cooperate and achieve common objectives for the common good. In pastoral societies, institutions are often not recognized by the modern state, but are habitual ways through which society manages day-to-day affairs. Institutions are not mere traditions but are adaptive responses that have evolved over time, often based on kinship or social classes. Pastoralists have developed indigenous institutions that have customarily handled all aspects of their social, economic, cultural and political lives. These institutions are based on clan ties and social relations where the clan chiefs, like Ugaz in Somali, Kedo Aba in Afar and Abba Gada in Borana, play coordinating roles in resource management, conflict resolution or prevention, and political and administrative matters of pastoralists. These institutions are governed by indigenous norms and values that enable the smooth operation of the pastoral system in the drylands. The sustainability of pastoral systems is threatened by the loss of such institutions that support sustainable management.

The effective functioning of customary institutions, found in all pastoralist societies, relies on the ability of those with authority to impose sanctions on those who break the rules and institutions for enforcement of rules. Amongst the Afar of Ethiopia, Eritrea and Djibouti, the use of natural resources is carefully regulated by well-established rules and norms, overseen by traditional chiefs or Makaban. Enforcement of rules and application of punishment is carried out by an institution called the Fiqema (Gemedo and et.al,2005; Hussien, 2004).

The Afar pastoral communities have been able to manage their communal grazing land for centuries due to their ability to regulate resource use level over a wide landscape by employing different strategies of mobility. Traditional institutions and special elders' committees enforced decisions for allocations of range and water resources. In addition, they established grazing reserves as means of sustaining their livestock during dry and drought periods. The pastoralists used their indigenous knowledge to regulate livestock grazing and to decide when and where to move to base on their perception about the resource status at a given time.

At present, the Afar is unable to apply the traditional rangeland management practices because of the pressure on the rangelands and loss of indigenous practices. Modern development interventions which promoted settlement through provision of essential services did not respect the traditional institutions and their approach to resource management. The customary practices were seen as retrogressive and a cause of environmental degradation. However, these traditional practices are key to environmental management (Gemedo and et.al,2005; Hussien, 2004).

This survey is, therefore, initiated with the intention to look in to pastoral community's perception towards the overall natural resources management experiences in Aura, Chifra, and Eua districts of Afar region.

2. Objectives of the Study

General Objective: The general objective of the study is to look in to pastoral community's perception towards the overall natural resources management experiences in Aura, Chifra, and Eua districts of Afar region.

2.1. Specific Objectives: The specific objectives of the study include:

- To assess the socioeconomic situation of pastoral community in the study area;
- To identify acting institutions over natural resources management in the study area;
- To describe pastoral community's perceptions towards institutions' natural resources management performances in the study area;
- To identify the major causes responsible for natural resources depletion in the study area;
- To suggest possible solutions that will help improve natural resources management in the study area.

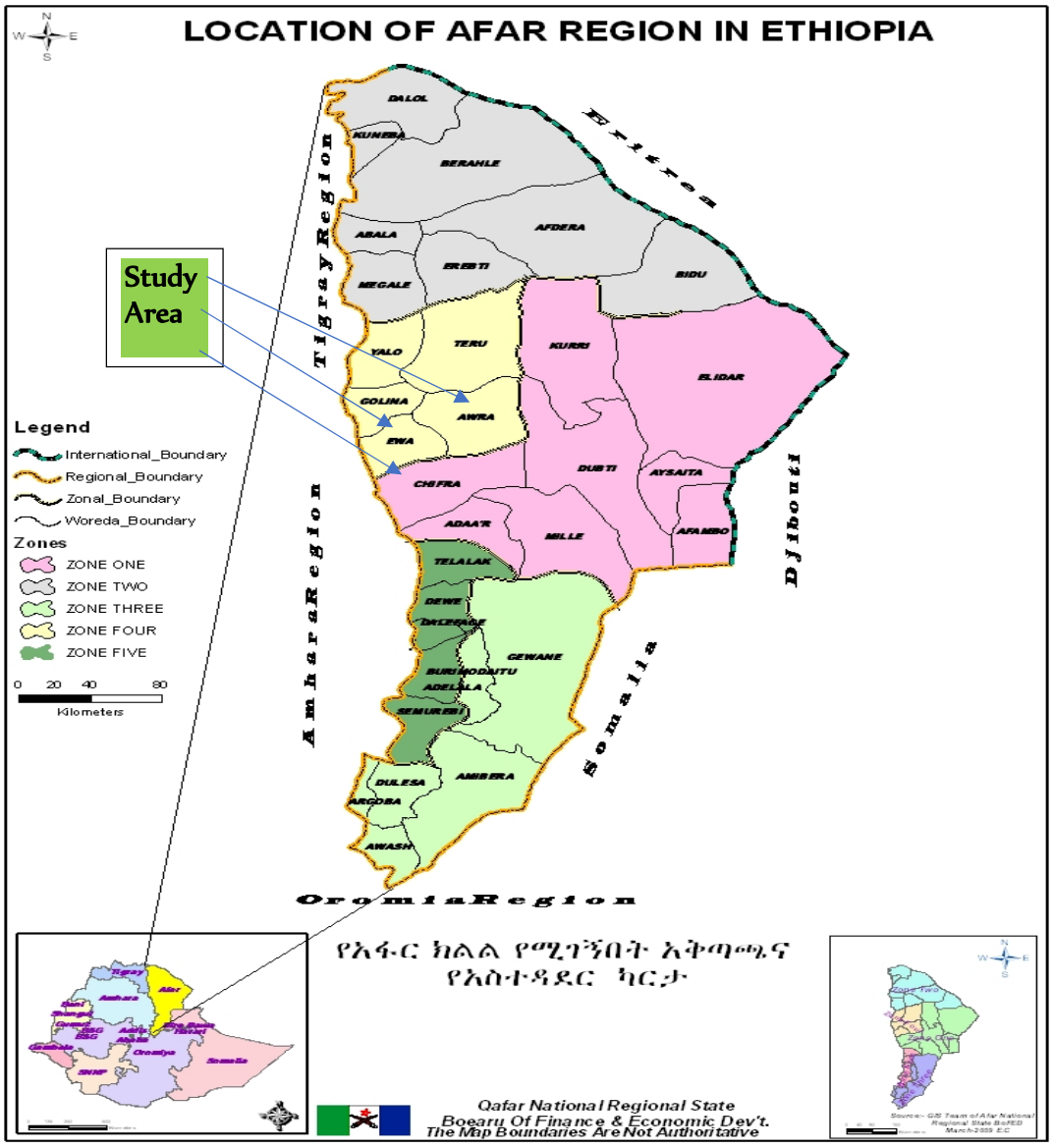
3. Methodology of the Study

3.1. Study Area

This study is conducted in Aura, Chifra, and Eua districts of Afar region. Aura and Eua districts are found in Fenti Resu (central zone) administration, whereas, Chifra district is found in Awsi Resu (Awsa zone) administration of Afar national regional state. The area is located in western part of the region that share border with Amhara region. Aura and Eua districts have 11 and 10 kebeles respectively, which is the lowest administrative unit in Ethiopia. Whereas, Chifra district has 19 kebele administrative units. These districts

purposefully taken as study area, and two kebele administrations were also selected at random from each district. Therefore, this study was conducted at six kebele administrations of the three districts.

Figure1. Location of the Study Area



Source: Adapted from Afar Regional Atlas,2009

3.2. Sampling techniques and Sample Size of the Study

In general terms the study employed multi-stage sampling technique. From the three woredas, six kebeles (i.e. 2 kebeles from each woreda) will be selected randomly. from the six sample kebeles 10 sample households were selected randomly. A total of 60 households were surveyed. Furthermore, six clan leaders and three district level development practitioners were also taken as key informants. About 21 pastoralists that composed of community elders, religious leaders, women, and youths were participated in three Focused Group Discussions. This study, therefore, used a total number of 90 individuals were used as sample size.

3.3. Types and sources of Data

In this study, both primary data and secondary data were collected from both primary and secondary data sources respectively.

3.4. Data collection methods and instruments

The study employed households' survey, Focused Group Discussion (FGD), key informants' interviews, and document analysis data collection methods. Household survey conducted using both open-ended and closed-ended questionnaire as data collection instrument. Whereas, for key informants' interviews and FGD purposes, check lists were prepared and used. Furthermore, in order to collect secondary data, document analysis (previous studies, reports, statistics and other relevant documents) was used.

3.5. Methods of data analysis

In this study, the collected data were summarized, coded, and analyzed using descriptive statistics. For data analysis purpose, Statistical Package for Social Sciences (SPSS) version 20 software program was used.

4. Findings and Discussions of the Study

This section of the study describes the main finding of the study that are obtained from analyzed data collected from surveyed households, key informants and FGD sessions, and document analysis.

4.1 Demographic Characteristics of the Respondents

This sub-section of the study deals with demographic characteristics of the respondent households. In terms of respondents' sex composition, about 85 percent of the respondents were male and the remaining 15 percent of them were female. Regarding to age of the respondents, the average of all the respondents was about 38 years.

The average age of respondents in Chifra district was the smallest (i.e. about 32.5 years) compared to average ages of the respondents in Aura and Eua districts. And it was much lower than the total average of all respondents of the study. The respondents' average ages in Aura and Eua districts were higher than the total respondents' average age of the study which were about 40 years and 41.5 years respectively. The median age of all the respondents was 40 years, and their mode age was 42 years.

The marital status of all respondents of the study were felt at either currently married or non-married category. About 88 percent of the respondents were currently married, whereas, the remaining 12 percent of them were non-married.

In the case of respondents' educational level, about 63 percent of the respondents were illiterate followed by basic education level that accounts about 20 percent of the total respondents of the study. Whereas, about 10 percent and seven percent of the respondents had primary school and secondary school level of education respectively. This shows that the proportion of respondents decreased as educational levels increased.

The other demographic characteristics addressed in this study is respondents' households' size. In this regard, that average household size of all the respondents was about 4.7 family members which can be considered as high household size. In terms of religion of the respondents, all the respondents (i.e. 100 %) were Muslims. Table1. Below shows demographic characteristics of respondents by district.

Table1. Demographic Characteristics of Respondents of the Study by District.

Respondents' characteristics		Districts						Total	
		Aura		Chifra		Eua			
		No	%	No	%	No	%	No	%
Sex	Male	17	85	18	90	16	80	51	85
	Female	3	15	2	10	4	20	9	15
Education	Illiterate	15	75	8	40	15	75	38	63.33
	Basic education	5	25	3	15	4	20	12	20
	Primary school	-	-	5	25	1	5	6	10
	Secondary school	-	-	4	20	-	-	4	6.67
Marital status	Non-married	-	-	4	20	3	15	7	11.67
	Currently married	20	100	16	80	17	85	53	88.33

Source: Survey result of the study

4.2 Economic Characteristics of the Respondents

Livestock production is the main source of income for the majority of respondent households (about 77 %) of the study area. Whereas, both livestock and crop productions were the main sources of income for the remaining 23 percent of the respondents of the study. District wise, livestock production was the main source of income for all the respondents (i.e. 100 %) of Eua district. It implies that all these respondents taken from Eua district were

totally pastoralist. Whereas, livestock production was the main source of income for 80 percent of respondents, and half of the respondents (i.e. 50 %) in Chifra and Aura districts respectively.

In terms of households' engagement in other non/off-farm economic activities; the majority of the respondent households' (75 %) didn't engage in other non/off-farm economic activities; while 25 percent of the respondent households were engaged in other non/off-farm economic activities. These household members mainly engaged casual works and productive safety net program /PSNP/ that is food for work type of program. Table2. Below shows respondents sources of income by districts.

Agro-pastorals, those both livestock and crop productions were the main sources of income; covers 23 percent of respondent households of the study area owned 0.5 hectare of farm land. In terms of livestock ownership, all the respondents (100 %) owned livestock like cattle, goat, sheep, camel and donkey. Accordingly, respondent households owned an average of seven cattle, 12 goats, 12 sheep, four camels and one donkey. Table3. Below shows average livestock ownership of the respondents in the study area.

Table2. respondents' main sources of income by districts.

Respondents' income sources	Districts						Total	
	Aura		Chifra		Eua			
	No	%	No	%	No	%	No	%
Only livestock production	10	50	16	80	20	100	46	76.67
Both livestock and crop productions	10	50	4	20	-	-	14	23.33

Source: Survey result of the study

Table3. Respondents' average number of livestock ownership by Districts.

Livestock Types	Districts			Total averages
	Aura	Chifra	Eua	
	Av. No	Av. No	Av. No	Av. No
Cattle	5.8	5.7	8.7	6.73
Goat	10	13.3	16.5	12.27
Sheep	12	12.3	12.4	12.23
Camel	3.25	3.4	5.9	4.18
Donkey	0.25	1.3	1.6	1.33

Source: Survey result of the study

4.3 Institutions and Their Roles over Natural Resources Management

This section deals with institutions that concerned with natural resources management in the study area. In this regard, about 85 percent of the respondents knew Institutions that were active and have working over natural resources management/NRM in their locality; and 15 percent of the respondents responded as they do not have information about institutions that were active and have working over natural resources management/NRM in their locality. These institutions were traditional/customary institution, governmental structures, and non-governmental organizations.

Institutions that have working on natural resources management/NRM play significant roles in managing natural resources. Pastoral communities of Afar have adopted highly effective and acceptable customary institutions that is responsible for managing natural resources throughout their history. Regarding to the current state of customary institution of the community in the study area, about 75 percent of the respondents perceived as their customary institution is acceptable by the community. Whereas, 25 percent of the respondents were responded as the institution have low acceptance by the community today.

In terms of the role of clan leaders in natural resources management; about 88 percent of the respondents were responded that clan leaders have and played a crucial role in natural resources management; while 12 percent of them responded that clan leaders do not have significant roles in natural resources management in their area. Table4. Below shows respondents' awareness, Customary Institutions Acceptance, and Clan leaders' current roles in natural resources management in the study area.

Table4. Respondents' awareness, Customary Institutions Acceptance, and Clan leaders' current roles in natural resources management.

Items	Options	Districts						Total	
		Aura		Chifra		Eua			
		No	%	No	%	No	%	No	%
Respondents' awareness	Yes	17	85	20	100	14	70	51	85
	No	3	15	-	-	6	30	9	15
	Total	**20**	**100**	**20**	**100**	**20**	**100**	**60**	**100**
Customary Institutions Acceptance	Yes	15	75	20	100	10	50	45	75
	No	5	25	-	-	10	50	15	25
	Total	**20**	**100**	**20**	**100**	**20**	**100**	**60**	**100**
Clan leaders' current roles in NRM	Yes	15	75	17	85	15	75	47	88.3
	No	5	25	3	15	5	25	13	11.7
	Total	**20**	**100**	**20**	**100**	**20**	**100**	**60**	**100**

Source: Survey result of the study

On the other hand, the majority of the respondents perceived that the Role of customary institutions in natural resources management had been very vital. However, their role has become weaker and weaker from time to time. According to the respondents traditional/ customary institution of Afar was very strong in environmental protection. About 47 percent of the respondents perceived that as" they become weak". Whereas 23 percent of the respondents were perceived customary institution roles was "good & above". While about 33 percent of them its roles as "not bad", and the remaining 20 percent of the respondents perceived the current roles of customary institution in natural resources management was "poor".

In terms of the current roles of Governmental bodies in natural resources management activities in the study area; about 55 percent of the respondents labeled it as "good & above"; while 32 percent and 13 percent of the respondents perceived the current roles of Governmental bodies in natural resources management was as "not bad" and as "poor" respectively. Whereas, the respondents' view towards the roles of non-governmental organizations/NGOs in relation to natural resources management in the study area; about 30 percent of them were responded as "good", while it has labeled as "not bad" and "poor & very poor" by 35 percent and 35 percent of the respondents respectively. Table5. below shows the current roles of the three institutions acting in natural resources management in the study area as perceived by the respondents of the study.

Table5. Institutions Current State in Natural Resources Management

Institutions	Districts	Respondents' Scores									
		V. good	%	Good	%	Not bad	%	Poor	%	V. poor	%
Customary institution	Aura	6	30	7	35	4	20	3	15	-	
	Chifra	3	15	5	25	7	35	4	20	1	5
	Eua	-	-	7	35	9	45	3	15	1	5
	Total	**9**	**15**	**19**	**31.67**	**20**	**33.33**	**10**	**16.67**	**2**	**3.33**
Governmental structures	Aura	4	20	7	35	6	30	3	15	-	-
	Chifra	5	25	7	35	6	30	2	10	-	-
	Eua	2	10	8	40	7	35	3	15	-	-
	Total	**11**	**18.33**	**22**	**36.67**	**19**	**31.67**	**8**	**13.33**	-	-
Non-governmental organizations	Aura	-	-	8	40	6	30	3	15	3	15
	Chifra	3	15	3	15	8	40	4	20	2	10
	Eua	-	-	4	20	7	35	7	35	2	10
	Total	**3**	**5**	**15**	**25**	**21**	**35**	**14**	**23.33**	**7**	**11.67**

Source: Survey result of the study

The respondents were also had asked about linkage and integration among institutions in natural resources management works in the study area. Accordingly, 55 percent of them were responded as 'good'; whereas, 24 percent and 21 percent of the respondents were responded as 'not bad' and 'poor' respectively.

The respondents were asked to rank these three institutions (namely: - traditional, governmental, and non-governmental institutions) based on their importance and performance related with natural resources activities in the study area. Accordingly, 45 percent of the respondents have ranked traditional institution as 'first' followed

by governmental bodies as 'second' position with about 43 percent; and NGOs as 'third' with 45 percent of the respondents. Table6. shows respondents ranking scores of governmental bodies, traditional institutions, and non-governmental organizations/NGOs in relation to natural resources management in the study area.

Table6. Respondents' Rank for on Institutions based on their importance related with natural resources management.

Institutions	Districts	Respondents' Ranks					
		1st		2nd		3rd	
		No	%	No	%	No	%
Customary institution	Aura	7	35	9	45	4	20
	Chifra	11	55	7	35	2	10
	Eua	9	45	9	45	2	10
	Total	**27**	**45**	**25**	**41.67**	**8**	**13.33**
Governmental structures	Aura	7	35	7	35	6	30
	Chifra	8	40	9	45	3	15
	Eua	6	30	10	50	4	20
	Total	**21**	**35**	**26**	**43.33**	**13**	**21.67**
Non-governmental organizations	Aura	6	30	7	35	7	35
	Chifra	5	25	6	30	9	45
	Eua	1	5	8	40	11	55
	Total	**12**	**20**	**21**	**35**	**27**	**45**

Source: Survey result of the study

4.4 Anthropogenic Causes of Natural Resources Degradation in the Study area.

Man made interventions that have existed in the study area resulted in loss of natural resources. The major causes that responsible for natural resources depilation in the study area that were identified by respondent households include cutting trees for house construction and fuel purposes, over grazing, and charcoal production. These actions are derived from various root factors, such as, climate change, population pressures, encroachment of invasive alien species (like prosopis Juliphera), emergence of urban centers, and etc. These derivers increased human needs of trees for house construction and fuel, and results shrinking of range lands. These factors were also mentioned by focus group discussants held during data collection period of the study. Environmental resilience has become deteriorated from time to time in their locality of pastoralist communities of the study area. Indigenous tree, shrubs, and grasses lost which were very useful for their livestock. These natural resources are very useful for soil & water conservation, feeds for livestock, and medicinal and ornamental purposes of the community. This issue was also verified by community members who participated in focus group discussion duding data collection. Furthermore, the researcher observed the depletion of natural resources in the study area.

5. Conclusions and Recommendations of the Study

5.1 Conclusions

Based on the information obtained from surveyed households, interviewed key- informants, focus-group discussions, and analyzed documents; the findings of this study are concluded as follows in line with objectives of the study.

The socio-economic situation of Afar pastoral community in the study area were very harsh in most livelihood indicators. Sociologically, the community's educational level is low, they got married at their early ages, and have high household size. In the case of economic issues, about, three-fourth of Afar community in the study area are totally pure pastoralists whose main source of income is mobility-based livestock production. Whereas, agro-pastoralists whose main income source is a combination of livestock and crop productions, account about one-fourth of the community in the study area. The community in the study area owned very small average number of livestock (i.e., 12 goats and 12 sheep are animal types the higher number owned in average) and farm land (i.e,0.5 ha). Generally, either of the two-production system doesn't sustain households' livelihood.
Customary institution of Afar pastoral community, government and non-governmental organizations are the three main institutions that have acting over natural resources management in the study area.

Even though, at present times, all the three institutions have good roles in natural resources management in the study area; the Afar pastoral communities in the study area perceived that their customary institution is the most important, effective, and widely accepted institution to manage natural resources in their area followed by government structures. Their customary institution has ranked 'first' by the community in relation to its importance to manage natural resources in the study area. Many literatures, however, argue that natural resources management roles of the Afar customary institution have getting weak through time. Of course, the community agreed that their customary institution doesn't as strong as previous over natural resources management at present day.

The major factors that result natural resources (vegetation) depilation in the study area are largely anthropogenic in nature. These include overgrazing, cutting trees for fuel and house construction, and producing charcoal are the main constraints that affect natural resources depilation and rangelands' loss of it carrying capacity. Furthermore, climate change and Alaine invasive species encroachment are the other treats and triggered growth of indigenous vegetation in the study area.

5.2 Recommendations

Based on the conclusions stated above, the following recommendations are forwarded.

Both the Federal and regional governments should strive to improve the socioeconomic deprivation of Afar pastoral communities.

Governmental bodies at all levels should devise a platform that enables integrated natural resources management implementations between customary, government, and non-governmental organizations/NGOs work together for common goals.

Both the Federal and regional governments should adopt natural resources management and conservation policies and strategies that recognize pastoral customary institution and harmonize with the modern governmental structures; and strengthen traditional pastoral institutions that allow to add its contribution to manage natural resources in a sustainable manner in pastoral areas.

All responsible bodies and stakeholders that are engaged in natural resources management and conservation should work together and implement various natural resources conservation and management techniques appropriate for pastoral area context that help reduce environmental degradation. Local administrators, communities and development practitioners should work to minimize cutting trees for fuel and house construction, and producing charcoal in pastoral areas.

References

Addisu Gebremedhin (2008). Use and management of Opuntia ficus indica (L.) miller and The Diversity and Abundance of Associated Woody Plants in Erob Wereda, Tigray Region, North Ethiopia. Msc Thesis, Addis Ababa University.

Azene Bekele (2007). *Useful Trees and Shrubs for Ethiopia*. Identification, propagation and Management for 17 Agroclimatic Zones. In: Tengnas. B, Ensermu Kelbess, Sebsebe Demissew and Maundu. P. (eds) World Agroforestry Centre. Nairobi, Kenya.

Barrow, E., Davies, J., Berhe, S., Matiru, V., Mohamed, N., Olenasha, W., Rugadya, M. {Su, Eth, Som} (2007): Pastoral Institutions for managing natural resources and landscapes. IUCN Eastern Africa Regional Office. Policy Brief No. 3 (of 5). Nairobi, 4 p.

BoFED (2009). Afar Regional Atlas. Bureau of Finance and Economic Development, 2009.

Cotton, C. M. (1996). *Ethnobotany: Principles and Applications*. John Wiley and Sons Ltd. Chichester. England.

Cunningham, A. B. (2001). *Applied Ethnobotany: People, Wild plant use and Conservation.* Kew Earthscan Publications, London and Sterling, UNESCO, Royal Botanical Gardens, WWF.

Dawit Abebe (1986). Traditional Medicine in Ethiopia. The attempt being made to promote it for effective and better utilization. *SINET. Ethiopian Journal of Sciences, 9*(supp): 61-69. Faculty of Science, Addis Ababa, Ethiopia.

Debela Hunde (2001). Use and Management of Traditional Medicinal Plants by indigenous people in Boosat Wereda, Welinciti Area. An Ethnobotanical Approach, MS.c Thesis. Addis Ababa University.

ECSA (2007). Summary and Statistical Report of the 2007 Population and housing census. Addis Ababa, Ethiopia.

Gemedo Dalle, Brigitte, L., Johannes, I. (2005). Plant Biodiversity and Ethnobotany of Borana Pastoralists in Southern Oromia, Ethiopia**.** *Economic Botany.* **59**(1): pp43-65

Hussien Adal (2004). Traditional use, Management and Conservation of Useful plants in Dryland parts of North Shoa Zone of The Amhara National region: An Ethnobotanical approach. M.Sc. Thesis, Addis Ababa University.

Tigist Wondimu (2003). The study of useful plants Around Dheeraa Town, Arsi, Ethiopia. An ethnobotanical approach. M.sc Thesis, Addis Ababa University.

Tigist Wondimu, Zemede Asfaw and Ensermu Kelbessa (2006). Ethnobotanical Study of Food plants Around Dheeraa Town, Arsi, Ethiopia, *SINET: Ethiop. J. Sci*. 29 (1): 71-80.

Zemede Asfaw (1997). Indigenous African Food Crops and useful plants. Survey of Food crops, Their Preparations and home Gardens in Ethiopia. UNU/ UNRA No. B6, ICLPE. Science Press, Nairobi, pp 65.

Zemede Asfaw (2001). Origin and evolution of rural home gardens in Ethiopia. In: I. Friis and O, Ryding (eds.), Biodiversity research in the horn of Africa region. Proceedings of the third International Symposium on the flora of Ethiopia and Eritrea at the Carlsberg academy, Copenhagen, August 25-27, 1999. Pp 273-286

Zemede Asfaw (2004). The Enset-based Home Gardens and Agrobiodiversity, Eyzaguirre. PB and Liares.O (eds). Smith Sonian Books. Washington.

Zemede Asfaw and Mesfin Tadesse (2001). Prospects for sustainable use and Development of Wild food Plants in Ethiopia. Econ. Bot. 55:47-62.

Zemede Asfaw and Tigist Wondimu (2007). Introduction to Ethnobotany. People and the Biota. Department of Biology, Addis Ababa University.