

Disturbed Traditional Resource Management affects the Preservation of the Boran Cattle in their Original Habitat

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Abstract

The Ethiopian Boran cattle evolved from the Borana pastoralists' successful breeding strategies under the harsh conditions of arid rangelands. At present two types of this breed are known to exist in the Borana rangelands: the *Qorti*, or the typical Boran, and the *Ayuna*, its local variant with smaller body weight and lesser demands on pasture. This paper illustrates the impact of external interference on the maintenance of the Boran cattle breed in its original habitat. The traditional land use system of Borana pastoralists has been based on well-planned consultative herd movements between functional rangeland categories and on herd management, to ensure availability of adequate grazing and water all year round. The well-intended artificial water ponds in Dida Hara and other parts of the rangelands opened up the pastures for permanent grazing and uncontrolled settlement. This has led to reduced mobility of the herds and subsequent overgrazing in those areas which were formerly only seasonally used. At the same time, the imposition of ruling on land management from the formal administration has compromised the merits of indigenous pasture management institutions, exacerbating the problems of resource use. The Borana pastoralists have adjusted their breeding strategies in response to the deteriorated rangelands by favouring the breeding of the *Ayuna* sub-type at the expense of the *Qorti*, and by increasingly acquiring more camels. Conservation of the typical Ethiopian Boran cattle, or *Qorti*, would require to secure adequate seasonal grazing and water resources, which would depend on public policies for the functioning and reinforcement of the indigenous consultative and negotiation processes for community-based management of the rangelands and the livestock that depend on them.

Keywords: Ethiopian Boran cattle, pastoral natural resource management, mobility, breed conservation, indigenous institutions of resource management.

Introduction

Pastoralists in the Borana rangelands were once famous for producing a high quality Ethiopian Boran cattle (Pratt and Gwynne, 1977; Cossins and Upton, 1988; Behnke and Abel, 1996). The Ethiopian Boran cattle was exported for commercial ranching to countries like Kenya, Australia and Mexico. The Improved Boran cattle in Kenya have undergone genetic improvement programs and have reached body weights of up to 850kg (Rege, 1999). A similar promising breed improvement program on the Ethiopian Boran initiated in 1960 at Abernossa ranch was discontinued two decades later for lack of policy support (Azage Tegegne, 2004). More importantly the degrading ecological conditions in the native habitat of the Ethiopian Boran have increasingly forced the pastoralists to select against the large-frame and true type Boran cattle, locally known as the *Qorti*, and to promote its smaller and more adaptable sub-type, referred to as the *Ayuna*, of the Ethiopian Boran cattle. The

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typical Ethiopian Boran cattle, or the *Qorti*, is currently maintained mainly at the government-owned Did Tuyera breed improvement ranch.

The Ethiopian Boran breed of cattle have evolved under the high risk conditions of the semiarid Borana rangelands. The Borana rangelands used to be considered as the best rangelands in eastern Africa (Coppock, 1994), and availability of water has been the key variable that determines utility of the pastures. Even when grazing resources were abundantly available (Cossins and Upton, 1987), availability of water essentially limited the cattle population in the rangelands. The Ethiopian Boran breed proved well adapted to these circumstances. It is known to have excellent beef production potential and good milk production capacity. It is also moderately tolerant to extended drought conditions and local disease challenges. This was matched by effectively functioning indigenous institutions for the management of available grazing and water resources during times of abundance as well as scarcity. The water and grazing resources were allocated by these institutions depending on the current and future capacity of these resources and the essential needs of their livestock holdings, particularly those identified as more valuable subsets of their herds. These traditional practices can be characterised as opportunistic strategies to make the best use of the natural resources at their disposal.

These indigenous institutions and the system of resource management they espouse have been under increasing pressure from external interference, notably by well-intended but poorly designed pastoral development interventions. These interventions emphasised development of additional watering points, which resulted in greater permanent grazing and uncontrolled sedentary settlements. Furthermore, the authority of these institutions in co-ordinating judicious access to available pasture and water has been undermined by the overriding rulings of the formal administration which is not necessarily consistent with the concerns of indigenous institutions for management of rangeland resources. The combined impact of all of these factors has been a progressive deterioration of the rangeland resources as manifested by undesirable changes in botanical composition of the pastures in the form of disappearance of preferred species and encroachment of undesirable woody browse species (Helland 1982, 1997; Coppock, 1994; Alemayehu Reda, 2001; Kamara, 2001). This trend has threatened the maintenance of the large-frame Ethiopian Boran cattle and favoured smaller and sturdier types of the Boran cattle. This paper assesses the impact of these external interferences on the current and future preferences of the pastoral communities for the sub-types of Boran cattle they maintain in the face of deteriorating pastures of the Borana rangelands.

Material and Methods

The field research was conducted in the Borana rangelands from September 2000 to July 2002. Data were collected from the typical Borana rotational grazing system (*Dirre*) using two districts with contrasting attributes both in their traditional livestock systems and in the extent of external interference. Web district represents the traditional dry season grazing area with one of the oldest deep well complexes and a permanent supply of good quality water. Valuable rainy season pastures, *Wayama*, were found near these water sources. In contrast, Dida Hara represents the former rainy season grazing area, *Goomole*, with only seasonally available surface water. This area represents those parts of the rangelands where the introduction of dry season watering ponds in the 1970s opened up more permanent grazing and uncontrolled sedentary human settlements.

PRA techniques, group interviews, geographic positioning systems (GPS) and official maps were used to assess the current status of natural resources, pastoral movements,

institutional networks current holdings of the Boran breed sub-types and community preferences for any the two sub-types of the Boran breed. Body weights of a total of 543 animals were estimated from linear body measurements during the peak dry and wet seasons using a representative subset of adult female and male cattle from each breed sub-type. The average body weights of these sub-types were compared and related to preferences of the cattle owners.

Results and discussion

Declining importance of the true type Boran cattle in the pastoralists' herds

The study confirmed the presence of two distinct sub-types of the Ethiopian Boran cattle in the sample herds: the traditional large-framed *Qorti*, considered here as the true type of the Ethiopian Boran cattle, and the smaller-framed *Ayuna*. There is also a third but less important category of animals that exhibited features that are intermediate between those of the *Qorti* and *Ayuna*. The *Qorti* sub-type has been known for its physiological adaptation to heat stress, drought tolerance, capacity to trek long distances, good mothering ability, docility and longevity. Other than its partial origin from highland cattle of Ethiopia, little is known about the attributes of the *Ayuna* sub-type (Haile-Mariam et al., 1998).

The pastoral communities, in line with scientific descriptions (DAGRIS, 2003, DAD-IS, 2003, Oklahoma State University, 2003) characterised the phenotype of *Qorti* as being of tall height with long legs, broad back, long neck, prominent hanging dewlap, short horns, small hump and a short tail. The original and the most preferred coat colour for Boran cattle was light grey for the body and dark grey around the dewlap. *Qorti* is recognized for high fertility, good growth and milk producing capacity under range conditions. Under favourable conditions of the rangelands the pastoralists prefer the large-framed *Qorti* type. However, compared to the *Ayuna*, *Qorti* was observed to show lower tolerance to drought and tick burden and poor adaptation to scarcity of pasture.

In the same way, the Borana pastoralists characterised the *Ayuna* type as shorter in height, smaller in body size, but more amenable to adapt to degraded rangeland conditions than the *Qorti* sub-type. It was judged as generally poorer than the *Qorti* in fertility rate as well as production of beef and milk. Pastoralists mostly rejected the *Ayuna* for its black coat colour because they associate it with low productivity.

Indeed, the body weight measurement confirmed a significant difference between adult *Ayuna* and *Qorti* cattle ($p < 0.01$), with the *Qorti* being generally 41 and 51 kg heavier than the *Ayuna* during the dry and wet seasons, respectively (Table 1). When these comparisons were made separately within sex groups, not only were the significant differences more pronounced but also there was broader variation in values in the adult males than in the females. The female *Qorti* on average weighed about 39 and 43kg more than the *Ayuna* ($p < 0.01$), whereas male *Qorti* were heavier than the *Ayuna* by 69 and 104kg ($p < 0.05$) during the dry season and the wet seasons, respectively.

According to the pastoralists the two sub-types of the Boran cattle have different geographical origins and habitats. *Qorti* was said to have originated from the grazing plains of the eastern part of Borana rangelands. The *Ayuna* type was said to have evolved from gradual introgression of genetic material from the highland cattle (Jemjem Zebu, Bale Zebu) into pastoral herds in the north of the rangelands. Dida Hara was considered to be more appropriate for the *Ayuna* type, but Web was judged as suitable for the *Qorti*

type. But this view of the pastoralists appears to be not consistent with the results of the range ecology study (Gemedo Dalle, 2004) that the central area of Web was actually more degraded than Dida Hara. However, Web is adjacent to the best wet season pasture, *Wayama*, in the East (see Figure 2), and a higher mobility of herds was observed in Web, which allows better access to high quality pasture for *Qorti* cattle. Furthermore, the investigations on the socio-economic household characteristics have revealed that in Dida Hara the heterogeneity in cattle possessions was high, whereas in Web livestock was more equally distributed (the gini coefficients based on the number of cattle per household were 0.92 and 0.17 in Dida Hara and Web, respectively). It was noted that there was less co-operation in herd management in Dida Hara, and it is argued here that the higher heterogeneity in cattle holdings, and hence wealth status, contributed to the low co-operation in herd management, as expressed in the reduced numbers of cooperating groups in Dida Hara after the 1999/2000 drought (Table 2). The level of cooperation was found to be associated with a household's potential for mobility after the drought (χ^2 -value = 21.3, $p < 0.01$), and thus the reduced co-operation in Dida Hara restricted mobility of the pastoralists. The higher mobility in Web, despite smaller average herd sizes, was due to better co-operation, and hence better disposition to make more judicious use of the grazing resources.

Indeed, the distribution of the cattle types in Dida Hara was significantly different from that in Web (χ^2 -value = 28.3, $p < 0.01$). The *Qorti* showed a higher frequency of occurrence in Web than in Dida Hara, whereas in Dida Hara, the proportion of the intermediate animals was about four times higher than in Web (Table 3). The average body weights of the different cattle types were not significantly different between Web and Dida Hara, confirming the distinctness of the sub- types in both sites. In total already 55.6 and 43.1

% of the adult cattle in Dida Hara and Web were of either *Ayuna* or intermediate type.

Furthermore, the Boran breed is threatened not only by genetic erosion but also by the fact that cattle are losing their predominant position to small ruminants and camels. In Dida Hara the drought reduced the share of cattle in favour of small ruminants, especially in impoverished households. In Web, the share of cattle was about the same, but the relative position of camels has increased from 6 to 9% and the share of small ruminants slightly dropped (Table 4). Camels have been only recently adopted by the Borana pastoralists, but already more than 50% of all the households have started keeping them. Camels are known to be better adapted to the degraded rangelands providing additional transport services and a more reliable milk production during the dry season. They are now increasingly seen as indispensable complementary elements of the Borana pastoral production system in response to the perceived ecological degradation.

The pastoralists fear that the *Qorti* is in danger of gradually disappearing from the Borana rangelands. They identified scarcity of pasture and the increasing recurrence of droughts as the main causes for the danger. Many factors have contributed to the scarcity of pasture area and its degradation but external interference into the effective functioning of indigenous institutions for rangeland resource management has played a major role.

Traditional practices of resource management for access to high quality pastures

The group discussions revealed that traditionally the Borana pastoralists follow a semi-sedentary mode of cattle production. This is based on concentric movements of livestock and herders within and between distinct indigenous landscape categories

(Figure 2). According to the characteristics of the natural resources, the Borana pastoralists divided the Borana rangelands into two zones with separate grazing systems: *Liban* and *Dirre*.

Liban represented the area north of the Dawa river and traditionally it had mainly a religious importance for accommodating the ritual celebrations of the Borana pastoralists. In *Liban*, the herd movements were limited to *Golbo Liban* for the dry season grazing near the river, and during the wet season grazing moved to *Diid Liban* to the east. *Dirre* refers to the entire area south of the Dawa river. Here the pastoralists exercised the typical Borana rotational grazing system around the main sources of permanent water, salt and pastures. The traditional well complexes (*tula*) are concentrated in the centre of *Dirre*, with valleys of white soil. The permanent water supplies of these areas attracted numerous cattle herds from all directions during dry seasons. The momentarily high pressure of livestock was slightly eased by the use of smaller and shallower wells (*adadi*) at the periphery of these rangelands. These dry season grazing areas were surrounded by the seasonally accessible wet season grazing areas. The plain grasslands to the eastern direction, known as *Wayama*, were said to be of great value for cattle. These areas had wide flat lands with fertile soils, which provided an abundance of high quality natural pasture. Also favourable for cattle were the areas to the north, known as *Gomoole*. Fewer herds were moved to the south, the *Golboo*, which were more suitable for small ruminants, and the central parts of *Malbee*, which also attracted herds from the bottoms of the surrounding mountain chains.

For better use of natural resources, particularly water and pasture, the Borana pastoralists stratified their cattle herds by physiological status, age, sex and walking ability and assigned these strata to well-defined sources of water and pasture. As was also reported by Coppock (1994), the long-established traditional resource management system of the Borana pastoralists provided grazing areas at residence (*warra*) (all year grazing areas in Figure 2), and at satellite camps (*forra*) (temporary grazing areas in Figure 2) for splitting off the cattle herds. Calves of both sexes younger than 5 months (*waatiye*) were generally kept around the homestead and were supplemented with forage cut and carried to them. Lactating cows providing milk for the households (*looni hawicha*), weak or sick animals and animals younger than two years (*yabiye*) predominated the home-based stationary herds. After the onset of the first rains, the satellite herds were split progressively and moved further to ensure that the resident herds got adequate water and pasture during the dry season, particularly in *Dirre*. Dry cows (*looni guessa*) and adult males were predominantly moved to more distant pastures like *Wayama*, *Gomoole*, *Malbe* or *Golboo*. Above a certain herd size, additional groups of castrated males (*sanga*) were further separated. The castrated males were considered precious animals to allow further exploitation of more distant pastures, deep into the *Wayama* area. The time and the number of animals that had to move were negotiated according to the local perception of the available forage, which became more necessary when livestock density was high. Owners of large herds were generally requested to keep their satellite herds out of the home-based pasture.

Such a stratification of the Boran cattle herds was essential for implementation of community rules and regulations for access to the different rangeland categories. These were dictated by the availability of water during the peak dry season. The main camps (*warra guddaa*) and adjacent pastures were clustered in rows at distance of 10 to 15 km around the wells (*dongora seera*). Additional forage banks (*lafa seera yabiye*) were reserved for weak and sick animals to use during periods of forage scarcity. The forage

banks were shared by several settlement clusters, and this helped to avoid further fragmentation of the rangeland. The wet season pastures were found in the periphery of these central grazing areas, and were open for the satellite herds to move into. The distance from the main camps to the location of the satellite herds was estimated to be up to 120 km. Apart from improving use of the available pasture and water resources, mobility of the herds was intended partly to allow for adequate recovery of the dry season pastures. Controlled burning of the bush in the wet season pastures favoured the emergence of more palatable grasses, which in turn enhanced forage intake. Pastoralists also practised early morning herding in order to extend the grazing time.

The decisions for the allocation of range and water resources were enforced by a complex network of institutions (Figure 1a) (Homann *et al.*, 2003). The right of free access to water and pastures for every member of the Borana was limited by trusteeships for each well held by a specific clan. The daily administration of the wells was left to supervisors (*abba herrega*). The water management at the level of the clans was supported by institutions determined locally by special elders' committees (*jarsa madda*) who coordinated the access of cattle to each well with the use of a nearby pasture (*madda*). Additional committees of the elders (*jarsa dheedaa*) were responsible for shared grazing areas (*dheedaa*). The responsibility for small scale land use planning was conferred to committees at camp clusters (*jarsa ardaa*) and neighbourhoods (*jarsa reera*). Concerns at village level were firstly directed to the head of the village (*abba olla*) and each household was represented by the head of the household (*abba warra*). Social security, including the peaceful resolution of conflicts, was assured for each Borana clan member by *abba qae* and *jallaba*, the local clan representatives. Directives for good governance for the entire Borana society were reviewed by the *gumii Gaayo*, the legislative assembly, and supported by the *gadda*, a complex system represented by *abba gadda*. Special counsellors (*hayyu*) were mediators between these institutions. The effective functioning of these networks of indigenous institutions is being seriously challenged by two external interferences: inappropriate rangeland development interventions and the introduction of ruling by the formal administration.

Detrimental effects of external interference on the functioning of indigenous institutions of resource management

The traditional natural resource management practice of the Borana pastoralists has been severely disturbed mainly by inappropriate development interventions. The most notable of these interventions has been the construction of numerous water ponds in the traditional wet season pastures (*Gomoole*), which effectively discouraged seasonal mobility of herds and opportunistic resource exploitation. The federal regionalisation policy has transferred large parts of *Wayama*, an area about one third of the Borana rangelands and two important wells, to the Somali Administrative Region. This effectively denied the Borana pastoralists access to these pastures. The ensuing socio-economic and political instability led to ethnic conflicts between the Borana and Somali pastoral communities. In addition, the encroachment of crop farming, the ban on burning and the establishment of private commercial ranches exacerbated disruption of the Borana traditional pastoral resource management system. The alarming growth of human population put further pressure on the natural resources, and has reduced the per capita availability of these resources. Recurrent droughts also added to the problem by causing huge losses of livestock and grazing resources.

In addition to the shrinking forage resources, the indigenous institutional networks by which pastoralists governed access to pasture and water resources have been severely

compromised. The government implemented formal units for political administration in the form of peasant associations (PA), which are alien to the indigenous system (Figure 1b). Younger community members, who are inexperienced in pasture management, were appointed with authority for local decision-making including access to rangeland resources. The power of these formal institutions to decide on access to formal education, relief assistance and extension services has further undermined the established authority of indigenous institutions. Most destructive of all on the large scale co-ordination of herd movements was the dissolution of the indigenous institutional networks from the lowest strata through the clan affiliated institutions to the highest level of traditional governance. In particular the institutions for local land use planning including their cross-linkages to the institutions for social security were severely weakened and the fundamentals for good governance have been eroded. The Borana elders' committees were no longer in a position to apply their knowledge and skills in rangeland management. Consequently, there has been increasing trespassing of regulations, the maintenance and rehabilitation of rangeland resources has become increasingly difficult, and necessary structures for decision-making and generation of indigenous knowledge have vanished. These have also caused more tension and conflict between and within the hitherto stable pastoral communities. All these factors led to the breakdown of significant parts of the indigenous institutions of resource management leading to uncontrolled expansion of grazing and sedentary settlements, further exacerbating the scarcity of the rangeland resources.

The current situation in the Borana rangelands implies that mobile land use in the traditional sense is no longer viable. The expansion of permanent water sources in the form of ponds in Dida Hara made it unnecessary to move the herds back to Web during the dry season. The wealthy owners of large mobile herds were the first to settle, and the area eventually became a permanent settlement. The grazing pressure expanded rapidly and Dida Hara experienced the highest losses of cattle in the entire Borana zone during the 1999/2000 drought. Due to the rapid decline of pasture availability, only a minority of wealthy herders could afford to procure *Qorti* bulls either from the market or from the government-owned Boran cattle breeding ranch. The majority of the households maintained either only the *Ayuna* type or only a small proportion of the *Qorti* at a low level of performance.

In Web mainly the owners of small herds remained. This area still had to cope with the seasonal demands of external herds in periods of water scarcity. During recent years impoverished households have settled in areas near the wells in breach of the traditional pasture allocation rules. At both locations pastoralists argued that lack of forage has become the major reason why traditional herd stratification and pasture allocations rules are no more observed, and practices like controlled rangeland burning and early morning herding are no more the norm. Moreover, maintaining of separate herds of castrates is possible only for a minority of Borana pastoral households.

Conclusions

In the Borana rangelands, the degradation of the natural pastures and the decline of dry season grazing reserves together with unlimited access to the wet season pastures for mobile herds has threatened the maintenance of the true Ethiopian Boran breed, the *Qorti*. The large-framed *Qorti* are considered not competitive when the grazing resources are scarce. The pastoralists responded by selecting for another type of Boran cattle (the *Ayuna*) with lower demands on forage and by increasing the adoption of small ruminants and

camels. Thus, conservation of the true Ethiopian Boran cattle would require improvements in the quantity and quality of grazing resources available to the Borana pastoralists.

The indigenous natural resource management practices in Borana rangelands need to be maintained. They should not be further undermined by poorly designed development interventions. Settlement patterns in the rangelands should be critically evaluated on whether they actually lead to better human support capacity of the resources as well as for their impact on sustainable utilisation of the available pasture and water resources. There is a need to re-instate the consultative and negotiation processes of resources use through transfer of critical authority on natural resource allocation back to the indigenous networks of institutions. These institutions need to be further empowered in their leadership capabilities. However, planning for rehabilitation of the degraded rangelands will have to start by acknowledging that the traditional strategies of systematic pastoral mobility may no longer be practiced at the scale known hitherto. Reduced mobility also entails loss of practice, indigenous knowledge systems and communications networks. For the pastoral communities even the mechanisms to periodically respond to drastic climatic variability are getting weakened and delayed. Hence, for the long-term valorisation of the expanded rangelands, sustenance of the necessary technical capability and skills for governing resource use and fostering cooperation within and between communities are critical priorities at the local level.

Furthermore, Borana pastoralists have lost access to the valuable grazing resources in the east of the rangelands, which are part of the original habitat of the Boran cattle. This loss severely limits the chances for conserving the Boran cattle in their original habitat by the Boran pastoralists. Facilitation of structures for continuous negotiation, including conflict mediation and arbitration between pastoral communities, are critical elements of public policy that aim at sustaining animal genetic resources in areas such as Borana rangelands.

Table 1. Average body weights (kg) of adult Boran cattle from sample traditional herds by phenotype and sex during the dry and rainy seasons, in Dida Hara and Web, 2001/02.

Type	Dry season			Rainy season		
	n	Mean	se	n	Mean	se
	Overall					
<i>Qorti</i>	112	277.7 ^a	6.1	148	317.0 ^a	5.2
Intermediate	76	235.3 ^{ab}	4.0	50	282.0 ^{ab}	7.0
<i>Ayuna</i>	86	237.0 ^b	6.4	71	265.7 ^b	4.5
Total	274	253.2	3.6	269	296.9	3.6
	Females					
<i>Qorti</i>	95	270.2 ^a	6.1	127	308.0 ^a	4.9
Intermediate	66	231.0 ^{ab}	3.1	44	270.2 ^{ab}	5.0
<i>Ayuna</i>	61	231.4 ^b	5.7	62	265.5 ^b	4.5
Total	222	247.9	3.4	233	289.5	3.3
	Males					
<i>Qorti</i>	17	319.1 ^c	19.0	21	371.2 ^c	17.6
Intermediate	10	263.5 ^{cd}	21.5	6	368.0 ^{cd}	26.3
<i>Ayuna</i>	25	250.4 ^d	16.9	9	267.4 ^d	19.0
Total	52	275.4	11.7	36	344.8	14.0

^{a,b}Means in columns followed by different subscripts are significantly different at $p < 0.01$.

^{c,d}Means in columns followed by different subscripts are significantly different at $p < 0.05$.

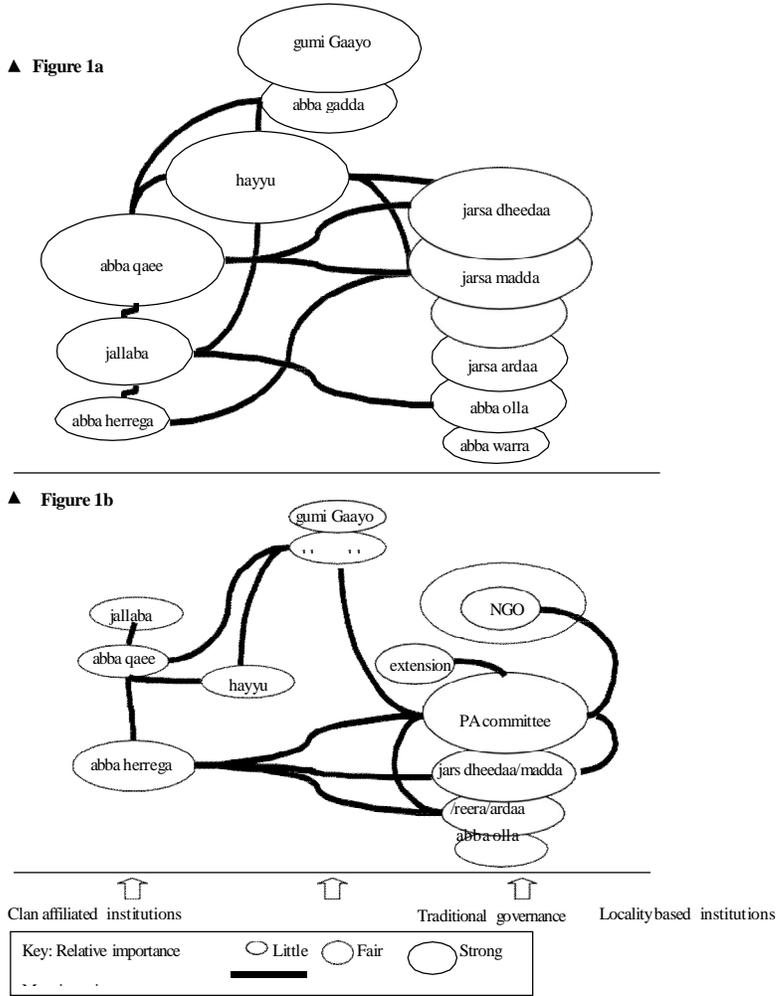


Figure 1. Venn Diagram on pastoralists' common perception about most relevant institutions for natural resource management at Web and Dida Hara; 1a: Set up of indigenous institutional 30 years ago, 1b: Current set up of indigenous institutional.

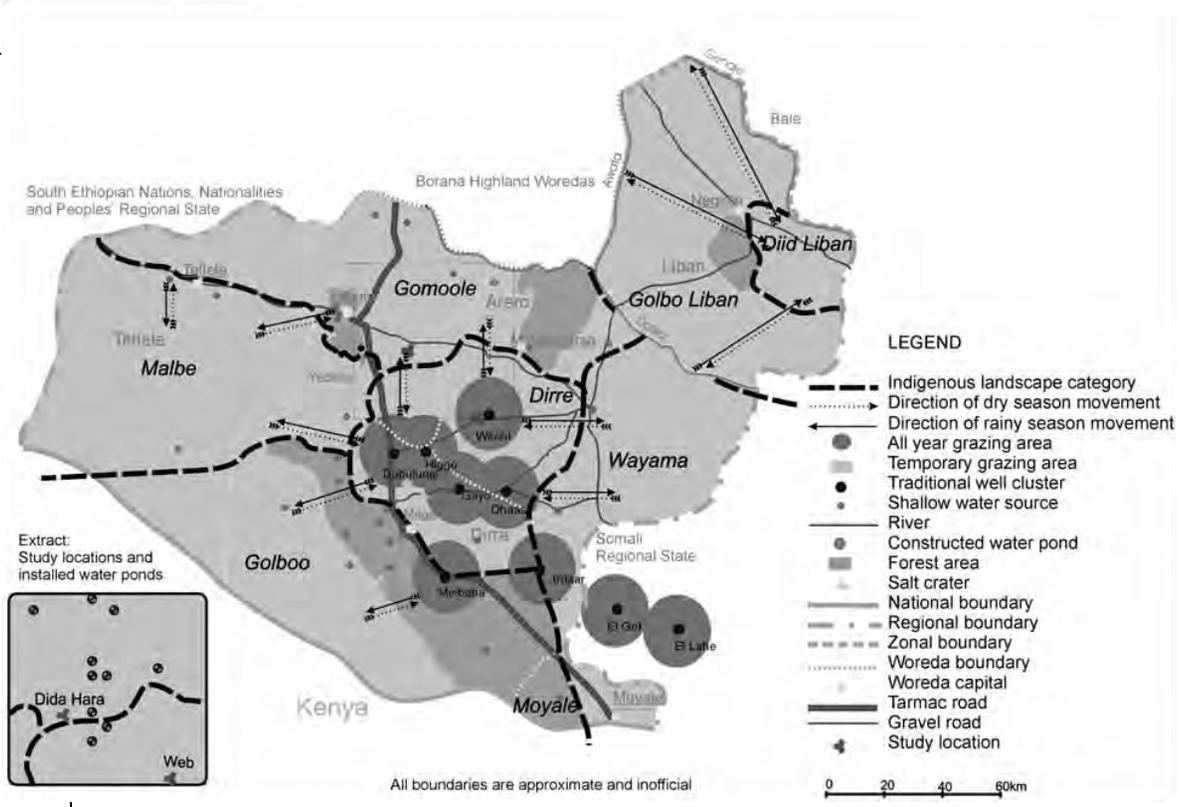


Figure 2. Indigenous land use patterns in Borana lowlands, southern Ethiopia.

Table 2. Frequency of households' standard of co-operation in herd management (%) in Dida Hara and Web, and significant differences, before and after the 1999/00 drought.

	Before drought			After drought		
	Dida Hara	Web	Significance	Dida Hara	Web	Significance
No group	22	3	p<0.01	74	38	p<0.05
Small group	55	21		19	41	
Large group	23	76		7	21	

Table 3. Frequency of occurrence and average body weights of adult Boran cattle in Dida Hara and Web, 2001/02

	Dida Hara				Web			
	Proportion (%)	Sample n	Body weight		Proportion (%)	Sample n	Body weight	
Type			Mean	se			Mean	se
<i>Qorti</i>	44.4	173	297.0 ^a	4.9	56.9	87	306.2 ^a	7.5
Intermediate	29.2	114	251.4 ^a	4.4	7.8	12	276.3 ^a	12.9
<i>Ayuna</i>	26.4	103	244.5 ^a	5.1	35.3	54	260.5 ^a	7.2
Total	100.0	390	269.7	3.1	100.0	153	287.7	5.3

^aMeans in rows followed by different subscripts are significantly different at p<0.05.

Table 4. Households' herd composition (% of head of species in the herd), before and after the 1999/2000 drought in Dida Hara and Web.

	Dida Hara			Web		
	Before drought	After drought	Difference (%)	Before drought	After drought	Difference (%)
Cattle	70	46	-24	64	65	1
Small ruminants	27	49	22	30	26	-4
Camel	3	5	2	6	9	3

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