

Topic 3: The contribution of plantation and agroforestry to rural livelihoods

Trees as key to pastoralist risk management in semi-arid landscapes in Shinyanga, Tanzania and Turkana, Kenya

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SUMMARY

In both Shinyanga, Tanzania and Turkana, Kenya, woodlands have been degraded over time, due to agricultural expansion, clearing to eradicate tsetse fly, famine camps, and past policy failures. This study analyzes the reasons for degradation, and examines what the key factors are which led to successful restoration of woodlands in both Shinyanga and Turkana. The study covers approximately fifteen years of restoration work, and is based on past and on going work, combined with action research. Basing the restoration on clearly identified local needs for tree products, and reviving and recognizing local institutional arrangements for natural resource management has been key to success. Turkana pastoralists in northern Kenya, and Sukuma agro pastoralists in Shinyanga, Tanzania, show how important trees are as components of natural resource and risk management in dry, risk-prone environments. The Turkana demonstrated that they can restore and manage forests to provide vital dry season and drought time food and fodder as a key component of land and risk management. Using traditional institutions and management systems, the people restored over 30,000 Ha. of Acacia woodland. In Shinyanga, the Sukuma revitalized the institution of *Ngitili*, or enclosure, and broadened its usage to include a wide range of woodland goods and services. Over 15 years, approximately 250,000 Ha were restored. External support was small and sensitively applied to foster local ownership. One crucial element of this, is the safety net functions that the restored forests fulfill during dry seasons, and drought times. As a result, risk is mitigated, and livelihoods can be better secured and improved.

BACKGROUND - A PAST HISTORY OF DEGRADATION AND LACK OF ACKNOWLEDGEMENT OF IMPORTANCE OF LOCAL NATURAL RESOURCE MANAGEMENT

Both the Sukuma and Turkana have customary mechanisms for conserving important areas of woodland as a source of multiple products for livestock and people, especially during dry and drought times. Traditional knowledge about natural resource management is an important basis for improving land use (Barrow et al. 1992; Dery et al. 1999). Farmers, through years of traditional experimentation, have developed strategies to cope with environmental and production problems (Otsyina et al. 1993). "*Ngitili*", or enclosure, in Shinyanga involves the conservation of range lands for use in the dry seasons. *Ngitili* developed in response to acute fodder shortages due to droughts, diminishing grazing land due to increased cropping, rapidly declining land productivity, and shortages of herding labour (Kilahama 1994; Maro 1997; Otsyina et al. 1993). While the Turkana have well-developed means of coping with dry and drought times through the setting aside of reserved grazing areas (*Amaire*), and family owned areas of important trees (*Ekwar*) (Barrow 1990). These traditional mechanisms are important for the management of natural resources, but have been, until recently, ignored as tools for development and change. As a result the degradation that has taken place has been mainly due to external changes and interventions.

Shinyanga region was extensively forested (Malcolm 1953), varying from Miombo woodland to Acacia bushland in the drier areas. Forest and woodland degradation in Shinyanga region has been caused by the clearing of forests to eradicate tsetse flies, over-grazing, uncontrolled bush fires, clearing of land for agricultural expansion and increased wood demand, in particular for fuel (Barrow et al. 1988):

Eradicating Tsetse Fly: Between 1925 and about 1947 major efforts were made to clear forests in unreserved land to eradicate tsetse flies. However, from the early 1980s, complete clearing of forests was stopped. Currently, selective felling of some trees and shrubs is practised (Ministry of Agriculture and Livestock 1997).

Cash Crop Expansion: In the early 1900's, agricultural production in Shinyanga region was confined to subsistence crops like sorghum and millet. By the early 1940s, large scale cultivation of cotton and tobacco had been introduced, accompanied by extensive clearing of forests, which has been the major source of deforestation in Shinyanga region (Kaale & Gillusson 1985; Kikula 1986; Maro 1997).

Declining Soil Fertility: Over 90% of the Shinyanga population depend on agriculture, but the area of arable land is declining due to soil erosion, loss of soil fertility, combined with poor agriculture and livestock practice. This combination of declining arable land and expanding demand for agriculture and livestock land is exacerbating the existing problem of land and natural resource degradation, leading to desertification (Kerario & Nanai 1995).

Livestock "Problem" exacerbated: The livestock dilemma presents a special problem. Livestock have a vital social and production role in Sukuma society, as well as providing insurance against periods of hardship. Yet the land is generally overstocked, and the conversion of grazing lands to land for cultivation (Barrow et al. 1992). The net result is a much reduced grass and herb cover, an increased dominance

of unpalatable species, a further loss of important browse species as they can no longer regenerate easily, and an overall loss of soil quality (Africare 1999; Vice Presidents Office 1997; Kerario & Nanai 1995).

Political Effects – Villagization: Under traditional systems, the ownership, management and land tenure rights of *Ngitilis* and land in Shinyanga were governed under local by-laws. After independence, the "Ujamaa" Villagization Act (1975) was introduced, and involved the relocation of farmers from traditional villages to newly created settlements to facilitate the provision of social services. In the process, the main household assets including houses, farms and *ngitilis* were often abandoned (Otsyina et al. 1993). The effects of villagization were exacerbated by population increases of both people and livestock. The new village pattern, although administratively advantageous, has made traditional adaptation to local ecological conditions more difficult where new villages were poorly sited and large in size. This has led to the break-down of some traditional soil conservation practises (Barrow et al. 1988).

Wood demand: The above factors, combined with population growth, have led to wood demand exceeding supply, resulting in accelerated rates of deforestation. Due to the scarcity of woodfuel, people travel long distances (over 10 km) to fetch fuelwood. Many women in Shinyanga increasingly use twigs, stalks and animal manure instead (Ministry of Community Development 1996). The contribution of woodlands and grasslands to human nutrition through the supply of fruits, nuts, leaves, berries and habitats for edible caterpillars and birds have declined drastically, thereby reducing peoples' coping strategies and putting them at further risk.

The destruction of forests and woodlands in the Lorugum area of Turkana took place during the drought years of the early 1960's (Table 1). The surrounding vegetation was destroyed to provide fuel for cooking, and for the construction of houses, and people were forced to over-use the natural resources.

As the area is an important water point, which is one of the reasons for locating the camp there, the arrival of drought-affected-people resulted in a near total clearing of the vegetation. Trees were felled and used with little thought for sustainable use, resulting in a rapid reduction in the trees and shrubs in the area. Trees were used for various reasons including for the provision of:

- Fuelwood in the camps, and large areas of Acacia woodland were cleared to provide fuel;
- Poles and timber for building houses, stores etc.;
- Branches of Acacia trees for livestock enclosures; and
- Fodder for the gradually increasing number of goats and sheep which the pastoralists started to accumulate. The branches of *Acacia tortilis* were cut for fodder, and the pods and leaves were shaken loose, using a longed hooked stick (or *Ereges* (Barrow & Ekarani 2002).

Table 1. A Historical Time Line of Degradation and Restoration Around Lorugum, Turkana

Date	Event
1962	Severe drought resulted in famine, and many people and livestock died.
1963	The first big feeding camp was moved to Logogo, 7 km from Lorugum. This camp was then moved to Nangor'dengo 3 km away from Lorugum.
1963	Chief Imana Amanikor and Lochocho Lochikume were introduced to the area, and they cautioned people against woodland destruction using the administration rules and regulations.
1964	Thomas E. Nachuch became Chief, and continued with similar conservation activities.
1964 - 1966	An irrigation scheme at Turkwel was started, which was close to Lorugum, and many pastoralists moved there. This increased population exerted further pressure on the vegetation as land was cleared for cultivation.
1981	Chief Musa Ngitieng was appointed Chief of Turkwel division. This was when the restoration of trees began. There was collaboration with the Forestry Department, together with the elders of the area to promote conservation and restoration.
1984	The President visited Turkana, and issued a directive prohibiting the indiscriminate felling of trees and charcoal production in the district. This helped Chief Musa Ngitieng and the elders of Lorugum focus on restoration.
1985 - 1989	The Forest Department carried out many forestry extension activities with support from the Turkana Rural Development Programme (NORAD funded). The Chiefs, Elders, Women groups and the schools were major target groups. Divisional level extension programmes for Chiefs and the elders started. As a result a draft Turkana District Forest Management Policy was produced, which provided additional support, as well as emphasizing the use of important traditional rules and regulations. This further helped the conservation effort because these guidelines were adapted by Chief Musa Ngitieng, for use in the area.
1990	Since 1990 Chief Musa used this draft policy as one basis for the restoration and management of the woodlands and natural resources in the Lorugum area, together with the elders. This was based on traditional rules, combined with the Chief's Act.
1997 - present	Chief Musa Ngitieng retired, and Chief Philip Arumait became the chief of Lorugum area. The area is still under the same conservation policies. The elders and the chief continue to be active in conservation.

Sources: (Barrow & Ekanan 2002)

This paper explores the key factors that have helped the Sukuma of Tanzania, and the Turkana of Kenya to restore large areas of woodlands, through natural regeneration and enrichment planting in such degraded landscapes. From both livelihood security and conservation perspectives, we analyze why the tree and woodland restoration has been so successful amongst these two groups of people in terms of, for example, why the people invested so much of their time in restoration, what changes took place to initiate and sustain the process, and to see how livelihood security has been improved, in a manner that also improves, or at least sustains biodiversity conservation? Shinyanga and Turkana were selected because of their differences (e.g. agro-pastoral vs. pastoralist, high vs. low land use pressures, and a lot of degradation vs relatively little), and their similarities (e.g. a detailed knowledge base about the importance of their natural resources, strong local institutional arrangements for natural resource management, and the importance of trees and tree products to their livelihoods). For this paper, forest landscape restoration refers to a planned process to regain ecological

integrity, restore forest functions, and enhance human well being in deforested or degraded forest landscapes (Maginnis & Jackson 2002 in prep).

INTRODUCTION TO THE CASE STUDY SITES

Shinyanga region, in north-west Tanzania, is divided into 6 districts, and 833 villages. The pre-dominantly semi-arid Shinyanga region has nearly 2 million people. The high population density of 42 people per km², combined with an expansive agro-pastoral land use system, and subsistence and cash cropping has exacerbated an already serious problem of clearing land for cultivation. Land clearing started in the colonial era to eradicate the tsetse fly, and has been perpetuated to increase agricultural productivity, by increasing the area under cultivation, especially for cotton and rice production.

The Sukuma people are agropastoralists, and their major crops include, maize, sorghum, millet, cassava, cotton and rice. Over 80% of the population own and manage livestock on communal rangelands (Hendy 1980). Higher livestock densities, and the expansion of cash crop cultivation have resulted in acute fodder shortages especially during the long dry seasons (Otsyina et al. 1993; Skerman 1968), as the grazing lands are being converted for cultivation, while livestock numbers remained the same, or increased.

Turkana is a semi-arid and arid district in Northern Kenya, with a population of about 225,000 people, and a low and highly variable rainfall, varying from 150 to 200 mm in the dry central areas to over 400mm in the south (Ecosystems 1985). There are numerous ephemeral streams, though the Turkwell and Kerio are the two most important rivers. The riverine vegetation plays a vital role for the Turkana who use and manage the trees in a silvopastoral system.

For the Turkana pastoralists, livestock (particularly cattle) are grazed in the lowlands after the rains to make best use of the annual flush of grass. Then the stock gradually move to the west, and to the hills to make use of the dry season grazing areas. The vegetation has come under increasing pressure due to population growth, urbanization and sedentarization, for instance the fish camps along Lake Turkana, relief camps set up as a consequence of droughts and famine, and, more recently, the refugee influx to the district from Sudan. The Lorugum area, to the west of Turkana district on the plains, was the site of a major famine relief camp in the 1960's (Table 1). This caused a lot of environmental degradation and affected an area in excess of 300 km².

For pastoralists and agro-pastoralists, trees play a vital role. They provide important browse for livestock, fruit and foods for people, medicines for both people and livestock, as well as wood based products, and their importance culturally (Barrow 1996). Critically they are a vital safety net in dry and drought times. As a result customary institutional and management arrangements exist to manage, conserve and use such resources. Unfortunately such systems have not always been able to cope with external pressures, nor have they received the understanding deserved by development planners and governments.

ROLE OF TREES IN LIVELIHOODS AND RISK MANAGEMENT

A brief understanding of the role of trees in the rural livelihood strategies of the two groups is required, as this provides the context for the success of restoration, and relates to how important tree and tree products are in terms of local natural resource management, which is the underlying reason for the restoration.

Shinyanga

In Shinyanga, there is considerable and detailed local knowledge relating to the values and uses of different tree species. Where this knowledge is still strong such trees are often not cut, in terms of customary management. However much of the tree and woodland degradation that has taken place has been due to external interventions, which did not take into account the detailed local knowledge base. This combined with a reserved grazing tradition provided great potential for building on local knowledge to restore woodlands. Of particular importance is the Sukuma practice of making "*Ngitili*" grazing and fodder reserves. This practice is known all over the region, and is culturally well established (Barrow et al. 1992).

"*Ngitili*" is an indigenous natural resource management system that involves the conservation of fallow and range lands by encouraging vegetation regeneration through controlled livestock grazing during the wet season for use in dry times. *Ngitili* was a well known and practised management system until the 1960's, when the combination of factors described in Section 1 led to the demise and degradation of *ngitili*, until the mid 1980's.

There are two types of *ngitili* reserves made namely family or individual reserves, and communal reserves. Family reserves are made on an individual's own land in fallow. Such *ngitilis* are preferred for calf grazing during the wet season (Brandstrom 1985; Malcolm 1953). Communal reserves can be made on any land suitable for dry season grazing. The opening of the *Ngitili* is done in sections, one section being completely grazed before the next is opened. The underlying idea is to maintain an area of standing hay until the next rains (Barrow et al. 1992). Communal *ngitili* are found along river beds and hill areas.

The people have traditional rules for protecting individual and communal *ngitilis* using traditional guards known as "*Sungusungu*", and traditional community assemblies known as "*Dagashida*". The majority of the Sukuma people adhere to these traditional rules, and this has contributed to the successful management and restoration of *Ngitilis* (Barrow et al. 1992; Kilahama 1994; Maro 1995).

Turkana

The people of Turkana have evolved sound ecological strategies enabling them to utilise the vegetation on a sustainable basis through exploiting different economic niches (grazers, including cattle, sheep and donkeys, and browsers including camels and goats), as well as diversified food procurement strategies (Brainard 1981). The Turkana silvo-pastoral system makes best use of the vegetation through a transhumant system of wet and dry season grazing combined with the setting aside of specific dry season grazing reserves (*Epaka* or *Amaire*, (Barrow 1996). Like the Sukuma of

Shinyanga local knowledge and institutional arrangements were not seen as important in terms of development and change, and so broadly ignored until the 1980's. In addition, little account was taken of the ecological consequences of refugee camp siting.

The Turkana, especially the women, have a well-developed traditional knowledge of the local flora and their uses (Morgan 1980). Trees, in particular, are vital as they provide fuelwood, building timber and household utensils. Certain important trees are protected by custom (Barrow 1996). In the long dry season they cut small branches to feed livestock and collect pods and fruits of certain trees (for example, *Acacia tortilis*) for fodder and food. The Turkana also use tree products for medicines, some of which have important clinical properties (Lindsay & Hepper 1978).

To manage their wet, dry and drought time grazing areas, the Turkana have a number of institutions for natural resource management, which, with their accompanying rules and regulations, are under the control of the Turkana elders, and, in some cases the women. Two of these institutions are important for this study, namely “*Amaire*” and “*Ekwar*” (Barrow 1996).

The Turkana make optimal use of the sparse vegetation by moving livestock between wet and dry season grazing, and by setting aside specific dry season grazing reserves called *amaire*. In addition, they have developed the management of their trees further, especially in the drier parts where the vegetation resource is more critical. The herd owner may own areas of important trees (*Ekwar* pl. *Ngikwarin*, which literally means the trees on the side of the river), dry season wells and sorghum gardens. These resources are owned by the herd owner and his close family relatives. Outsiders will not be allowed to use them without permission. In the dry season, it is often access to fruit and fodder trees that restricts movement. So in the dry season the livestock and herd owner will be found in his “*Ekwar*” unless all the stock have to go to the wetter hill areas in the west (Barrow 1996). Families have sub divided portions of forests along the riverine woodlands in the Loruugum area as their *Ekwar*s. Though the pasture is communally owned, trees existing in the *Ekwar* are protected by individuals or families. The Chiefs and the elders ensure that this practice worked, through the use of traditional rules.

RESTORING WOODLANDS AND TREES TO MEET CONTEMPORARY NEEDS

Shinyanga

With a still strong memory of the *ngitili* system together with some remaining *ngitili*, this provided the basis for HASHI, a Government implemented soil conservation project in Shinyanga region behind the forest restoration effort, to work with *in situ* conservation in the region. The Sukuma people had already suggested that restoring *ngitili* was an easier and better option than planting trees, many of which were exotic, and not of the people's choice anyway. The ingredients of a successful restoration effort had now come together, namely the identified:

- Local need for restoration to supply much needed goods and services;
- Desire by the people to invest in restoration;

- Presence of already existing management institutions; and
- Activities of HASHI to catalyze this through extension, training and technical advice.

As a result the number and area of *ngitili* has increased dramatically since 1986, at which time there were about 600Ha of *ngitili*, to the present where there are over 250,000 Ha of *ngitili*. To intensify the contribution of *Ngitili* to the improvement of livelihood, the original objectives of *Ngitili* were expanded to cover other tree products and services required by people while retaining the original objective of providing fodder for the dry season. Currently, traditional and scientific experiences are shared in the management of *Ngitili* to facilitate the restoration of forests and improvement of community livelihood (Barrow et al. 1988; Kaale et al. 2002).

In 1998, Tanzania approved its revised forest policy, which places strong emphasis on participatory management and decentralization. This further supports the restoration of *Ngitili*. The principles of multiple-use forests has been adopted, where biodiversity conservation and management guidelines are incorporated in management plans. Local communities are encouraged to participate in the management of forests through collaborative and community based forest management. Villagers and communities are supported to select, and set aside degraded and village forested areas to be conserved and managed as village forests (Barrow et al. 2002).

Surveys of village boundaries have been made to help villages obtain village title deeds, and individual title deeds within village land. This helps secure village and farm lands, and is an incentive for future improvement. The National Land Policy of 1997, the Land Act of 1999 and Village Act of 1999 have actively supported the formal establishment of *Ngitili*. Lastly, village governments are increasingly empowered to enact village by-laws to protect their *Ngitilis*, using traditional rules and village guards (*sungusungu* or *wasalama*).

New *Ngitilis* are normally established on degraded croplands and rangelands, but site selection is influenced by land availability, proximity to homesteads, production potential, and the ease of protection. Potential sites are demarcated in the wet season and protected from animals. The initial siting is the responsibility of the family heads in the case of private *Ngitilis*, and a group of elders for communal *ngitili* (Otsyina et al. 1993).

The gradual breakdown of "Ujamaa" (villagisation), and influence of *in-situ* conservation practices by HASHI, resulted in farmers reclaiming previously owned *ngitilis*, while others established new ones especially on private land. But only 35% of the owners said they have enough land to expand existing *ngitilis*. Individual or private *ngitilis* are located around the homestead (51.6% of respondents), along low-lying river ways (23%) and on farmlands (14%) (Otsyina et al. 1993).

Between 1980 and 2001 a total of 18,039 individuals, 172 villages, 19 institutions, 22 groups and 71 schools conserved *ngitilis* with a total area of 78,122 ha in a sample of 172 out of the 833 villages in the region (Table 2). The average *Ngitili* size is 2.2 ha, but range from 0.1 ha – 215 ha. Communal village *Ngitilis* account for 50% of the total *Ngitili* area conserved in the region while individual household *Ngitilis* account for 47%. *Ngitili* are equally widespread in all villages and districts, and most

respondents (90%) have access to individual or communal reserves. Based on this, it is estimated that over 250,000 ha of *Ngitili* has been restored throughout the 833 villages in the region. Only 9% do not own or have access to *Ngitili* now (Otsyina et al. 1993).

The number and area of *ngitili* restored since 1986 demonstrates the resurgence of a traditional natural resource management systems to meet contemporary needs. Need has driven the restoration - need for dry season grazing, timber and now wood forest products. HASHI, as a project, was in the right place, at the right time, and with the right approach and attitude to help translate this need into the present day reality of a locally owned Sukuma restored landscape.

Table 2. Ownership of *Ngitili*, Shinyanga Region (1980-2001)

District	Villages		Institutions		Households		Total Area
	No.	Ha.	No.	Ha.	No.	Ha.	Ha.
Bariadi	36	11,214	22	2,482	3,930	6,191	19,887
Kahama	65	7,376	12	92	990	2,941	10,409
Maswa	16	2,561	18	71	1,925	4,336	6,968
Meatu	23	4,486	19	35	4,836	9,620	14,155
Shinyanga Rural	18	15,264	32	689	4,844	7,806	23,759
Shinyanga Urban	12	1,975		-	126	245	2,224
Bukombe	2	300		-	388	390	720
TOTAL	172	43,176	103	3,369	18,039	41,149	78,122

Source: (HASHI 2001)

Ngitili are becoming a key component in Sukuma land use management. Securing livelihoods through agriculture based approaches and options has not been enough, as they do not take into account the many and varied needs of people. The people use their restored *ngitili* to fill many of these needs by:

- Providing a source of dry season forage for livestock;
- Ensuring that people obtain fuel and poles from nearby, and do not have to walk great distances;
- Allowing people access important medicinal plants, which is particularly important when "formal" health services are becoming increasingly expensive;
- Providing a place where people can harvest wild fruits and foods to add variety to their diets, and as a source of foods in dry and drought times;
- Acting as a risk management strategy for dry and drought time use, and so enhancing the resilience of the overall system; and
- Being a source of shade and quiet.

Turkana

As the effects of the famine receded, the Turkana pastoralists in the camps started to reconstitute their livestock herds and return to the pastoral economy. The camps were closed and the number of people depending on the natural resources of the area returned to pre-camp numbers. Key to the forest restoration process was, paradoxically, the people who lived in the camp and their accumulation of livestock, goats in particular. The large numbers of people in the camp with their enclosures provided an unlikely but ideal starting point for restoration (Barrow & Ekarani 2002). These livestock enclosures had a significant influence on the recruitment of *Acacia tortilis* to the wood and bush land landscapes of the area (Reid & Ellis 1995).

One key component of the goats diet is the pods of *Acacia tortilis*. While the pods provide a nutritious food, the seeds are not digestible and are excreted in the goat droppings (Reid & Ellis 1995). As the goats are enclosed during the night time, most of the droppings were excreted in these enclosures and many would have found their way into the thorn fence. When the rains returned masses of *Acacia tortilis* germinated from these pre-treated goat droppings in and around the now empty enclosures of the camp. This formed the basis for the regeneration of the *Acacia tortilis* woodland.

The germination of the goat droppings on its own is not enough, as without protection most would be quickly browsed, though some would be protected by the decaying thorn branches of the enclosure. Many of these seedlings formed rings, which corresponded to the size of the enclosure which offered the seedlings protection from browsing. Trees in old livestock enclosures grow quicker, due to improved fertility, and water retention capability of the soils (Reid & Ellis 1995). In this case, the effect has been accentuated by the presence of large number of refugees who gradually accumulated livestock. Thus a large area was covered with young *Acacia* seedlings. For many years these seedlings were kept small as a result of intermittent browsing. Because of their initial protection in the enclosures, they were strong enough to survive such grazing pressures but they were not able to grow much.

The Turkana reserved grazing area systems and institutions provided the means to allow the young seedlings to fully establish. Since the early 1980's, when Chief Ngitieng became the chief, and took the responsibility and initiative to ensure that the restoration took place, with the support of the elders, a variety of activities were undertaken, including:

- Environmental awareness raising at public meetings;
- The use of forest rangers and administrative police to protect the forests;
- The traditional court *Lokuko*, was used to enforce traditional and administrative rules; and
- The *Amaire* system of reserved areas was introduced.

The people of the area felt it important to conserve their natural resources, as they had all seen what had happened after the drought, and wanted to ensure that the trees and forest were in good condition. They were very clear as to what the benefits of conserving their *Acacia tortilis* trees were, including:

- Provision of **building material**;
- **Pasture**: When a reasonably good cover of trees and bushes had developed, this acted as a windbreak, and helped provide a better micro-climate for grasses and other ground vegetation;
- **Fodder**: During the dry season, the leaves and pods from the *Acacia tortilis* are a vital source of livestock fodder;
- **Food Security**: The flour or *Apinet*, which is made from the grinding of pods (not the seeds) of *Acacia tortilis*, is an important component of Turkana dry time coping strategies, as it can be stored for a long time. It is nutritious, and can be made into porridge either on its own, or mixed with maize meal;
- **Fuelwood** is the only source of domestic energy, and is also sold;
- **Medicines**: The small roots of *Acacia tortilis* are burned and the smoke inhaled to clear colds and coughing. The fresh pods are boiled in water, and used as a general preventive medicine; and
- **Shade** from the tree is very important for people, and for lactating livestock to produce enough milk for people and young livestock.

These were the reasons why people conserved the degraded landscape and allowed the trees, *Acacia tortilis* in particular, to be restored. This was due to Chief Ngitieng's interest, with support and involvement from the elders of the area, and his use of both customary rules and regulations based on the draft Turkana Forest Policy (Forestry Department Turkana district 1989), as well as those of the Chiefs Act (Cap 128). The Chief organized public meetings on forest conservation so that the community would understand and be involved. Greater awareness was created concerning the values of trees and of the forest. The elders, Chief and the communities then agreed on certain rules and regulations on how to restore and manage the Lorugum forests (Box 1).

Box 1. The rules and regulations agreed to for the Restoration of the Forest

- Pastoralists living near the riverine forests were only allowed to collect dead wood, and in particular wood that had been washed down during the rains for household needs;
- People agreed not to destroy abandoned livestock enclosures after they moved. People re-cycled their building materials, so little wood was cut for building.;
- No fires were allowed. People had used fire to destroy tick infested areas, which also destroyed young trees;
- Charcoal burning was restricted to using dead wood, and had to be burnt well away from any tree;
- Dead branches could be harvested, after the elders and the community had checked the cause of death;
- No debarking of trees was allowed to provide roofing material; and
- The use of long hooked sticks (*ereges*) to harvest pods and leaves from the *Acacia tortilis* was no longer allowed.

Source: (Barrow & Ekanan 2002)

Rules which were not followed were the subject of "Lokuko", or traditional court where elders and chiefs meet to decide on the kind of sanction to be levied on offenders of, for example, forest destruction. The types of offence includes the cutting of important live trees, debarking, and setting of fires. The offenders were fined livestock, usually goats, depending on the magnitude of destruction, and the number of livestock owned. This helped ensure that the people respected the rules and regulations agreed to. Since the sanction mechanisms were based on customary practice and institutions, they were understood and broadly respected by the people.

In 2002, the elders and Turkana people compared the environment, with what it was like in about 1985. The elders, community and Chief Ngitieng, now retired, identified the following indicators of success for the woodland restoration:

- **Pasture** during rainy periods is richer and re-establishes more easily. The growing trees help conserve and protect the grass and other ground vegetation. The land produces more fodder for livestock, so the people can graze their livestock for longer, before moving to other pastures;
- **Water:** The people say that the water table is now higher. Shallower wells are dug in the river beds as compared to the past, whether they are constructed by pastoralists or by institutions;
- **Forest Landscape:** The restoration of the woodland has made the area significantly more attractive, and provides a much better climate to live in. While *Acacia tortilis* is the main species being restored, and over 10 other species are also regenerating; and
- **Winds:** When the land was bare, the winds blew hard and long, and the area was very dusty. Now the restoration has acted as a large windbreak, which has been important for Lorugum village. It has the added effects of improving the micro-climate for vegetation, and for helping to ensure that valuable tree species regenerate.

As a result the area has become more attractive for people, both for their own well being, and for their livelihood security. The pastoralists also think that the best approach for forest conservation is to involve all the different stakeholders, especially those whose livelihoods depend on livestock and natural resource management. The community has agreed that the restoration of the forest has made their livestock production higher. The people now use the forest for browse, fuelwood, medicine, wild fruits (food), pasture, and building material. The present condition of the forest is one of a wooded grassland with a lot of dwarf *Acacia tortilis* growing amongst the initial restoration, covering an area of approximately 30,000 Ha. The average height of the originally restored trees is about 6 m. with a diameter of between 15-30 cm., and the original restoration is acting as a secure haven for many more young trees to germinate and establish.

TREES AS KEY COMPONENTS OF LAND USE AND RISK MANAGEMENT

Ngitili, as a management institution, is based on traditional knowledge. It ensured the success of the restoration as it was clearly understood by the villagers. They are now increasingly able to secure their livelihoods and mitigate risk through obtaining dry season fodder, and other non timber forest products and services.

Private *Ngitili* can increase a farmer's land value, and are increasing in importance, at least in terms of numbers of *ngitili*. This possibly reflects a shift from more common property to individual regimes. Communal *Ngitili* have helped people restore degraded hill and river edge areas. Not only do they provide badly needed dry season forage, they also help reduce soil erosion and conserve catchment areas. Likewise such *Ngitili* help reduce the need for the agro-pastoralists to move large distances to seek grazing during the dry season, thereby reducing livestock threats of theft and disease.

The forestry sector at both the national and local levels have given strong support for the *Ngitili* approach. As a result *Ngitili* are enhancing the conservation of biodiversity. For example at least 10 important medicinal plants have been recognized in *Ngitili*. The Forestry Department and HASHI have assisted with *Ngitili* improvement, through boundary and enrichment planting and pasture improvement. There is an increasing recognition, both in policy and practice, of the importance of existing local institutions for the management of *Ngitili*, both the official village government, as well as the traditional institutions. This devolution of control and responsibility to the village level has been an important attribute of the success of *Ngitili*.

Farmers' views on *Ngitili* improvement and management varied. About 80% of people admitted that there has been positive changes from before villagization, including ownership patterns, degree of *Ngitili* protection, location in relation to homestead, conflicts associated with use, grazing period and types of animals (Maro 1995). *Ngitili* were less protected in the past as compared to present, although at that time they were located close to homesteads. Most farmers (90%) expressed the great value of *Ngitili* as an important source of pasture for animals at the most critical time of the year, including pasture and browse security (62%), availability of thatch (12.5%), control of soil erosion (5.8%), restoration of soil fertility (8.0%), source of wood products (4%), and as a source of income (4.4%) (Maro 1995).

There has been a massive change in the vegetation of Lorugum, Turkana. There are a number of reasons why and how this took place. As in so many such cases, there is a visionary and strong personality who catalysed the process from within. Chief Ngitieng knew that this restoration process would work, and had the perseverance and strength of character to make it work despite much early criticism.

The 1984 visit by the President of Kenya gave the Chief and the people of the area the necessary political support. At the same time the forestry component of the NORAD-funded Turkana Rural Development Programme emphasized and built on existing traditional rules and regulations of the Turkana pastoralists through a wide ranging forestry extension programme. This provided technical legitimacy to the restoration effort, and helped articulate traditional practice into present day draft district forest policy (Forestry Department Turkana district 1989). The people know how important *Acacia tortilis* is to their livelihood security and risk mitigation strategies. It is,

simply, the most important tree for the Turkana pastoralists, and is the reason the Turkana have developed ownership rights over trees (Barrow 1990).

KEY ELEMENTS OF SUCCESSFUL RESTORATION

In both these examples woodlands are being restored, and important naturally-regenerating indigenous trees are being left and managed. The *Ngitili* practice in Shinyanga is being redefined on a wider scale than just for fodder. It is also seen as a source of multiple natural resources, with an increasing focus on trees. This demonstrates, at an individual or village level, the importance of restoring both large and small areas of wood and grass lands. In Shinyanga, the right conditions of decentralization, increased tenure security and the empowering approaches of HASHI were there, combined with the traditional knowledge base about *ngitili* management as the starting point for restoration. The *ngitili* example demonstrates how traditional institutions, rules and regulations, can be used to complement *de jure* village law and policy. This linking of the traditional and modern is an important lesson, not just in terms of knowledge and management, but also in terms of law. While in Turkana, forest restoration has been successful, and proves that indigenous natural resource management systems can be incorporated to meet contemporary pastoralists needs. But such work has to be carried out with the full support and ownership of the local people. The role of both HASHI and the Forest Department in Turkana moved from one of more traditional tree planting and soil conservation to catalyzing and facilitating a people driven process. This happened in the mid to late 1980's , when HASHI realized the importance of *ngitili* and the importance of local ownership.

The case studies demonstrate that the Sukuma and Turkana are shrewd and intelligent managers of fragile and risky landscape. It helps negate the “tragedy of the commons” paradigm of pastoralism (Hardin 1968), as they both have techniques to foster and enhance tree recruitment and restoration, and the social structures and institutions to make it a reality. These two case studies demonstrate a number of practical lessons for forest and woodland restoration including:

- Building on existing knowledge systems is the basis for restoration. In both cases there is a detailed knowledge base about the importance of individual species as well as overall management systems;
- Restoration efforts were integrated into existing institutional structures, which are well understood by the people together with their accompanying rules, regulations and sanction mechanisms;
- A reasonable degree of social coherence and a strong social structure is desirable to implement such improvements and changes;
- Positive and facilitating approaches of external change agents (HASHI in Tanzania, and the Forestry Department in Turkana), to support and guide the process rather than dominate and drive it;
- The pastoralists in these two areas need trees, but trees they want, not those imposed or suggested to them by outsiders. Simply put, trees and woodlands are crucial to these people's lives and livelihood security; and
- The keeping and management of livestock is consistent with tree and woodland restoration, for the simple and often forgotten reason that pastoralists depend on

trees for browse and forage for their livestock, as well as to meet other household and contingency needs.

Though these are the key attributes to the forest restoration process, it is a combination of these and other factors that has allowed for the remarkable changes in the attitudes to, and restoration of wood and grasslands, both ecologically and socially with respect to trees and woodlands over a relatively short period of time to take place. Other factors that are important include:

1. The main principle underlying the restoration process is common sense, and relates to direct forage and tree needs, so it is easily replicable;
2. A past history of woodland and tree conservation which had not been forgotten;
3. Increasing local people's and groups ownership and control over, as well as their capacity to manage their own resources;
4. This type of work has moved forest management and restoration from one of officially reserved national and district forests to where even the smallest restored areas restored are recognized;
5. Even the smallest areas can be conserved, which makes the practice more widely applicable with greater local interest - in this sense it is a cost free approach once established. Both "poor" and "richer" farmers benefit and can restore and manage their trees and woodlands;
6. Generating local interest in natural resource management, for improving the restored areas, through for example enrichment planting;
7. An increasingly enabling and supporting policy and legal framework including those relating to forestry, land tenure and local government reform;
8. Importance of real participation and community ownership; and
9. Variety of indigenous species restored.

Forest and woodland restoration is not just the responsibility of Government. These two examples demonstrate that rural people will, and do restore very significant areas provided the incentives are right, and that policies are developed that fit local conditions. In this case the need for dry season forage for livestock, combined with the increasing need for timber and non wood forest products are the two main drivers for this restoration practice. The individual areas vary in size from large community based restored forests of over 30,000 Ha. in Turkana, 300 Ha. village forests in Shinyanga, and individual woodlands of 1-15Ha on individuals farms. The restored trees and woodlands provide important livelihood benefits, for instance forage and browse for livestock, foods and fruits for people, and medicines, as well as the timber based products. This has helped the people improve their own livelihoods, and enhance the resilience of the land use systems, especially in dry and drought times.

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