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Livestock-rangeland management practices and community perceptions towards rangeland degradation in South Omo zone of Southern Ethiopia

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Abstract

A survey was conducted in Hamer and Benna-Tsemay districts of the South Omo zone of Ethiopia, with the objectives of assessing the range-livestock management practices and perceptions of the different pastoral groups (Hamer, Benna, and Tsemay) towards rangeland degradation. This information is considered to be vital to future pastoral development planning and interventions. The information was gathered through group discussions, personal observations, and using a structured questionnaire where each household was taken as a unit of analysis.

The average family size per household was for Hamer = 7.05 for Benna = 7.93 and for Tsemay = 7 with nearly 98.1% of the respondents without any kind of education. All pastoral groups derived their main income from the sale of animals, which was followed by the sale of honey as in the case of Hamer and Tsemay pastoralists. The average livestock per household was 25.7, 10 and 2.8 tropical livestock unit (TLU) cattle, goat and sheep, respectively. The major livestock production constraints were drought, feed and water shortage and animal health problems. The different pastoral groups have the opinion that the condition of their rangeland is poor, mainly due to overgrazing, drought and increase in human population. Furthermore, there was also a problem of bush encroachment which is an indicator of rangeland degradation. There are no range improvement practices undertaken to improve the condition of the rangelands. Mobility is the first measure taken to solve shortage of livestock feed and water but many of the pastoralists replied that they face many problems during migrations. Because of the unfavorable climatic condition for cultivation, most of the respondents of Hamer and Tsemay pastoralists and about 35% from Benna still prefer communal land tenure, where resources are shared. In conclusion, the indigenous knowledge of the pastoralists about range-livestock management and their environment should be incorporated while planning range-livestock development projects for the study districts.

Key words: Household characteristics, indigenous knowledge, mobility, pastoralists, rangeland and livestock constraints

Introduction

The rangelands of Ethiopia cover about 60% of the total area and are the major sources of livestock feed (BLPDP 2004; PFE 2004). These areas are characterized by lowland plains, relatively harsh climate with low, unreliable and erratic rainfall and high temperatures (Ayana 2007). Of the total livestock population of the country, about 40% cattle, 75% goats, 25% sheep and almost 100% of camels are raised in the rangelands (Alemayehu 2004). The rangelands are not only known for livestock rearing, but there are also many wildlife, parks, sanctuaries, and reserves (Abule et al 2005).

Research studies about indigenous rangeland management around the world and at large in Africa showed that indigenous people consider resource conservation in their management strategies (Ayana and Fekadu 2003). This aspect was, however, never studied in detail in South Omo zone of Southern Ethiopia. Furthermore, as observed in Ethiopia and in many nomadic pastoral areas rangeland-based life

style and production systems are in difficulty and the rangeland is degrading from time to time because of extreme climatic fluctuations, land-use changes, and other factors (Solomon 2003; Ayana 2007; Koocheki and Giliessman 2005). Furthermore, the failures in pastoral development are partly attributed to the ignorance of the indigenous knowledge of the pastoralists. However, traditional experiences, skills and strategies accumulated by pastoralists over the centuries should instead complement modern scientific knowledge rather than be ignored (Tsundle 1999; Ayana and Oba 2008).

In the South Omo zone, there are many ethnic groups, namely, Hamer, Arbores, Benna, Tsemay, Turme, Mursi, Dasenetchi (the Geleb), and Karo tribes. Of these, the major ethnic groups found in the study area are the Hamer, which live in the Hamer district and Benna, and Tsemay, which live in Benna-Tsemay district. The human population of the study districts by ethnic group was 32,795 (Hamer), 27,130 (Benna) and 11,498 (Tsemay) (CSA 2002). Even though, the study areas have diverse range-livestock management practices with a large number of livestock (cattle, sheep and goats) that contribute more than 65% to the economy of the pastoralists, less attention in research and development was given to the study districts because of their remoteness from the central part of the country, poor infrastructure, and the lack of communication systems (PADS 2004). Accordingly, a study of the existing range-livestock management practices and the perceptions of the pastoral communities towards rangeland degradation is important, as this will provide the way for designing different rangeland interventions to be undertaken in the area. Therefore, the objectives of this study were to describe the existing range-livestock management practices, identify current livestock production constraints, and document the perceptions of the different pastoral groups about rangeland degradation.

Materials and methods

Description of the study area

The South Omo zone is one of the 13 zones found in the Southern Nations, Nationalities, and People's Regional State in Ethiopia. The study districts (Hamer and Benna-Tsemay districts) are found in South Omo zone and have a total land area of 9,496 km2 (Hamer = 5,742 km2 and Benna-Tsemay = 3, 754 Km2). The districts are located 4º 27'-5º 39' north and 35º 23'- 37º 49' east, bordering Kenya to the South; Bako gazer district to the North; Borana zone and Konso district to the East, and Kuraze and Selamago districts to the West. The study districts, Benna-Tsemay (Key Afer) and Hamer (Dimeka), are located at about 739 and 839 km from the capital city of Ethiopia, Addis Ababa, respectively. The study area is characterized by semi arid and arid climatic conditions, with mean annual rainfall increasing from the extreme south lower part, with some 350 mm, to the upper part where it ranges to 838 mm. The rainfall is bimodal, with the long rain season from April to June and the small rains in September and October. In general, the study area has an erratic, variable rainfall and high ambient temperature ranging from 26-35ºC. The vegetation cover of the study area is a mixture of *Acacia*, *Boswellia* and *Commiphora* woody species and short grasses type with varying density of woody vegetation (Alemayehu and Tezera 2002).

Data collection

Secondary information relevant to the study was collected from all possible sources, even though, they were very scanty and did not give detailed information on the study subject. The methods of the study were through group discussions, using semi-structured questionnaires and personal observations during field survey. Each group discussion consisted of 8 to 12 people of different age group including pastoralists, development agents, agricultural experts, village leaders and seven group discussions were undertaken in the study districts. Group discussions were used to extract information on the study subjects and to get insights from community members who are directly or indirectly involved in the production system. The information gathered through the above processes was summarized and used as a basis to design structured questionnaire to quantify the important parts of the study and hence to have an overall understanding about the range-livestock management practices and perceptions towards

rangeland degradation taking each household as a unit of analysis. All the respondents were males and it was difficult to include females because of the strongly developed cultural protocols.

A semi-structured questionnaire was prepared to draw out information on land uses and utilization, perceptions of the pastoralists on different vegetation composition, water sources, feed resource, migration, drought, occupation, income sources, farming and food consumption, rangeland condition, degradation and management practices, livestock population, management and production constraints. Furthermore, in the questionnaire prepared, there were single and multiple response questions. Single response questions were those questions where the sampled household has a single reply and multiple response questions were type of questions where the individual household can give more than one answer to a given question. In the case of the latter, the percentage of responses (respondents) will be greater than 100%. To administer the interview, enumerators were recruited and training was given. Pre-testing of the questionnaires was made before the actual data collection, and appropriate modifications and corrections were done. Both the researcher and the trained enumerators collected the actual data. In general, a single-visit formal survey method (ILCA 1990) was followed to gather the necessary information and the data was collected in November 2005.

In the study districts, there were forty nine (49) pastoral associations (Kebeles) (25 in Hamer and 24 in Benna-Tsemay districts). Of these, 25 peasant associations were randomly selected, 13 from Hamer district and 12 from Benna-Tsemay district. Ninety (90) households were randomly selected, 40 from Hamer district and 50 from Benna-Tsemay district (30 from Benna ethnic group, and 20 from Tsemay ethnic group). The latter was based on the proportional number of households in the two ethnic groups.

Statistical analysis

The collected household data were summarized and analyzed using Statistical Package for the Social Sciences, (SPSS, version 10 1996). Descriptive statistics such as mean, percentage and standard deviation were used to present the results. The highest number of responses or respondents was given the first rank (1) and the lowest number of the responses (respondents) the fourth rank (4^{th}).

Results and discussion

Demography of the pastoralists

The average family size in the study districts was 7.3 persons/household with a range of 2 to 18 (Table 1) where a family consisted of the household head, wife, children and some dependents.This is lower than that reported for the Borana pastoralists (13.5) (Alemayehu 1998), north Kenya (8.2), Uganda pastoralists (14.7) and higher than that reported for the Kereyu (6.17) (Abule 2003). The low family size could be associated with the late age marriage commonly practiced by the community and the absence of polygamy in most of the poor pastoral families. The average age of the respondents in both districts was 46.6 ±1 with an age interval of 30 to 66 and all respondents were male. In general, the level of education in both districts was very low (nearly 98.1% of the respondents were without any kind of education) (Table 1) and this represents a serious limitation to the transfer of technology and emphasizes the importance of education that must be improved. In the study districts, family size has a direct impact on the availability of labor and on the chance of children to go to school and the elders of the villages have the right to decide on the number of children going to school from each family or household. In order to give permission, the elders take into account the labor requirement of the family. If there is an adequate amount of labor for the family, the extra sons will be allowed to go to school otherwise, they will not be given permission. In all the pastoral groups, however, females are not allowed to go to school and the intensity of this problem is more pronounced in pastoralists with less access to educational facilities.

Labor division, occupation and income sources

The different pastoral groups in the study districts have strong, culturally prescribed norms for division of responsibilities and labor between age groups and sexes which is in agreement with reports from other pastoral areas (Beruk 2003). Accordingly, in all pastoral groups, watering and feeding (generally herding) of livestock is the responsibility of all family members. Children and women participate in herding sick, lactating, small ruminants, some kids and lambs. The adult and youngsters are the groups, which move with cattle to distant places during migration. In these pastoral communities, women make all major domestic decisions, including those related to fetching water, household duties, herding small ruminants, herding lactating and sick animals, which are reared close to the homestead and they also take part in crop cultivation. The youngsters also have the responsibility of defending the tribes and villagers from the attacks by other tribes or groups and this is similar to the case in Afar and Kereyu (Abule et al 2005) and the Borana pastoralists (Solomon 2003).

Table 1. Profile of respondents by family size, age of the respondents (mean ± SD) and educational background of the family (percentage); (respondents: Hamer = 40, Benna = 30 and Tsemay = 20)

Variable	Hamer district	Benna-Tsemay district	
	Hamer (Mean ± SD)	Benna (Mean ± SD)	Tsemay (Mean ± SD)
Family size			
Male	3.79 ± 0.51	4.07 ± 0.49	3.67 + 1.69
Female	3.26 ± 0.42	3.87 ± 0.54	3.33 ± 0.71
Total	7.05 ± 0.81	7.93 ±0.83	7 ± 2.3
Age of respondents, Years	48 ±1.47	46.7± 1.8	45 ±2.29
Education, %			
Formal			
Children	1.5	2.13	1.75
Adult	0	1.87	0
Overall	1.5	4.00	1.75
Non-formal			
Children		1.40	1.17
Adult		0.40	0.17
Overall		1.80	1.34

The main occupation of Hamer and Tsemay respondents was pastoralism while that of Bennas` agro-pastoralism. Accordingly, except the Benna community, the majority of the Hamer and Tsemay pastoralists derived their living from livestock rearing and this is mainly due to the unfavorable climatic condition in the areas occupied by Hamer and Tsemay pastoralists (Figure 1).

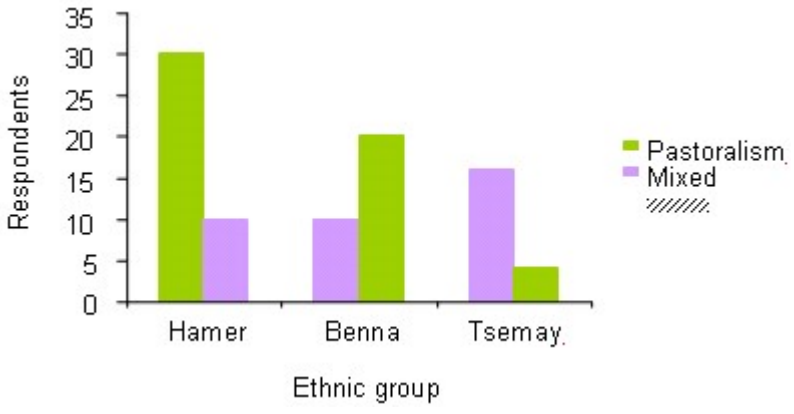

Figure 1. Occupation of the different pastoral groups in the study districts by ethnic group (Respondents: Hamer = 40; Benna = 30; Tsemay = 20)

The main source of income in all pastoral groups was from the sale of livestock (Figure 2), which was followed by the sale of honey as in the case of Hamer and Tsemay pastoralists and this dependence on livestock as the main source of income is well documented in other pastoral areas of Ethiopia (Alemayehu 1998; Abule 2003) and the East African countries (Ndikumana et al 2001).

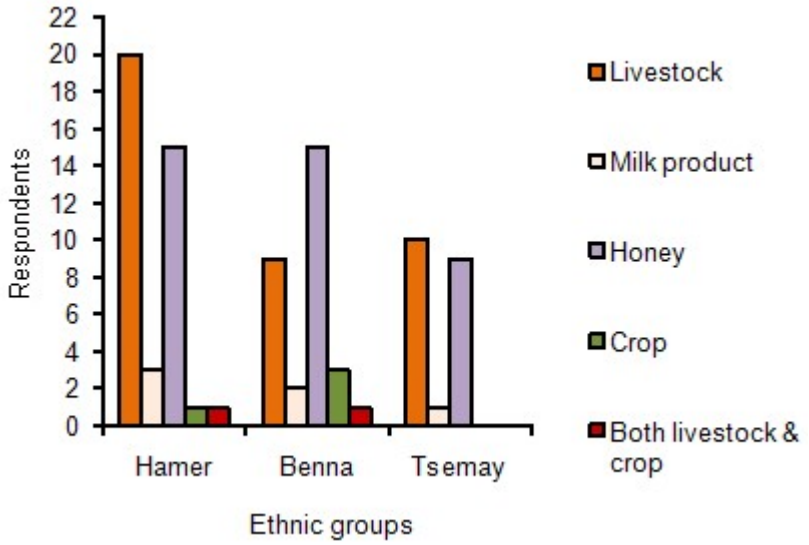

Figure 2. The main sources of income of the respondents in the study districts by ethnic groups (Respondent: Hamer = 40; Benna = 30 and Tsemay = 20)

Pastoralists living nearby the towns, to some extent, earn their income from tourism, sale of charcoal, firewood, grass to cover roof and from the sale of milk and milk products. Unlike the case in other pastoral areas of Ethiopia, where the income from the sale of milk and dairy products is not shared between men and women, in the study districts, the income derived from the sale of milk and dairy products is shared between men and women for purchase of local beverages like *Tej* and *Borde* (alcoholic drinks).

Farming and food consumption

Because of the increase in human population and the inadequacy of livestock production to fully support the needs of the communities in the study districts, there is a good initiation for rain- fed crop production. Crop cultivation is practiced in both districts with integration of livestock using oxen as source of power. The entire sampled household replied that they are engaged in crop production and the largest proportion of the households produce crop for home consumption. However, in addition to production of crop for home consumption, eight percent of the Hamer pastoralists and 10% of the Benna community cultivate crops for sale as a source of income. The main crops grown in the study districts are sorghum, maize, millet, barley, wheat, and tef (*Eragrostis tef*). The pastoralists further indicated that they would continue with farming though it is full of risk. This emerging increased dependence on crop cultivation in order to meet the needs of the households conforms to the reports from other pastoral areas of Ethiopia (Teshome et al 2009).

Table 2. Division of labor for major activities in the different pastoral groups of the study districts (respondents: Hamer = 40; Benna = 30 and Tsemay = 20)

Activities	Family head	Wife	Son	Daughter

Land clearing	XXX	-	X	X
Ploughing	XXX	-	X	-
Weeding	X	XXX	X	X
Harvesting crop	-	XXX	X	X
Collecting grass for house construction and for weak and sick animals.	-	XXX	-	X
Herding cattle	X	X*	XXX	-
Herding of goats, sheep and calves and sick animal	-	XXX	X	X
Grinding grain	-	XXX		X
Migration	X		XXX	X
Fetching water	-	XXX		X
Defense	X		XXX	--

XXX = major responsibility, X = contributor, X = occasional contribution*

Cereals were the primary source of food in good, pre-drought (period immediately before the drought and determine ability to cope with the drought) and drought times for all sampled households in the study districts (Table 3). In general, there was no difference among the pastoral groups in the study districts in what they eat during good, pre-drought or drought times and this is in agreement with the practice of their neighboring Borana pastoralists (Coppock 1994). In addition, during drought time, the different pastoral groups in the study districts were forced to eat fruits and leaves of some wild plants, because of loss of their livestock and the shortage or absence of grains in the market for purchasing or bartering. Furthermore, the price of livestock declines very rapidly so that the term of trade between livestock and grain is not in favor of the pastoralists which is similar to the cases in other pastoral areas (Ndikumana et al 2001; Getachew 2003).

Table 3. Response of the different pastoral groups to the type of food they consume in different times (1st = food type eaten most frequently and 4th = food type eaten least frequently; respondent: Hamer = 40; Benna = 30 and Tsemay = 20)

Pastoral groups	Food consumed	Good time	Pre drought time	Drought time
Hamer	Cereals/ grains	1st	1st	1st
	Milk and milk products	2nd	2nd	2nd
	Meat	3rd	3rd	4th
	Fruits and leaves of wild plants	4th	4th	3rd
Benna	Cereal/ grains	1st	1st	1st
	Milk and milk products	2nd	2nd	2nd
	Meat	3rd	3rd	4th
	Fruits and leaves of wild plants	4th	4th	3rd
Tsemay	Cereals/ grains	1st	1st	1st
	Milk and milk products	2nd	2nd	2nd
	Meat	3rd	3rd	4th
	Fruits and leaves of wild plants	4th	4th	3rd

Livestock production and their management

The different pastoral groups varied in terms of their livestock ownership. Accordingly, the Benna communities owned more number of cattle and sheep per household than the Hamer and Tsemay pastoralists owing to the relatively favorable climatic condition for rearing of cattle and sheep (Table 4). Furthermore, the incidence of diseases like trypanosomiasis is less severe in the Benna area than in the others and the area occupied by the Hamer pastoralists is highly infested with trypanosomiasis. The reasons for the lower numbers of cattle owned per household by Tsemay pastoralists was the recurrent drought affecting the area and the presence of diseases. The Hamer pastoralists had more number of goats per household than the other two pastoralists groups because of the suitability of the area for rearing goats.

Similar to the case in the other pastoral areas of Ethiopia and other East African countries (Ndikumana et al 2001), the major decisions concerning livestock such as sales, lending and/or borrowing of animals and giving animals for bride payment, and ownership is the responsibility of the family head (male) except in the case of widow woman. The widow woman has got the right to decide on the livestock under the control of her deceased husband family if she is not married to one of the brothers of her deceased husband. Though the family head (male or widow woman) is the owner of livestock, the society has a big role in making decisions concerning the sale of livestock particularly cattle because cattle are considered as community property. If a household wants to sell cattle, he or she must get permission from the village elders depending on the nature of their problems. However, there is no need of getting permission for selling goats and sheep because they are considered as liquid assets.

Table 4. Mean TLU of livestock by species owned per household in the study districts (respondents: Hamer = 40; Benna = 30 and Tsemay = 20)

Ethic groups	Livestock species		
	Cattle	Goats	Sheep
Benna	32.2 ± 22.9	7.5 ± 3.6	4.5 ± 0.7
Hamer	24.5 ± 22.8	11.8 ± 3.8	2.2 ± 0.9
Tsemay	20.3 ± 24.7	10.7 ± 2.4	1.8 ± 0.6
Mean	25.7 ± 23.5	10 ± 3.3	2.8 ± 0.7

All pastoral groups in the study districts keep more than one species of animal mainly, goat, cattle, and sheep where advantages can be taken of the various adaptation strategies of the different animal species to diseases, feed and water shortage, drought and the diversity of the out put to be obtained from the animals and this is in agreement with the reports from the other pastoral areas of Ethiopia and the East African countries (Ndikumana et al 2001). Herd composition in the study districts revealed that, the proportion of goats (45%) was higher than that of cattle (41%) and sheep (14%) and female cattle dominate the herd composition (Cow = 42%; Heifers and calf = 35%; ox and bull = 23%). In most cases, cows are not sold, slaughtered or bartered by the pastoralists in the study districts and they stay in the herd until they die. A female dominated herd structure was used to offset long calving interval and thus stabilize milk production, which is a typical characteristics of pastoralists (Ndikumana et al 2001).

Importance of livestock

Livestock are the main assets of the pastoralists in the study area upon which the livelihood of the pastoralists depends. Livestock in the study areas are used as a source of food (milk, meat, and blood), social functions, as a means of saving, income source, and risk minimization.

The pastoralists in the study districts in general do not slaughter animals for home consumption in normal times but consume animal products such as milk, meat and eggs and by-product (butter and cheese). However, the pastoralists in the study districts slaughter animals during cultural ceremonies such as wedding and funeral days and if the household is rich he can slaughter in other days too. There is no difference among the pastoral groups with regard to consumption of products and by-products from animals except that all the Hamer and Tsemay pastoralists do not eat cheese, as they do not have the practice of making cheese. Ten percent (N = 3) of Benna pastoralists living near by Keyafer town replied that they make cheese for home consumption.

The number of cattle they own decides the status of individuals in the community. All the sampled households of the different pastoral groups wished to have a large number of cattle to get a higher status in the society. In addition, bride payment is one of the traditions in both districts in which cattle play the major role. Even though ploughing with oxen is a recently introduced (25 to 40 years) technique to the areas, most of the pastoralists involved in crop production use oxen as a source of power.

With regard to the role of animals as a means of saving, income source, and risk minimization cattle are

used in the societies as bank saving account and small ruminants as liquid assets. The different pastoral groups in the study districts do not have the practice of selling milk but butter is the major animal product that is used as a source of income. Animals are kept for sale during emergency and at the time of crop failure for those involved in crop production. Though the role of livestock in risk minimization is the same in all the pastoral groups, the magnitude was higher for pastoralists living in lower altitude Tsemay and Hamer) than for those living in the higher altitude (Benna) owing to the partial dependence of the latter on crop production. Accordingly, all respondents of Tsemay pastoralists, 32% (N = 13) of Hamer, and 20% (N = 6) of Benna are using livestock for risk minimization. The reason why all Tsemay pastoralists depend on livestock for risk minimization could be associated with the shortage of rainfall these areas receive.

Livestock production constraints

The majority of the pastoralists in the study districts ranked drought (stressful period: a focus on ensuring survival of breeding stock) as the primary problem (Table 5) for livestock production which was followed by shortage of feed and water (can happen without drought) and health problem which were more or less similar to the constraints faced by animals of different pastoral areas in Ethiopia (Beruk 2003).

Table 5. Livestock production constraints ranked as percentage of the responses: (Hamer = 40; Benna = 30 and Tsemay = 20)

Districts	Ethnic groups	Problems		
		Drought	Feed and water shortage	Health
Hamer	Hamer	97.21(1^{st}) 2.79 (2^{nd})	2.79 (1^{st}) 68.75 (2^{nd}) 28.46 (3rd)	68.75 (1^{st}) 28.46 (2^{nd})
Benna-Tsemay	Benna	62.5 (1^{st}) 25 (2^{nd}) 13 (3^{rd})	13 (1^{st}) 62.5 2^{nd}) 25 (3^{rd})	37.5 (1^{st}) 62.5 (2^{nd})
	Tsemay	All ranked first	All ranked second	All ranked third

Rangeland management and pastoralists perceptions on rangeland resources and utilization

Traditional rangeland management practices

In all pastoral groups of the study districts, the council or tribal leaders control the overall management and utilization of the communally owned rangeland. However, the control over rangeland usage is for pastoralists coming from other ethnic group and very loose for their members or it can be said that there is no control. If pastoralists from other tribe want to use the rangeland for their animals, they have to get permission from the council or the tribal leaders and getting permission is not as such difficult for the tribes, because pastoralists of the study districts have the culture of sharing resources at any circumstances although their traditional system of rangeland management in general is not well developed as that of the Borana pastoralists (Oba 1998).

Land ownership and land uses

According to the information obtained from the discussions with the elders of the different pastoral groups, some 40 years back, the land in both districts was all most all owned communally. Currently, however, pastoralists owned small plots of cropland and rangeland enclosure near by their cropland and around their homestead. The rest of the vast rangeland is still owned communally and this communal ownership of the rangeland is similar to the type of land ownership in many pastoral areas of Ethiopia and East African countries (Abule et al 2005).

With regard to the type of land ownership in future, the majority (60%) of the Benna pastoralists, 30%

of the Hamer and 28% of the Tsemay pastoralists wanted the land to be owned privately (Figure 3).

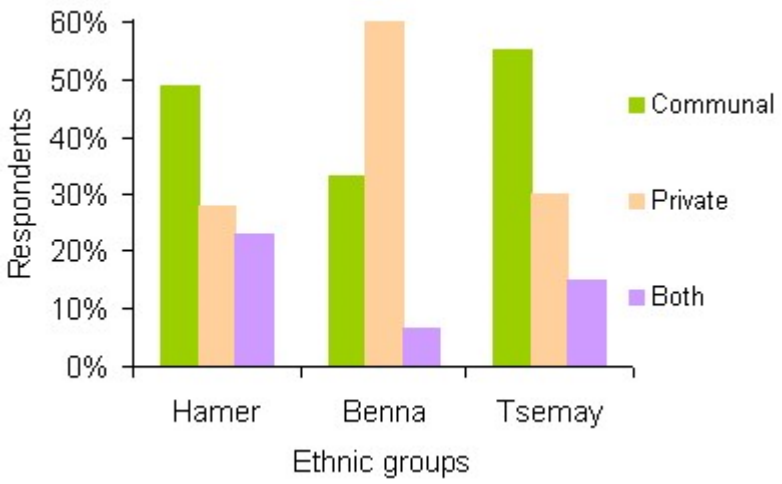

Figure 3. Percentage of respondents indicating the type of ownership preferred by the pastoralists for managing their rangeland
(respondents; Hamer = 40; Benna = 30 and Tsemay = 20)

The rationale behind the choice of private ownership were: to manage the rangeland privately and conserve forage during the wet season from the rangeland, so that they do not move from place to place in search of feed for their animals. In addition, families with less number of livestock particularly the young ones have a different opinion; since they own less number of animals, they think that they will not get equal benefit from the rangeland use. Thus, families with less number of livestock particularly the young peope need the rangeland to be shared individually so that they can get the benefit from the rangeland equally. Furthermore, the choice for private ownership of the grazing land by many of the Benna communities was associated with their involvement in crop production more than the other two pastoral groups. They want to cultivate more land and conserve forage for their animals due to the favorable climatic condition of the areas. But, the Hamer and Tsemay pastoralists showed less interest in private ownership of the grazing land because the climatic condition of the areas is not as such favorable for crop production. Those pastoralists who wanted to continue with communal type of ownership argued that dividing the rangeland for individual ownership can be the source of conflict and they also indicated dividing the rangeland is not their traditional culture.

With regards to changes in the land use, many of the respondents in both districts replied that there was an increase in the size of the cropland with a subsequent decrease in the size of the grazing land (Table 6). Pastoralists were of the opinion that the increase in human population and the inadequacy of the livestock production to fully meet the demands of the households due to many reasons like drought and privatization of the rangelands were some of the reasons for the decrease in the size of the grazing land and an increase in the size of the cropland.

The pastoralists in the study districts do not have the practice of allocating grazing lands according to seasons. Although it was not widely practiced, they establish small enclosures around their homestead for use by lactating cows, sick animals, and calves during critical periods of feed shortage and such utilization of the rangeland by establishing enclosures is similar to that practiced by the Borana pastoralists (Oba 1998). The practice of establishing enclosures is relatively more in the higher altitude areas than in the lower altitude areas because of the un-favorable climatic condition of these areas for sufficient biomass production. Thus, it was the Benna communities who have more experience in establishing enclosures than the other pastoral groups because they are living in the higher altitude areas of the study districts. In general, it can be said that the pastoralists in the study districts do not have the practice of conserving rangeland land plants through the establishment of enclosures.

Table 6. Percentage of the sampled households indicating the change in land use in the study districts (respondents: Hamer = 40; Benna = 30 and Tsemay = 20)

Trend	Type of land use	Pastoral groups		
		Hamer	Benna	Tsemay
Increasing	Grazing	14.7	10	15
	Cultivation	47.7	83.3	40
Decreasing	Grazing	85.3	90	85
	Cultivation	10	10	20
Constant	Grazing	0	0	0
	Cultivation	41.3	6.7	40

Utilization of rangeland vegetation

Pastoralists in the study districts, during periods of critical feed shortage, conserve forage for livestock around their homesteads, loop browse plants and harvest grasses and legumes from the rangelands. All pastoral groups that live in the higher altitude zone of the study districts, harvest grasses and legumes found under the canopies of big trees and between big rocks and conserve standing hay, but pastoralists in the lower altitude zone of the study districts, loop browse plants. Thus, 67% of the Benna, 77% of the Hamer, and 85% of the Tsemay pastoralists replied that they loop browse plants and harvest rangeland plants. Woody plants play a central role in the farming systems of the study districts, where the different pastoral groups use woody plants for a wide range of uses, the primary being as a source of livestock feed. The use of woody plants by pastoralists for different purposes has been documented by many authors (Ahmed 2004; Ayana 2007).

Pastoralists perceptions towards vegetation compositions

All pastoralists in the study districts replied that the proportion of grasses and legumes has decreased while that of woody vegetation increased (Table 7) and this change in vegetation proportion is in line with the reports of others (e.g, Sharon 2000). The possible reasons indicated by the pastoralists for the change in vegetation composition were drought, overgrazing and the allocation of large area of land for non-pastoral use, which created grazing pressure on the remaining areas.

Bush encroachment is commonly considered a major factor to livestock production and natural resource conservation because it alters habitat structure and decreases herbaceous production (O' Connor and Crow 1999). Accordingly, all pastoral groups in the study districts replied that compared to the past, their grazing lands are more covered with bushes and shrubs (Table 7), which was responsible for a decline in rangeland condition. They further elaborated the possible reasons for bush encroachment. According to them, drought, which weaken the grass stratum, overgrazing and the absence of burning are the major causes and the reasons indicated here are similar to those reported for other areas (Smit 2002). The main problems faced due to bush encroachment are reduction in the production of the herbaceous layer, restriction of livestock movement and damage to the body of the animals. Previously, the pastoralists used burning as a method of bush control, but currently they do not use any type of control methods because burning as a method of bush control was banned by the government.

Table 7. The perceptions of the different pastoral groups about vegetation composition in percentage (respondents; Hamer = 40; Benna = 30 and Tsemay = 20)

Status	Plants species	Ethnic groups		
		Hamer	Benna	Tsemay
Increasing	Grasses	2.5	6.7	-
	Legumes	-	3	-
	Shrubs	92.5	63.3	100
Decreasing	Grasses	97.5	93.3	100

	Legumes	100	97.7	100
	Shrubs	5	30	-
Constant	Grasses	-	-	-
	Legumes	-	-	-
	Shrubs	2.5	3	-

Pastoralists perceptions towards rangeland condition

Periodic assessment of the condition of the rangeland is part of the traditional natural resource management practices on which the welfare of their animals is based. Accordingly, 89 % (N = 36) of the Hamer, 83 % (N = 25) of the Benna and 90 % (N = 18) of the Tsemay pastoral groups replied that they make periodic assessments on the condition of their rangeland. This assessment, which is mainly based on the availability of grasses, water, free of animal and human disease, suitability to the different livestock species and security to the herders (Table 8), can be unconditional or be carried out on an individual or group basis and the criteria used by the pastoralists in the study districts is similar to that set by the Maasai in Kenya (Oba and Post 1999). In general, greetings (day to day meetings) in these pastoral groups mean holding discussions about water, rainfall, rangeland condition, and welfare of their animals.

The majority of the respondents (> 80%) replied that the condition of their rangeland is poor. Many interacting reasons, with profound implications to the future of the rangelands and the pastoral production systems, were given for this poor state of the rangelands. Recurrent drought, overgrazing, increase in the number of livestock, bush encroachment, and the allocation of vast area of rangeland for non-pastoral use and increase in the size of cropland (cultivation) were the major reasons for the poor condition of the rangeland. The decline in the condition of the rangeland as perceived by the pastoralists was in agreement with the reports of Oba (1998) and Ayana (1999) in Borana rangeland; Amsalu and Baars (2002) from the mid rift valley and Abule (2003) in middle Awash areas of Ethiopia

In the early days, when grass was abundant, the pastoral groups in the study districts, used to burn their grazing land as a measure of rangeland improvement. However, these days except making enclosures there is no rangeland improvement activity being undertaken in the study areas.

Table 8. Criteria used in rating rangeland condition by the different pastoral groups in the study districts

Condition	Criteria
Poor	Availability of less and unpalatable grasses Absence of permanent water source Far from homestead High incidence of diseases for both human and livestock. Ecologically not suitable to different animals species There is problem of security for the herders.
Fair	Moderate amount of palatable grasses are available Water is available at least for two months of dry seasons Moderately far from homestead Less incidence of diseases for human and animals Ecologically suitable to the majority of the animals There is no as such problem of security
Good	Enough amount of grasses and legumes for their animals therefore their animals have good body conformations. Water is available though out the year. Near to their homestead Very little or no incidence of diseases for human and animals Ecologically suitable to all animals No problem of security

Major rangeland constraints

As it has been discussed in the previous sections, the major constraints raised by the pastoralists, elders and different community members during the field work were drought, deterioration of the rangelands with a shift in vegetation composition, i.e., decrease in the proportion of grasses, legumes and increase in the proportion of unpalatable grasses, bushes/shrubs and absence of water in the rangeland which conforms to other reports (Abule 2003).

Feed resources in the districts

In extensive rangeland systems, livestock production is highly dependent on the availability of natural grazing, the quantity and quality of which are primarily determined by the amount and distribution of rainfall, given the temperature regime, soil type and topography of a particular rangeland sites. Thus, the major feed resources in the study districts are natural pasture (grasses, legumes and browse plants) and in certain areas crop residues. The natural pasture is available to animals for about five months, starting from mid April to July (main rainy season) and mid October to December (short rainy season). Many of the Benna and some Hamer pastoralists who live in the higher altitude areas and involved in crop production practice the use of crop residue as an animal feed. The crop residues used as animal feed are the stovers of maize and sorghum and the straws of wheat, tef and barely and they are available for supplementing feed for a few weeks during the harvesting seasons and in the study districts, there was no practice of conserving crop residues. Browsing plants are available throughout of the year but mainly in the dry season at the time when the production of the herbaceous layer is very negligible, i.e., from mid September to mid December.

All the sampled households in both districts reported that there is a critical feed shortage during the dry season (November to January). The measures taken by the different pastoral groups to solve feed shortage are migration (November to January), supplementing lactating, sick animals, kids and lambs with grasses and leaves of shrubs. Eighty-four percent of the Hamer, 47% of the Benna and 90% of the Tsemay provide supplement to their animals during the dry season. The critical shortage of feed and the measures taken to solve the problem are in line with the general situations prevailing across the rangelands in Ethiopia (Abule 2003).

Water sources

Tracking water of consumable quality for livestock is one of the major occupations for pastoralists and one of the key determinants of pastoral movement and migration. Accordingly, the sources of water for animals in the districts during the dry season are permanent rivers, boreholes, hand pumps, ponds, lake, and water extracted from temporary rivers beds (river beds). Seventy-five (75%) of the Hamer use water from permanent rivers where some of them have to travel long distances (of this percentage more than 85% were getting water by moving more than 10-20km distance to river Omo and 15-30 km to river Kako) (Figure 4).

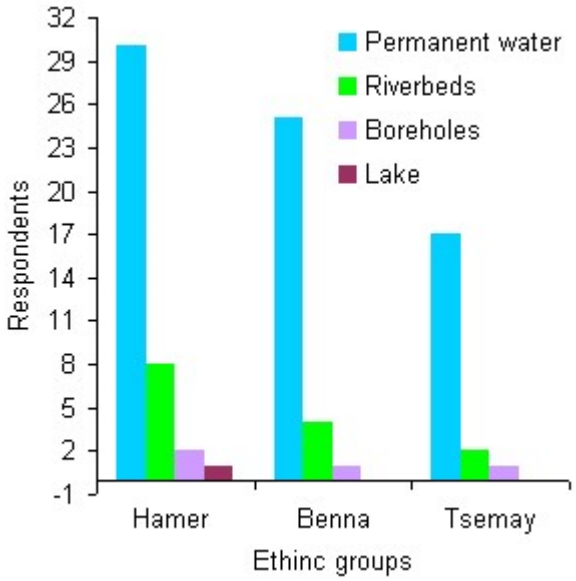

Figure 4. Response of the different pastoral groups towards water sources (respondents: Hamer = 40; Benna = 30 and Tsemay = 20)

82% of Benna pastoral groups were using permanent water sources (rivers) (of this percentage about 75% were getting this water by moving more than 10-20 km distance to river Kako and 10-20 km to river Omo), and 92% of Tsemay pastoral groups were getting water from permanent water sources (rivers) (all pastoralists getting this water by moving at more than 10km to river Weyto and more than 30 km to river Kako) (Figure 4). In all the pastoral groups, there was no problem of water in the wet season as they can use water from all sources around their settlements such as permanent and temporary rivers, ponds, and deep boreholes.

Generally, in the study districts, water resource use control are very loose for the members of the community, i.e., there is no control over the use of the natural water, deep boreholes and hand pumps made by government and non-government organizations (NGOs). The sources of water for animals and human beings are the same, the water is not clean based upon the subjective judgment of the pastoralists and there is a critical shortage of water during the dry season (December and January). All pastoral groups were migrating long distance to get water for their animals as major alternative and using river beds water to overcome this problem.

In the study districts, the frequency of watering of animals is dependent on season like the case with the Borana, Afar and the Somalia pastoralists (Dawit 2000). In the dry season, those herders, particularly owning cattle, graze their animals for two consecutive days and move their animals on the third day to the watering points. In the wet season, however, because of the availability of water everywhere animals drink water depending on their need.

Perceptions of the pastoralists towards migration

Mobility is an inherent strategy of the pastoralists to optimize production of a heterogeneous landscape under a precarious climate. The fact that grazing resources are found in different places at different times affects the herders strategy. For example, pastoralists tend to prioritize mobility (whether in the form of nomadic or seasonal transhumance) and an opportunistic approach to resource management (Hussein et al 1999; Ndikumana et al 2001). Mobility is one of the major copping strategies for drought and in case of water and feed shortage. It is practiced by all pastoral groups in the study districts and it is carried out during the dry season mostly for four months (December to March). All pastoral groups agreed that currently the frequency of migration has increased in the study districts due to recurrent drought; deterioration of grazing lands and increases in livestock population. Most of the pastoralists replied that migration is a practice undertaken while facing many problems during migration. Some of

the problems faced during mobility are incidence of diseases to humans and livestock, death of animals and human beings, water and feed shortage, attack by wild animals and these problems are more or less similar to those constraints faced by pastoralists in other areas of Ethiopia (Sharon 2000; Abule 2003).

Drought and their coping mechanisms

One of the major problems currently faced by the pastoralists in the study districts is drought and in the past it used to happen every 10 years or more. However, recently, drought is coming every two to three years. The intensity of drought is more severe on the sides of Tsemay pastoralists than Hamer and Benna pastoralists. Owing to the relatively favorable climate in Benna areas for crop production, the Benna pastoralists are affected less than the others. The major coping mechanisms of the pastoral groups in the study districts are migration, herd management strategies that include maintenance of female dominated herd composition, herd diversification, keeping of large herd size and provision of supplementary feed where available and the pastoralists coping strategies are similar to those practiced by other pastoralists (Ndikumana et al 2001).

Rangeland resource use conflict

The word conflict has been used to describe a wide range of interactions between herders and farmers over natural resources, interactions that are qualitatively different from each other and clearly of different degrees of severity. Thus, the umbrella term conflict has been used to cover tension between resource users, straight forward arguments between individuals, disputes between individuals or groups, or with the state, legal proceedings between resource users, political action to evict certain resource users, theft, raiding of livestock, beatings, killing of humans or livestock, and large-scale violence between groups involving multiple killings (Hussein et al 1999). The usage of this term under the context of this study was to explore land use conflict in the study districts, which reflects ongoing competition over access to scarce land resource among the different pastoral groups. Based on this fact, in the past, conflicts among the different pastoral groups were common in the study districts. Some of the resource use conflicts were between Tsemay and Borana; Hamer and Geleb; Hamer and Borana; Benna and Borana. Accordingly, all of the respondents from the Tsemay pastoralists and 70.59% (N = 24) of Hamer and 33.33% (N = 6) of Benna pastoralists replied that they were involved in the conflict. The main cause of the conflict was livestock theft or raiding among the neighboring ethnic groups and the others are conflict over a specific area of grazing and the lack of respect for the grazing rules set by the elders. Therefore, the different pastoral groups are armed in order to defend their families and properties. The pastoralists in the study districts use two mechanisms to prevent, manage and resolve conflicts. These are either through the traditional (the negotiation of elders) or modern mechanisms (through government law). At times, depending on the nature of the problem, they use a combination of the two mechanisms.

Conclusions

- The wealth of indigenous knowledge of the pastoral communities regarding their livestock and rangeland management should be taken into consideration when planning livestock and rangeland management projects as previous livestock developments undertaken in Ethiopia and neighbouring east African countries which disregarded the pastoralists knowledge almost all have failed (Scoones 1995; PADS 2004).

- As the problems of the rangeland are complex, it may not be easy to solve all problems using traditional knowledge alone and these knowledge better be augmented with knowledge from the scientific world.

- To sustain the pastoral production system in the districts, the current condition of communal rangeland should be improved through rangeland rehabilitation, conservation and proper management. Among others, resting of the communal grazing areas, proper grazing management,

strengthening of privately owned enclosures as well as establishment of community based enclosures in some key sites are very essential.

- Furthermore, it is essential to recommend the need to focus on strengthening of the traditional resource management system, technical and technological supports to the pastoralists.

- The failure in previous development projects in the pastoral areas was their top down approach which did not involve the pastoral communities. As the main actor in the rangeland is the pastoralists, development projects need to be participatory.

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