FACTS Reports

Field Actions Science Reports
The journal of field actions

Vol. 3 | 2009
Vol. 3

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OpenEdition Journals

Electronic version
URL: http://journals.openedition.org/factsreports/279
ISSN: 1867-8521

Publisher
Institut Veolia

Electronic reference
H. M. Warui and M. Kshatriya, « Implications of community based management of woody vegetation around sedentarised pastoral areas in the arid northern Kenya », *Field Actions Science Reports* [Online], Vol. 3 | 2009, Online since 24 September 2010, connection on 01 May 2019. URL : http://journals.openedition.org/factsreports/279

Field Actions Science Report
www.factsreports.org

FACTS Reports

Implications of community based management of woody vegetation around sedentarised pastoral areas in the arid northern Kenya

H. M. Warui[1, 2], and M. Kshatriya[2]

[1]Kenya Agricultural Research Institute, National Arid Lands Research Centre,
P.O. Box 147 Marsabit, Kenya. hmwarui@hotmail.com
[2]The International Livestock Research Institute, P.O. Box 30709, Nairobi.

Abstract. This paper addresses effectiveness of Environmental Management Committees (EMCs) in managing woody resources in pastoral villages in northern Kenya. The effectiveness is assessed in the realm of participation in sustainable use of the vegetation, predicted based on gender of the resource users and extent of contact with development agents. Marsabit Development Programme (MDP) largely supported formation of EMCs, in Marsabit District of northern Kenya, where the study was carried out. Both social data based on a questionnaire survey and biological data on physical availability of vegetation on the ground were generated. Results of both data sets showed more sustainable harvesting practices of woody vegetation in villages that MDP had high presence. It is therefore concluded that MDP influenced woody resources utilization practices of the pastoralists in Marsabit district.

Keywords. Pastoralists, environment, degradation, participation, management, arid, Kenya

1 Introduction

This paper is about the effectiveness of Environmental Management Committees (EMCs) in managing woody resources in pastoral villages in northern Kenya. Haro et al. (1998 and 2005) studied the process of formation and functioning of EMCs as institutions through which community based management of natural resources in arid Northern Kenya operate. Haro found that EMCs were constrained in their effectiveness. The thesis of our study was that effectiveness of EMCs, and thus participation in sustainable use of the vegetation, can in fact be predicted based on gender of the resource users and extent of contact with development agents (for which proximity of resource users to the market centre is used as a proxy).

2 Context

Arid and semi-arid lands cover nearly two-thirds of the African continent, and a majority of African livestock are found in these dry zones (Behnke and Kerven, 1994; Ellis, 1994). In northern Kenya, semi-arid and arid lands constitute 60% of the country and are home to around one million pastoralists (Bruce and Mearns, 2001). Pastoralists are knowledgeable people with regard to range ecology, monitoring and management (Mapinduzi et al., 2003; Links, 2006; Okoti et al., 2006).

Correspondence to: Harun Maina Warui
(hmwarui@hotmail.com)

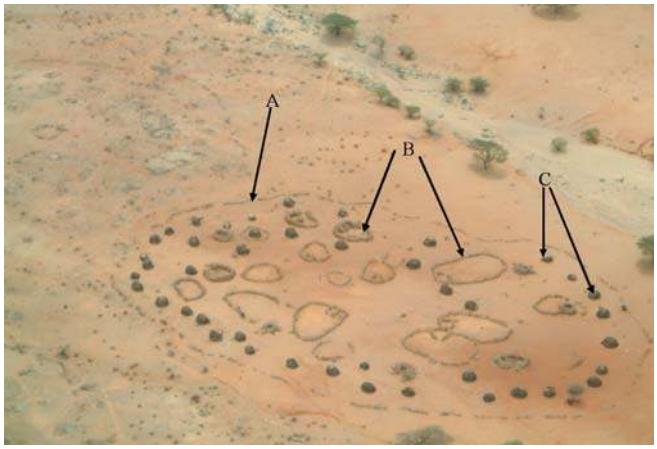

Figure 1. Aerial photograph of a village at Korr settlement: "A" represents boundary mark of the village using cuttings of tree branches, "B" the kraals, commonly used at night to house livestock and "C" the huts, which lie along the boundary of the settlement (approximately 32 huts in total) (photo by M. Kshatriya).

Traditionally, pastoralists in northern Kenya were totally nomadic. However, in the last three decades the trend has been a shift to a semi-nomadic lifestyle and construction of small villages that form settled areas in an approximately 25-km radius around market centers. This shift has caused environment degradation in the settled areas because of overharvesting trees and large shrubs (Lamprey and Yusuf, 1981; Lusigi, 1986;

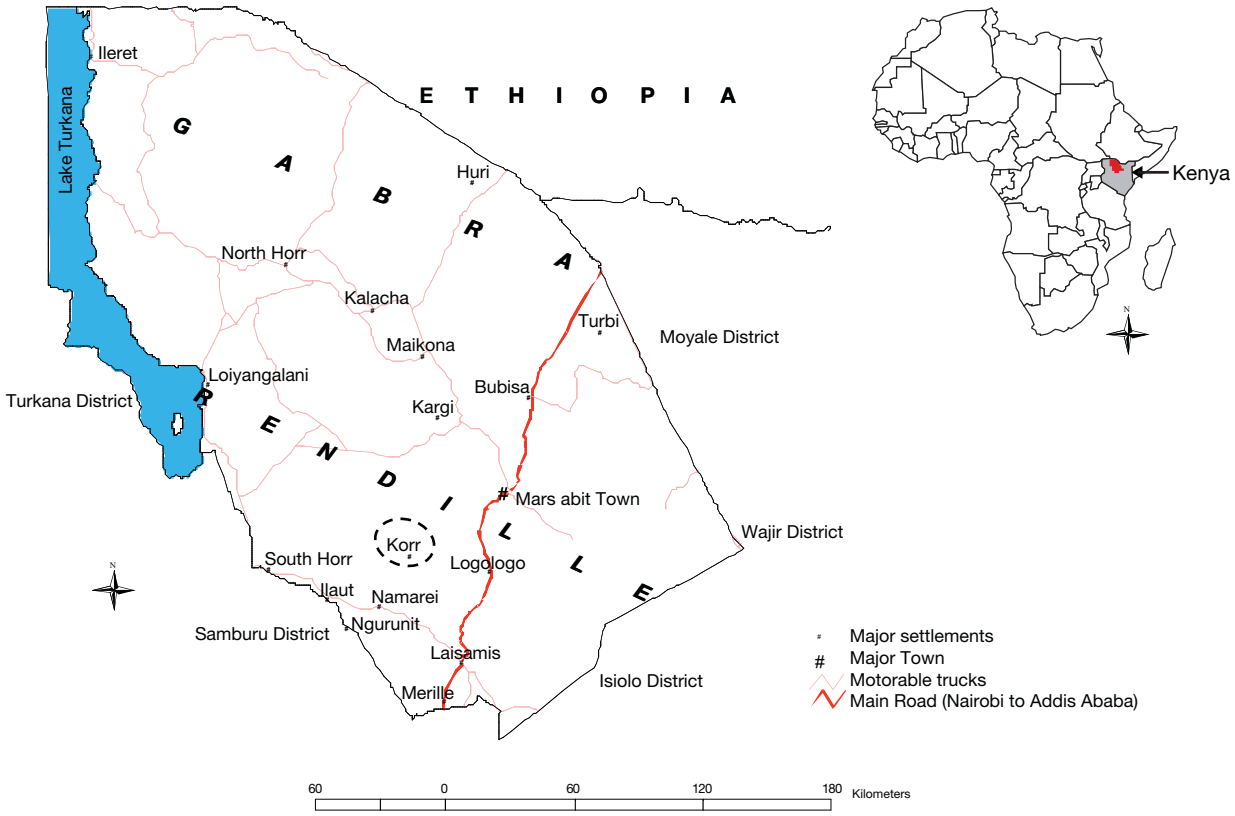

Figure 2. A map of Marsabit district

Wamugi, 1993; Haro et al. 1998). The pastoralists use a large amount of tree branch cuttings from thorny trees or shrubs to construct kraals (livestock enclosures) to protect livestock against predation by wild carnivores and keep them together at night (Lusigi, 1986). The kraals are shown in Figure 1, an aerial view of a typical village.

The high dependence on woody vegetation is compounded by the regular shifting of the villages within a localized area as a means of controlling accumulation of livestock pests, with new kraals constructed each time they migrate. The pastoralists tend to use cuttings from *Acacia spp*. more often than non-Acacia species, which Wamugi (1993) attributed to the following:

- Presence of stronger and well-placed thorns that protect livestock against predators and prevent the livestock from straying at night.
- Ready availability and wide distribution.
- Great ability than most other species to withstand harsh environments and resist termite attacks.

There are many species of acacias; however *Acacia tortilis* is the most important source of fodder among the pastoralists of Marsabit District[1]. Therefore it is better that they do not use it to build kraals.

This paper focuses on Marsabit District in northern Kenya (Fig.2), which is occupied by the Rendille ethnic group in the south and the Gabra ethnic group in the north, separated by the Chalbi Desert[2]. The German Technical Cooperation (GTZ) funded Marsabit Development Programme (MDP) has focused on conservation of *Acacia tortilis* in the settled areas of Rendille and Gabra territories.

MDP promoted sustainable management of the tree species under common use, through land care groups popularly known as Environmental Management Committees (EMCs). Their membership constitutes men, women, and youths.

Each EMC oversees use of natural resources at a so-called "neighbourhood," which typically includes a portion of one settled area and the pastoral hinterland where its residents graze their livestock. It typically covers about 500 km^2 with well defined geographical features, and includes about 5 to 10 villages. Within a settled area, the assignment of villages to neighbourhoods is usually determined based on the layout of available natural resources, particularly pasture land and water.

The conservation techniques recommended by MDP through the EMCs included several pieces of advice:

1. Don't cut all the branches off the trees; leave at least one. The practice is in line with Wamugi (1993) who showed that removing some branches encourages secondary growth of the plant and the sprouting twigs and

[1]See Duke (1983) for detail on the description, distribution and ecology of *Acacia tortilis*.

[2]In this paper we use the terms "Rendille territory" and "Gabra territory" to refer to the parts of Marsabit District occupied by the corresponding ethnic groups.

leaves, which provide valuable sources of forage for livestock. On the other hand, when most of tree's branches are harvested, the death of some of these trees is inevitable as they do not have the ability to coppice (regenerate from stumps).

2. Don't cut down the whole tree, just take branches.
3. Don't use *A. tortilis* if you have a choice.

3 The experience of the EMCs and thesis of the study

Haro et al. (1998 and 2005) have done a lot of work on the EMCs. Their research provide us with context that is important to understand before we get on to the contribution of this paper.

According to Haro et al. (1998), pastoralists within a neighbourhood are in a position to undertake the following:

- Coordinate annual grazing patterns.
- Develop area-specific resource management plans.
- Select village members deemed best to represent their interests.
- Set aside an area as dry season pasture reserve.
- Close an area for rehabilitation by enforcing by-laws.

Haro et al. (2005) described the process that MDP followed in establishing EMCs. To begin with, MDP discussed useful resource use practices with village elders and other community leaders (such as councilors). It was expected that the leaders would explain the importance of these practices to their community members. This would have led to local residents defining action plans to implement environmental management programmes in their neighbourhoods. However, the leaders were unable to fit into intricacies of community decision-making authority. The imposed resource management regimes tended to ignite resource use conflicts rather than being a measure to address land degradation. Moreover, the neighbourhood leaders were unable to implement the action plans due to:

- Lack of wide acceptance of legitimacy of the EMCs, because there was no cultural precedent for such rule-making and enforcement.
- By-laws initiated in specific neighbourhoods not being observed by pastoralists from other neighbourhoods under the shared use arrangements of the resources (ownership of resources within a neighbourhood does not exclude user rights of non-members).

In view of the above, MDP facilitated further deliberations within the neighborhoods on how to improve existing local resource management structures through a consultative process on sustainable use of common resources. Participants expressed the need to support EMCs that have a defined mandate and that also raise environmental awareness of resource users in all neighbourhoods. In a series of participatory management workshops held at the neighbourhood level, MDP staff facilitated drafting of natural resource management by-laws and protocol for members of the EMCs. (For details see Haro et al., 1998). A follow-up by MDP on the operation of EMCs after a three year period revealed some constraints regarding their operation (Haro et al., 2005), including:

- Confusion over the mandate of the EMCs due to the overlapping nature of the resource use patterns for traditional definitions of neighbourhoods.
- Poor integration between EMCs in different neighbourhoods, with rules set by the groups not being necessarily the same.
- Apprehension about sanctioning members of one's own neighbourhood group.
- Lack of "tangible" incentives (e.g. meeting or duty allowances) for the members of the committees.
- Legal status of the EMCs was unclear.

In order to harmonise resource management protocols in different neighbourhoods, MDP convened a workshop with representatives of EMCs and other key leaders. Participants agreed upon harmonization of natural resource management protocol, detailing the procedures and penalties (Haro et al., 2005).

This study uses mainly descriptive statistics to try to explain when the EMCs were effective and when they were not. The theses of the study was that first, participation in sustainable use of the vegetation, which EMCs oversee, varies with gender and extent of contact between resource users and development agents. Some villages were more frequently visited than others, especially by MDP staff. These were considered in the present study as "highly-targeted" villages. The ones less visited were considered "low-targeted." Our thesis, therefore, is that highly-targeted villages will show more sustainable resource use than low targeted villages. Second, there might be a gender difference in adoption of the recommendations of the MDP.

4 Materials and methods

4.1 Study area

The study was carried out in Korr settlement and its environs in Rendille territory of Marsabit district (Fig. 2). Most pastoralists are nomadic, with some household members living permanently in villages located close to market centres and water points. A village includes up to seventy households. Villages that share the same water points and livestock pastures constitute a neighborhood.

4.2 Data collection and operationalization of variables

We took two approaches to the study, one social and the other biological. The social component involved use of a structured survey of 180 Rendille pastoralists randomly selected from 42 villages. We measured the sustainability of pastoralists' branch harvesting practices by presenting them with three statements to which they responded on a five-point scale from strongly disagree to strongly agree. These were:

Table 1. Levels of participation in sustainable resource use

Sustainability of harvesting	Score range	Full sample		Highly-targeted		Low-targeted	
		Number	%	Number	%	Number	%
Very low	1-2	0	0	0	0	0	
Low	2-3	35	19	2	7	33	21
Moderate	3-4	84	46	8	30	76	50
High	4-5	62	35	17	63	44	29
Total		180	100	27	100	153	100

Table 2. Level of participation in sustainable resource use disaggregated by gender

Gender (n)	Village class	N	Sustainability of harvesting practices; number and percent of total		
			Low	Moderate	High
Male (103)	Highly-targeted	15	1 (7%)	6 (40%)	8 (53%)
	Low-targeted	88	20 (23%)	43 (49%)	25 (28%)
Female (75)	Highly-targeted	10	1 (10%)	2 (20%)	7 (70%)
	Low-targeted	65	13 (20%)	33 (51%)	19 (29%)

1. I mostly rely on tree species that are valued for other uses, especially those that are source of fodder for the livestock.

2. I leave at least one branch on a tree when harvesting.

3. I remove the entire tree, leaving only the trunk (tree stump) when harvesting.

We adjusted and averaged the three values provided (flipping responses for questions 1 and 3 so that "5" is always a sustainable response), to calculate a composite measure of reported harvesting practices for each respondent.

The biological portion of the study was based on physical data on availability of vegetation on the ground, measured in quadrants established along a transect. This is a widely used method to determine the distribution and abundance of trees and shrubs (Krebs, 1999). We established geo-referenced plots (quadrants) measuring 120 x 90 m^2 on the transects at intervals of about 200m. The length of each transect was dependent on how far villagers go to collect resources. We established five transects; two in the sites utilized by the highly-targeted villages and three in the sites accessed by the low-targeted ones. In each of the plots, *Acacia tortilis* trees were enumerated in three age classes (saplings, young trees and mature trees), determined on the basis of basal diameters. The basal diameter of the saplings was ≤ 10cm, young trees between 10cm and 30cm, and mature ones greater than 30cm. In each age class, counts were taken for unharvested plants, plants with at least one branch remaining after harvesting, and plants with only a stump left.

The biological measure of *Acacia tortilis* harvesting in each plot was computed as a ratio of the number of *A. tortilis* tree stumps to the total number of trees (stumps plus existing trees in all three age classes) originally in the plot (referred to hereinafter as "tree stump ratio"). The one-branch tree ratio was also computed.

4.3 Data analysis

We employed descriptive statistics in the form of frequencies and percentages in the analysis. For the questionnaire data, we sought to answer several questions. First, how does the composite measure of reported harvesting practices differ between respondents in highly/targeted and low/targeted villages? Second, how does it vary between the genders of the respondents?

For the biological data, we determined tree stump ratio and one-branch ratio by village class (highly-targeted and low-targeted villages).

After preliminary data analysis, we presented the results of the study to the livestock keepers in feedback seminars held at the villages.

5.0 Results and discussion

As shown in Table 1, a majority of the respondents (46%) scored moderate on the composite indicator of sustainable harvesting practices. However, a majority of the respondents (63%) from the highly-targeted villages scored high suggesting a higher influence of MDP presence in the highly targeted villages.

As Table 2 shows, female resource users harvest trees more sustainability than males. During the feedback seminars, villagers explained that women are mainly responsible for the repair of kraals, which requires relatively little woody material. On the other hand, the initial construction of kraals, which requires a large quantity of woody material, is a male responsibility. Moreover, establishment of the fences that offer adequate protection of livestock from the predators requires thorny branches that are mainly available from the *Acacia spp*. These can explain the overall lower sustainability of males' harvesting practices, when compared to females.

The results in Table 3, from the biological data, show higher one-branch ratios in highly-targeted village transects than

Table 3. Condition of the trees by the type of village class, length of transects (meters) and number of quadrants

Transect	Village class	Length of transect	Number of quadrants (m)	Mean-average tree ratio		
				Unharvested	One-branch	Stump
1	High	1836	9	0.268	0.616	0.116
2	High	1032	7	0.309	0.562	0.129
3	Low	1234	7	0.493	0.358	0.149
4	Low	388	3	0.921	0.079	
5	Low	189	2	1.000		

Table 4. Males' tendency to cut whole tree in highly and low-targeted villages

Sustainability of harvesting practices	Score range	Highly-targeted		Low-targeted	
		n	percent	n	percent
Very low	1-2	0		0	
Low	2-3	0		18	20
Moderate	3 - 4	5	30	46	50
High	4 – 5	10	70	24	30
Total		15		88	

those in the ones in sites accessed by residents of the low-targeted villages. The observation may be attributed to women in highly-targeted villages repairing their kraals using more inferior species, than their counterparts in low-targeted villages; though the survey data do not confirm this. We observed higher tree-stump ratios in low-targeted village transects than in highly-targeted village ones (Table 3). These results suggest that MDP presence has an impact on behavior of the resource users. Thus, in highly targeted villages there was a tendency towards more sustainable harvesting. This could be attributed to the EMCs having an impact where there was close support from MDP.

To shed more light on the above observations, we looked specifically at male responses to question 3 on the questionnaire survey, whether they tend to cut down whole trees, and whether that differs between highly-and low-targeted villages (Table 4). Men show more sustainable scores on the full tree cutting question from the questionnaire when they are in highly-targeted villages.

This means that males in the highly-targeted villages are using more of the alternative inferior trees than the *A. tortilis* to build kraals, as per EMC instructions. This was explained by the resource users during the feedback seminars. However, they observed that some of these species like *Solanum arundo* when old do not make a strong and intact fence.

The different results presented in this paper support the conclusion that MDP, influenced woody resources use practices of the pastoralists in Marsabit district. However, one caution on this conclusion is that the highly-targeted villages are typically those that are closer to market centers. Therefore, with the highly-targeted villages consistently performing better on sustainability than low-targeted villages, this could in fact be due to the proximity to the market centers, and not to the targeting by development agencies. Occurrence of this limitation to monitoring and impact assessment of projects can be circumvented by agencies ensuring that all their working entities (e.g. the villages) receive the same level of attention.

Acknowledgements: The authors are very thankful to the chief-editor and one of the reviewers of the FACTS Reports for their valuable review comments of the manuscripts. The study received financial support from the European Union funded Agricultural Research Support Programme (ARSP) of the Kenya Agricultural Research Institute (KARI). The study was carried out when the principal author was a research fellow at the People Livestock and Environment (PLE) Programme of International Livestock Research Institute (ILRI). Both organisations are greatly acknowledged. Immense work undertaken by Messrs Paul Leparnati and Fabiano Wambille of data collection is acknowledged. The Rendille pastoralists are equally thanked for their cooperation in providing the required information during the field work.

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Annex

Woody species relied for materials of kraal construction in the Rendille area

Local name	Scientific name	Description of use
Hagar	*Commiphora pseudopaoli*	Pastoralists mainly utilise it in the construction of the village periphery fence. It is a taboo for some of Rendille clans to either use the species in making of livestock kraals within the village or its dry wood for fuel. It is believed that putting it in these uses can lead to poverty. Those who culturally use the species, utilize it in making cattle's kraals only, and not for camels or sheep and goats. It has relatively strong thorns that accords a good in preventive fence against livestock leaving the kraal and at the same time keeping off the predators.
Ramo	*Commiphora spp.*	The species provide a strong fence, which coupled by the species' strong and sharp thorns make it hard for hyenas and lions to break through. When branch cuttings of the "ramo" are available in plenty, they can be used alone, with no supplementary materials from other species. The species is not used along the entrance of the enclosure to avoid the threat of the thorns piercing human beings and livestock. It roots easily through vegetative propagation. This reduces the need of continuous repair of kraals. It is easy to drug its branch cuttings from harvesting areas.
Galdayan	*Commiphora spp*	It provides very strong fencing materials. Old branch materials can be re-used to construct kraals in newly migrated sites. The smell from the species keeps off the camel fly. Therefore, when used in the construction of camel kraals it helps in controlling the parasites.
Andiakha	*Euphorbia cuneata*	It has very softwood that rots easily. The branches when used in kraal construction break easily. It is only used in the reinforcement of kraals made with branch cuttings from other species. It is not readily available in most of the areas.
Bilhil	*Acacia mellifera*	It has strong wood and does not rot easily. Its branches are also good for use along the entrance of the livestock kraal. The old branches that have been used for kraal construction can also be re-used in making other kraals. It is easy to drag harvested species' materials.
Dahar	*Acacia tortilis*	It provides strong fencing materials, but it is under controlled use. It is readily available in most of the areas. In most of the villages, harvesting of the species is only permitted in places where there are plenty young ones ("dahar gap"). Branch cuttings of *A. tortilis* are mainly used in construction of "naabo" (shrine). "Naabo" can also be made using branches from: – *Acacia mellifera* – *Acacia reficiens* – *Cordia sinensis*
Sikawai	*Solanum arundo*	The species grows in plenty along river valley. It has hooked thorns and branches that are highly intertwined. Thus, its branch cuttings offers a good protection against predators and prevents livestock from getting out of the kraal.
Hooliya	*Acacia nubica*	It provides relatively good fencing materials, but donkeys feed on its dry twigs.
Bubunto	*Delonix elata*	The species mainly provides rafters for constructing pens for kids and lambs. It is also a source of fodder for the sheep and goats