# The Effect of Internal Human Conflicts on Forest Conservation and Sustainable Development in Kenya

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**Abstract**

Sustainable management of forest resources in Kenya will only be possible if we practice good governance of the forest resources; which calls for the respect for the rule of law, respect for human rights, a willingness to give space and a voice to the weak and the more vulnerable in our society; that we respect the voice of the minority, even while accepting the decision of the majority; and, respect diversity (Wangari Maathai, 2005).

The Mount Elgon, Mau, Tugen and Gathiuru (Mt. Kenya) among other forests have witnessed a wave of conflicts among the communities themselves mainly due to population pressure and with forest regulators which have not only affected the conservation of the forest resource but also the livelihoods of the forest adjacent communities.

Studies carried out by the IFRI program in 14 forests indicate the wave of conflicts have led to incidences of forest destruction through often illegal activities by forest adjacent communities were recorded leading to degradation of the forest resources and loss of biodiversity.

The studies concluded that there was need to involve members of communities in direct dialogue and eventual participation in managing the forests to not only sustain their livelihoods but to also contribute to the general development of the area and the country as a whole. The study further recommends the adoption of Participatory principles and their application in natural resource management. This would create a sense of ownership of the forests and other natural resources.

## 1. Introduction

The use and management of common pool resources have been a source of tension between different actors the world over. Conflicts in the forest sector revolve around questions of control, access to the forest and forest products and historical claims over the forests. Although the demand of forest products has steadily risen, the total area of forests continues to decline and between 1990 and 1995, the total area of forests in developing countries decreased by 65.1 million hectares. Major causes of forest cover change in developing countries include conversion of forests to agricultural land and large infrastructural development causing tension between the need to conserve and the need for development. These have further intensified conflicts between forest managers who are often powerful, centralized state authorities or the ruling elite and the less powerful forest dependent communities (Sayer et al, 2005).

Kenya's population has increased from 5 million in 1948 to reach some 30 million in 2000. Despite the impacts of HIV/AIDS and other major development problems, Kenya's population is projected to reach 40 million by 2015. Yet only about 15-20% of Kenya's surface land is arable and more than 70% of the Kenyan human population depends on this arable land to provide food security and human settlement for these 30 million people. The pressure on rural lands, forest, water, and biological resources will therefore be intensified dramatically to meet the needs of the growing population. The annual population growth rate of over 3.6 % in the country also means that pressure to convert forest, to agricultural land will remain high. This, if not checked, will lead to a progressive reduction of forest cover due to further gazettement and encroachment of forestland which would further intensify conflicts between the different actors.

Kenya's economy also relies heavily on the country's natural resources and agricultural output both in terms of people's livelihoods and as a contribution to national income. The exploitation and competition for the country's limited natural resources continues to jeopardize the state of the environment, mainly due to unsustainable and unplanned exploitation. Conflicts in the forestry sector are therefore mainly between the government and the forest adjacent communities (Castro and Nielsen, 2001). The major bases of conflicts therefore revolve round the government's need to conserve the forest and the communities' requirements to have the forest meet their livelihoods. The main factors that contribute to conflicts in the forest sector therefore include population growth, continued dependence on the forest resources by many Kenyan communities, the existence of different tenure regimes in the forest sector, and the inordinate share of the forests and forest resources acquired by the politicians and other political elites (Ochieng-Odhiambo 2000; Wass, 2000 and 1995; Okoth-Ogendo, 2000).

This paper seeks to examine the condition of forests in Kenya and to analyze the effect of human conflict on conservation (of these forests) and sustainable development. It links the changes in forest structure, density, species composition and regeneration to demographic and other socioeconomic activities among selected communities living adjacent to forests.

The following section of the paper reviews the different types of conflicts that are common within the natural resource sector in Kenya. It discusses the linkages between demographic changes and reduction of forest cover, the linkages between forest conservation and sustainable development and the effect of conflicts between the two. The next section then explains the methodology that was used in carrying out the study followed by discussions on the results.

## 2. Conflicts arising from management of natural resources

Conflicts arise from human relations when individuals have different values, rights, obligations, needs and interests that must be met from a particular resource. In forest management, conflicts can be occasioned by degradation or decline in forest resources and ensuing competition over the reduced amounts of forest products; from perceived scarcity through competitive use; and, a failure to negotiate rules and regulations for sharing a resource which are acceptable to all stakeholders (Castro and Nielsen, 2004). In a conflict over the use of natural resources, conflicting parties often end up contradicting, compromising, or even defeating the interest of the other in pursuit of their own interests (Ochieng-Odhiambo, 2000).

The major players/institutions in Kenya that are given the responsibility of managing various natural resources in Kenya include: Kenya Forests Service (KFS); Kenya Wildlife Services (KWS); Local County Councils, Group Ranches; Private Ranches; Kenya Forestry Research Institute (KEFRI); National Museums of Kenya (NMK); and Moi University. Undefined institutional arrangements also have the effect of further causing conflicts between managers and forest dependent communities due to different objectives and management strategies.

The recognition of the role of conflict and conflict resolution has partly come as a result of decentralization and participatory approaches in natural resource management (Castro and Nielsen, 2004). These approaches imply a wider stakeholder involvement, each with their own priorities in respect to what products and services a forest should produce. In Kenya, a new forest policy has therefore been passed that will include forest dependent communities in the management of forests in the hope of reducing forest related conflicts.

## 2.1 Conflicts arising from forest tenure

Tenure can be described as conditions under which access to land or trees is acquired, retained, used, disposed of, or transmitted by individuals or groups of people. Tenure is an important factor, which is instrumental in determining the success or failure of forest management. Tenure defines the social relations among people and the rights they hold in relation to resources or property. Property or tenural rights are held in a variety of ways referred to as bundles (Okoth-Ogendo, 2000) and as reported by Sarin (1998); are dynamic and may change from time to time.

Sustainable development and the efficient and equitable use of natural resources depends on the ways in which property rights are defined and distributed (Wiebe and Meinzen-Dick, 1998:203 ;). According to Knox et al (1998), there is not just a simple division between *de jure* (statutory) and *de facto* (locally practiced) rules when looking at tenurial /property rights. They argue that there are overlapping legal and normative frameworks related to property rights. Customary, religious laws and unwritten local norms may *all* address the rights and responsibilities that are associated with natural resources.

Policies which set out to change the definition and distribution of property rights especially in common pool resources has produced mixed results, which have often been biased against the interest of local communities (Rocheleau and Edmunds, 1997). Scholars who support private tenure over communal tenure argue that communal tenure has often proven ineffective in recognizing and enforcing secure property rights for communities. This remains a contested viewpoint. For example, common property regimes practiced in Africa before colonization had in-built control mechanisms which ensured that trees and forests were sustainably managed. Such mechanisms included strict schedules of forest use and rules for harvesting only particular parts of a tree (Barrow, 1999). While individual or private property rights exclude other users from accessing property such as forests and trees, communal tenure is inclusive and encourages participation by the whole community. However, where changes have taken place in the socio-cultural and economic spheres of a community, it may not be easy to operate under communal tenure systems of resource ownership despite their being more amenable to community based forest management approaches than private tenure (Shackleton, 2002).

The change from customary/ communal to public and private tenure has a major cause of conflicts in Kenya (Ongugo, 2004). Customary systems accommodate the use rights of multiple parties, toward systems which confer transfer or user rights to an individual (Wiebe and Meinzen-Dick 1998:210). This move has often been associated with privatization and development of land markets that do not favour those in society who are less endowed with capital assets. As a result of

the change in land tenure arrangements, many customary rights of access or use, such as grazing livestock, taking fallen branches for firewood or collecting medicinal plants from a forest may be considered as an offence (Rocheleau and Edmunds, 1997). Although these rights may be important for livelihoods especially those of poor households, they are often seen as offensive by those who manage government forests.

Some of the problems afflicting the forestry sector in Kenya may be due to conflicts between conservation and use and institutions involved in their management. Conflicts in the use of forests and forestland arise partly due to unclear tenure (Okoth-Ogendo, 2000). In the absence of clearly stated tenure regarding ownership of a natural resource, some form of negotiation involving roles and responsibilities of the participating parties becomes necessary. Many forest adjacent communities believe that public forests belong to them (although legally, they are owned by the government). As a consequence, the community members have not accepted the legal position of government ownership and still wait for the time when the forest would be returned to them as the rightful owners of the resource. This is particularly common in Kenya where many forest adjacent communities depend on the forests for land and other forest products. One overriding observation is that in the process of 'development', forestlands had been considered as wilderness or wasteland and were left without clear management plans. For example, while forest land in Kenya is managed as a public resource, decisions pertaining to their use usually do not reflect the public good theory which requires that public goods are managed in such a way that they benefit the local people more than those from outside (Kigenyi et al, 2002).

Using plantation forests that are managed under public tenure as an example, Kenya had established about 160,000 hectares of plantation forests by 1990. In 2002, the plantation area had declined to 120,000 hectares. The reduction was blamed partly on the Forest Department, which in turn blamed this reduction in area on the type of tenure which they had no means to enforce. Politicians further excised an estimated 40,000 hectares of plantation forestland in Eastern Mau and Mt. Kenya forests for settlement because under public tenure, the Forest Department could not protect the forests from the politicians.

Sharing benefits of forest resources has also been a major cause of tension between the Kenyan government and community members and other private stakeholders. In most cases, the flow of benefits from forest is curtailed by the management of the forest and those who benefit the most are national and international communities through revenue and tourism. Local communities could benefit from such forests directly through sharing of revenue collected from the sale of forest products, and paid as park entry fees. This has however not been possible due to lack of policy and legislative instruments. This lack of direct

benefit to local communities or the curtailment of their livelihood opportunities has to some extent alienated the local communities from the forest and led to encroachment into the forestlands. Since forestlands in many Kenyan forests are usually fertile areas suitable for the production of agricultural crops, such areas also experience high population pressure. This further exerts pressure on the land thereby creating conflicts between the forest managers and those who would like to cultivate agricultural crops. Trade in illicit drugs such as *Canabis sativa* have thrived in forests including Mt. Elgon, Mt. Kenya and even the Aberdares which have provided secure areas on which to produce the crop. This in itself has been a major source of conflict between the forest adjacent communities, the Kenya Forests Service and those who produce the drug in the forests (Ongugo, 2004).

Tension between the different management organizations due to tenure is also common in the Kenyan forests. Some forests are divided into a forest reserve and a national park. A good example is the Mt. Elgon forest which is managed under the public land tenure. The Forest Department manages the reserve that covers 74,000 hectares; while the Kenya Wildlife Service manages the park which covers 34,000 hectares. The boundaries between the forest reserve and the national park are marked by features such as rivers, valleys and rocks. Wild animals roam across these boundaries into plantation forests, which they debark and sometimes uproot (Ongugo, 2004). These wild animals have caused huge losses to the Forest Department but since the two organizations are public organizations, it has not been possible for the Kenya Wildlife Service to compensate the Forest Department for the loss of timber due to debarking especially, by elephants and buffaloes.

Another area of conflict resulting from tenure is between the Kenya Wildlife Service in the forests and the forest adjacent communities. Farms which are located close to the park boundary are usually destroyed by wild animals. The Kenya wildlife Service is not able to compensate the farmers for crop losses. Although the organization has tried to solve this problem by putting up electric fences, there are problems with its maintenance and in some areas it does not protect all vulnerable farms. There are no buffer zones between the park/forest reserve and the private farms thus further complicating the problem.

### 2.1.1 Tenure and Legislation

Under new forestry management initiatives, attempts at the introduction of policies, which encourage community participation, have been hampered by the lack of comprehensive and supportive land tenure arrangements (Okoth-Ogendo, 2000). Statements from the government indicate that natural resources in Kenya are governed by over sixty pieces of legislation. Some of these pieces of legislation have been overtaken by the current development trends, while others

contradict each other. For example, while the Forest Act advocates for tree planting under private tenure, the Agriculture Act encourages the farmers to reduce the number of trees on their farms in order to create land for more agricultural crops. Land ownership in this case under private tenure may result in conflict of use between agricultural production and tree planting. Another example is where the Forest Act encourages private land owners to plant trees for their own use while the Chief's Authority Act which advocates for public land tenure, discourages them from planting trees through the rule of "permits" issued for the use of trees on private land. Such conflicts among different land tenure leads to confusion and the result is a disorganised and disjointed participation by different stakeholders in forestry development in the country. Such a situation may then lead to unsustainable management of tree resources on land owned under public tenure; while at the same time leading to over harvesting trees on land managed under, communal and private tenure.

### 2.2 Population pressure

Estimates show that 2.9 million people in Kenya (almost 10% of the population) live in the areas adjacent to indigenous forests and directly depend on forest resources for their livelihoods and survival. Yet studies now indicate that the forest cover in Kenya lies at less than 3%.

Population increase implies that the number of users and uses has grown competing over the available scarce natural resources. Available research reports (IFRI CRCK reports) show that deforestation is a big threat to Kenya's economic development. With an increase in the population, the need for agricultural land has increased. More forestland is converted to agricultural land for food production. Forest adjacent communities use the forestland for subsistence food production but commercial users also access the forest to supply forest products to the urban markets.

### 2.3 Conversion of natural forests into agricultural land

The non-residential cultivation (NRC) or *Shamba* system is adopted from the *Taungya system* of South America. It was devised by the then Forest Department (FD) in 1943 to facilitate plantation establishment. The system was prompted by the acute land shortage faced by communities after colonization, and a need to reduce plantation establishment costs by the Forest Department. It was also meant to provide food security to the farmers.

Under the Shamba system, the cultivators were incorporated into the FD through employment and were permitted to clear and cultivate cut over indigenous bush cover from a specified land area; usually between 0.4-0.8 ha per year. This is done with the agreement that tree seedlings are planted on this land, and subsequently tended through weeding, pruning and safeguarding against game

damage. In return the FD provided the resident cultivator with employment, social amenities and land for the cultivation of annual crops such as maize, potatoes, beans, peas and other vegetables. Cultivation proceeded until a time when tree seedlings were large enough to shade, and thus inhibit the growth of annual plant crops; usually a period of 3-5 years.

The extent of the Shamba system was restricted to the high potential areas, comprising about 3% of Kenya's land area, and representing 12% of Kenya's total agricultural land. These areas are endowed with fertile soils of volcanic origin and a high annual (>1000 mm) rainfall with a bimodal distribution.

Clearly, the Shamba system was an important arrangement that enhanced and sustained the food security of otherwise landless peasants. The system was discontinued in 1986 chiefly due to an expanded human population whose demand for forest land allocation exceeded the initial FD objective of plantation establishment. In addition, illegal activities (e.g. forest clearing, tree poaching, hunting) from the resident cultivators and their families jeopardised forest protection and management. Interestingly, resident cultivators in forest areas with high wildlife populations voluntarily gave up the practice due to crop destruction and livestock predation.

After the Shamba system was stopped, communities living around the forest moved in and settled in areas that were cleared. Forest degradation has since escalated as they do not use indigenous forest management knowledge.

In the 1990s the Forest Department introduced the Non-resident Cultivation (NRC) for the establishment of plantation forests. Through the approval of the respective District Development Committees, cultivators were involved in plantation development under certain terms and conditions that were enforced by the respective Forester, District Forest Officer and Provincial Forest Officer.

The Non-resident cultivation is a modification of the Shamba system that attempts to reduce the risk of cultivators claiming squatter rights on forestland. The system however, fails to take into account the need to protect crops from wild animals and thieves that invade the plots at night.

### 2.4 Human Settlement

Carving out of forests for human settlement has increased as the government is very keen to settle the forest dwelling communities along the forest boundaries or within the cleared forest plantations. However indigenous communities such as the Ogiek of Mau and the Dorobo of Mt. Elgon are strongly opposed to this and are keen on working out modalities of managing the forests together with the government. There has been continuous eviction of the communities from the

forests for resettlement outside the natural forests. Some community members have resisted the government's efforts to forcibly remove them from the forests thus causing a lot of conflict between the community and the authority. This also includes the Tugen of Tugen Hills forests in the Great Rift Valley.

The communities affected claim that resettlement is politically motivated as the community is aware of some people who have registered as part of the community in order to obtain land. So far the outsiders have been allocated land but some of the Ogieks are still concentrated in Forest Reserves.

## 2.5 Forest excisions

The process of forest protection was introduced under the 'East Africa Forest Regulations, 1902' by the first Conservator of Forests. These regulations allowed for the gazettement and degazettement of forests, and control of forest exploitation through a system of licenses and fines.

The Government through the Minister for Natural Resources has the express authority to degazette the forest through a legal process of excision. These excisions are done with the intent of converting the area to other alternative land uses like settlement, private agriculture that do not foster tree cover. The forests are degazetted then surveyed and demarcated for the proposed use.

There are several loopholes in the excision process. These include:

- The excisions are made without consultation with the stakeholders. Procedures of collecting public views and sharpening their perspectives on causes-effects linkages as it may affect those aggrieved by the excision are never put in place and neither are provisions for compensation clear. A notice is placed in the *Kenya Gazette* and whoever wants to contest it is given 28 days to do so. The Minister is however under no obligation to consider the views in the final decision. The readership of the Kenya Gazette is very limited and not many people get to know about the notices.
- The Minister has the powers to put in a notification and he can be influenced by political and economic pressure but not necessarily for the common interest of the public.
- Excisions usually take place after the forests have already been illegally occupied.
- There is no environmental and socio-economic impact assessment done for the proposed changes in land-use leading to unsustainable land management.

## 3.0 Research methods

IFRI research instruments (Ostrom and Wertime, 1995) were used to collect both biophysical and socio-economic data.

### 3.1 Biophysical data collection

Data was collected from forests with varying agro ecological zones from 1999 to 2007. The forests had been revisited at least once and data collected from the same plots or as close as possible to the first plots. The forest data (biophysical data) was collected using random sampling method whereby plots were selected using UTM grid co-ordinates. The approximate positions of the plots on the maps were located using the last four figures of the Eastings and Northings. Once the reference point was established, bearings and distances to the plots were calculated using a compass and pacing the distances between the plots. A linear tape was used to measure the distance of the diameters, from the center of the plots.

A total of 30 plots were established within the selected IFRI forests. Data was collected within two concentric circles of radius 3 metres and 10 metres from the centre. Within the radius of 3 metres, the species at the ground cover were identified and their percentage cover determined. Within the same circumference, diameter at breast height of between 2.5 and 10cm for the saplings and shrubs were recorded, and the heights taken. Within the radius of 10m, the diameter of trees with a DBH (diameter at breast height) of 11cm and above was taken and their estimated heights recorded. From the data collected, it was possible to determine the total number of the species from all the plots, and their heights and diameters. Data on the number of seedlings, percentage of crown cover per plot, soil type, moisture content and color was collected. Data on human/environmental impacts on the vegetation was also recorded and documented. For the second visits, Co-ordinates from the first visit were used to locate the site, the reference points, and the plots where data was collected during the first visit.

### 3.2 Socio-economic data

The IFRI program relates forest users and institutions through informal interviews to collect information on numerous entities that influence forest use. Different IFRI forms were used to collect data on the site, the settlement, the products found in the forest, the user group, the organizations found in the forest among others. The team then used Participatory Rural Appraisal methods (PRA) to gather more socio-economic data. These included historical profiling, general group discussions, and some focus group discussions with members of the community to obtain information on specific topics such as the history of the

area, user group and product information and to capture major changes in the area and the relationship of the users with forest resource managers. A transect walk in the village was also used to gather more information and interviews with key informants such as the Chief, local elders, and the forest users were used to get key information about the area in relation to the use of forest resources. The research team members made observations and noted important changes on the condition of the forest, socio-economic status of the community members and infrastructure (roads, schools, hospitals etc) in the settlement.

Household questionnaires were also used to gather more information on the households.

### 3.3 Study Area

Data was collected from a total of 14 forests in Kenya. The forests had varied agro ecological zones ranging from moist mountainous forests to dryland forests. The following fourteen forests were studied:

- Mountaineous forests which included Aberdares, Gathiuru, Upper Imenti,Chorlem, Kimothon, Tugen Hills, Loitokitok, West Mau and Tugen Hills.
- Dryland forests which included Ole Legis and Ebburu.
- Lake region forests were Thim Lich Ohinga and Ramogi
- The only Mangrove forest was Vanga

## 4.0 Results and Discussions

### 4.1 Population dynamics

Several factors were tested to determine possible conflicts between demographic characteristics and the forest resource. The results indicated that the number of households varied from one forest site to another with Chorlem and Kimothon, both in Mt. Elgon forest having the highest population.

Results also showed that the number of households, nuclear families and individual members varied from forest to forest with Chorlem and Kimothon leading in each of the three parameters (Table 1).

Table 1: Number of households, nuclear families and individuals

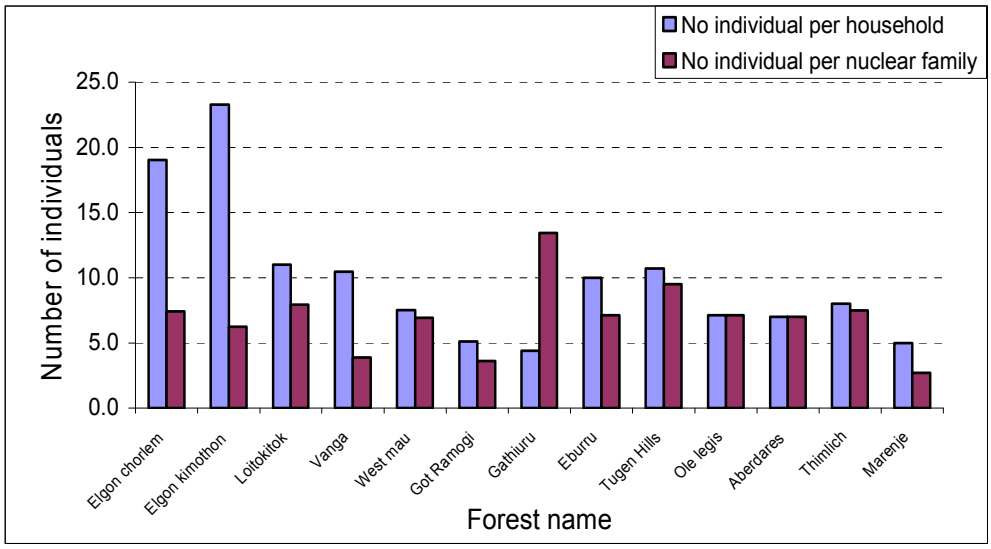
| | Current number of households, nuclear families & individuals | | |
|---|---|---|---|
| Forest name | Households | Nuclear families | Individuals |
| Chorlem | 1,366 | 3,500 | 26,000 |
| Kimothon | 911 | 3,399 | 21,200 |
| Loitokitok | 323 | 449 | 3,565 |
| Vanga | 501 | 1350 | 5,250 |
| West Mau | 175 | 190 | 1,315 |
| Upper Imenti | 230 | 300 | 11,920 |
| Got Ramogi | 602 | 850 | 3,071 |
| Gathiuru | 567 | 186 | 2,500 |
| Eburru | 500 | 700 | 5,000 |
| Tugen Hills | 140 | 158 | 1,500 |
| Ole legis | 70 | 70 | 500 |
| Aberdares | 696 | 696 | 4,871 |
| Thimlich | 375 | 400 | 3,004 |
| Marenje | 100 | 185 | 500 |
| Chi-square value | 5.616 | 5.726 | 3.787 |
| d.f | 2 | 2 | 1 |
| p-value | 0.060 | 0.057 | 0.052 |

* The number of households, nuclear families and individuals were categorized (households & nuclear families=3 categories; individuals = 5 categories) for Kruskal Wallis test.

Further analysis using Kruskal Wallis test for number of households, nuclear families and individuals showed that there was a significant difference ($p<0.1$) between the forests (Table 1). This shows the possible variation in the use of forest products and competition for forest resources as the number of individuals, households and nuclear families increased (figure 1).

Kimothon had the highest number of individuals per household and Gathiuru had the highest mean number of members in a nuclear family (figure 2).

**Figure 2: Number of individual members in household and nuclear family.**




The population adjacent to the forests has also been growing steadily over the years (table 2). Data from all the sites have shown a steady increase except in West Mau where there was a dramatic population decrease 10 years ago due to land and tribal clashes which resulted in a huge out migration of people. But the population grew between 5 and 10 years later due to natural causes and the return of some of those who had migrated from the area. The implication of the growing population across all the forests implies direct pressure on the existing forest resources due to increased demand.

**Table 2: Number of households**

| Forest | No of HH 20 years ago | No of HH 15 years ago | No of HH 10 years ago | No of HH 5 years ago | Current no of HH |
|---|---|---|---|---|---|
| Mt. Elgon (Kimothon Block) | 100 | 150 | 400 | 1000 | 6000 |
| Mt. Elgon (Chorlem Block) | 30 | 100 | 1000 | 1700 | 2000 |
| Loitokitok Forest | 200 | 300 | 450 | 562 | 813 |
| West Mau (Kedowa block) | 170 | 300 | 140 | 200 | 220 |
| Upper Imenti forest | 80 | 120 | 150 | 180 | 200 |
| Gathiuru forest | 50 | 170 | 352 | 450 | 560 |
| Got Ramogi | 360 | 400 | 482 | 530 | 850 |
| Thimlich Ohinga Forest | 100 | 150 | 250 | 300 | 400 |
| Eburu Forest | 280 | 350 | 420 | 500 | 700 |
| Aberdare ranges | 300 | 348 | 522 | 640 | 696 |
| Tugen Hills | 20 | 125 | 132 | 140 | 158 |
| Marenje | 50 | 60 | 80 | 100 | 185 |

* Data for 2 forests withheld

### 4.1 Population increase and the Forest Resource

The abundance of tree species varied from one forest to another with hard wood high valued trees like *Olea spp, Prunus Africana, Nuxia congesta, Podocarpus falcutus, Juniperous procera, Warbugia ugandensis, Brachylaena huillensis, Acacia spp, Teclea nobilis* (table 3) showing signs of facing extinction. The less abundant species indicates the high demand of the species which increases the chances of conflict between users and the managers.

**Table 3: Changes in Tree densities**

| Species | Tree density between 5-10 yrs ago | Current tree density |
|---|---|---|
| Average densities of trees/ha from 10 Highland forests | | |
| Prunus africana | 5.6 | 1.9 |
| Olea species | 27.1 | 14.1 |
| Nuxia conjesta | 10.1 | 6.7 |
| Podocarpus falcutus | 5.8 | 7.7 |
| Juniperus procera | 7.4 | 13.1 |
| Warbugia ugandensis | 4.24 | 1.4 |
| Teclea nobilis | 8.2 | 7.9 |
| Brachylaena huillensis | 5.8 | 0.1 |
| Average densities of dry land species from 4 forests | | |
| Acacia nilotica | 1.9 | 0.8 |
| Acacia abyssinica | 3.9 | 10.1 |
| Acacia lahai | 0.3 | 0 |
| Acacia seyal | 6.9 | 1.6 |

Population increase, as indicated above, is likely to put a lot of pressure on the forests hence reduction of forest products resulting to competition and conflict among the people using the forests.

There were disparities of tree species composition and density between the first and the second visit of assessment (Table 4). It is widely believed that the more the number of households, the more the pressure on the forest. The expectations on comparing demographic characteristics and tree densities in the studied forests were that the tree density in high populated areas could have been lower. But the results indicate higher tree densities in some areas.

**Table 4: Tree density in different forest sites**

| Forest name | Tree density between 5-10 yrs ago | Tree density/ha | Current Tree density | Tree density/ha |
|---|---|---|---|---|
| Aberdares (Wanjohi block) | 232 | 242.2 | 128 | 135.8 |
| Gathiuru forest | 357 | 478.8 | 189 | 200.5 |
| Got Ramogi | 449 | 476.4 | 386 | 409.6 |
| Tugen hills forest | 318 | 337.4 | 203 | 215.4 |
| Loitokitok (Kikelelwa Forest) | 316 | 335.3 | 340 | 360.8 |
| Mt. Elgon (Chorlem Block) | 400 | 424.4 | 414 | 439.3 |
| Mt. Elgon (Kimothon Block) | 204 | 216.5 | 239 | 253.6 |
| Thimlich Ohinga Forest | 130 | 137.9 | 230 | 244.04 |
| Upper imenti forest | 340 | 360.8 | 288 | 305.6 |
| West Mau (Kedowa block) | 378 | 401.1 | 657 | 697.1 |

* Data on 4 forests withheld

There have been some significant changes on tree densities in some forests that could be attributed to population growth (table 2). These include Aberdares, Gathiuru, Got Ramogi and Tugen Hills where the tree densities have decreased. But in some forests such as Thim Lich Ohinga, West Mau, Loitokitok and others, the human population has increased over time but the effect on the forest resource has not been very visible. There could be several explanations for this. First, there has been an increase in protection activities around some of these forests. Second, community groups have increased their conservation activities around some of the affected areas. Third, a presidential decree passed in 1999 that banned harvesting of any forest products. This has put some measures of control in some of the forests.

Although the presidential ban has been in place for the last almost 10 years, it is also true that the tree density of some forests has further reduced indicating the high pressure on the forest products despite the ban.

### 4.3 Other demographic factors

There were differences in other demographic characteristics (Table 5) where Chorlem had the highest mean number in each of the parameters.

Inferential analysis of the demographic characteristics (Table 5) using Kruskal Wallis test showed that there were significant differences ($p<0.05$) in the number of wealthy households, poor households, number of illiterate individuals, those passed primary, secondary and college, number of individuals owning land, number of individuals whose land is not sufficient to meet the subsistence needs,

number of months food is consumed and number of households with surplus food between forest sites. In addition Mann-Whitney U test showed that there were significant differences ($p<0.05$) between forest sites.

There were no differences ($p>0.05$) in some of the forest sites on some demographic characteristics (Table 5). Factors such as the highest number of illiterate individuals and number of individuals with land not sufficient for subsistence needs as well as fewer numbers of households were likely factors that could increase pressure on the forest resources resulting to conflicts. For example it is widely believed that when highest numbers of individuals are illiterate, they are likely to lack information on the sustainable use of forest resources. They are also more likely to solely depend on the forest for their income due to limited options thus causing more pressure on the forest. Individuals with limited land sizes are also likely to cause more conflicts between the users and the forests and the users and the regulators. This is directly linked to the need of more land to meet their subsistence needs as well as more need for the forest products.

**Table 5: Other Demographic characteristics in different forest sites**

| | Mean number of wealthy households, poor, illiterate individuals, passed primary, secondary, college, owning land, land not sufficient to meet subsistence needs, sufficient food, months food is consumed and households with surplus food | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Forest name | Wealthy households | Poor households | Number Illiterate | No. Passed primary | No. Passed secondary | No. Passed college | No owning land | Land not sufficient subsistence | No of months food consumed | No households with surplus food |
| Elgon chorlem | 3a | 9a | 2376.9i | 2312.7i | 312.3f | 77.8c | 363.4e | 332.3g | 7.3b | 67.5d |
| Elgon Kimothon | 7a | 28b | 304.5f | 242.4g | 99.2d | 25.5b | 48.3b | 58.1b | 4.6a | 15.5b |
| Loitokitok | 56 | 24b | 75.0c | 66.6d | 12.2a | 9.0a | 101.3c | 81.3c | 6.5b | 10.0ab |
| Vanga | 3a | 19bc | 19.0b | 25.0b | 5.0a | 1.0a | 4.0a | 36.0b | 8.0b | 4.7a |
| West Mau | 4a | 15c | 510.0g | 435.0h | 225.0e | 40.0b | 98.0 | 46.3b | 10.4 | 40.0 |
| Upper imenti | 2.8a | 3.8a | 235.2e | 227.4 | 74.0c | 10.0a | 144.2d | 108.8c | 6.8b | 13.0ab |
| Got Ramogi | . | . | 65.7c | 42.5c | 71.5c | 42.0b | 37.5b | 41.5b | 6.5b | 8.5a |
| Gathiuru | 13.3b | 33.4b | 123.4d | 93.6e | 39.6b | 17.1a | 100.6c | 126.5d | 3.4a | 20.3b |
| Eburru | . | . | . | . | . | . | 350.0e | 220.0 | 4.0a | 130.0 |
| Tugen Hills | 30c | 12c | 1250.0h | 200.0f | 600.0g | 450.0d | 140.0d | 120.0d | 4.0a | . |
| Ole Legis | 2a | 2a | 3.0a | 3.0a | 31.0b | 10.5a | 2.0a | 8.5a | 10.0c | 2.0a |
| Aberdares | . | . | 2534.0j | 2653.0j | 731.0h | 150.0d | 696.0g | 464.0f | 12.0c | 696.0e |
| Thimlich Ohinga | . | . | . | . | . | . | 300.0f | 190.0e | 4.0a | 26.0c |

* similar letters indicates no significant differences and different letters shows significant differences at $p<0.05$ using Mann-Whitney U test for each parameters per column

## 4.2 Wealth

Wealth or poverty can affect the forest resource in different ways. It is assumed that the more wealthy the household, the less the household's dependence on the forest and vice versa. It is because it is assumed that wealthier households have a variety of options and are therefore less dependent on the forest resource. But data collected from the sampled Kenyan forests indicate that while there was a significant difference in the number of wealthy vs poor households, their dependence on the forest was the same. There was therefore no significant difference between harvesting of products between wealthy and poor households

The quantity needs of user groups that the forest products showed that firewood was the major product harvested followed by timber and fodder (Table 6). Since the communities heavily depended on the forests for these products, then the scarcity of the products was expected because the species composition and diversity was low and less abundant especially for timber and firewood.

**Table 6: Mean of various forest products for different user groups**

| User group needs | Minimum | Maximum | Mean |
|---|---|---|---|
| Fodder | 5 | 100 | 60 |
| Timber | 2 | 100 | 67 |
| Fuel wood | 1 | 100 | 79 |
| Biomass, green manure | 2 | 100 | 15 |
| Food | 0.5 | 100 | 27 |
| Other forest supplies | 1 | 100 | 44 |

On correlating the users needs of fuel wood with several factors such as wealth, land ownership, individuals owning land and number of individuals whose land was not sufficient to meet the subsistence needs, the results showed that there was no significant correlation (Corr. =0.059, -0.173, 0.2338, 0.227 with p-values of 0.405, 0.2391, 0.1676 and 0.1753, respectively, in that order) between the factors. This implied the use of forest products was not influenced by the status of an individual. All individuals therefore, irrespective of their status, depend on the forest for most products. This could be a source of conflict among the users themselves who are of different status, between the users and the managers and finally on the forest resource which is under continuous pressure.

The type of a house a community member lives in can also determine the status of the person in the community. For example, farmers who live in brick walled, tile roofed or iron sheet roofed houses are generally considered wealthy in most rural settings. Those who live in semi permanent houses are generally of the middle class while those who live in mud walled grass thatched houses are generally considered poor. For most forest adjacent communities sampled, a majority lived in mud brick house with corrugated or sheet metal, warp shingles

and mud brick house with thatch/straw/other vegetation (Table 7) indicating the low level of living standards of the forest adjacent communities.

**Table 7: Type of houses lived by individuals adjacent to the IFRI forest sites**

| Type of house | Most frequent kind of house lived in | 2nd most frequent kind of house lived in | 3rd most frequent kind of house lived in |
|---|---|---|---|
| Stone/concrete/brick house with concrete/good wood or stone | 6 | 3 | 22 |
| Stone/concrete/brick house with corrugated or sheet metal | 8 | 17 | 20 |
| Mud brick house with corrugated or sheet metal, warp shingles | 22 | 40 | 8 |
| Mud brick house with thatch/straw/other vegetation | 38 | 14 | 6 |
| Mud brick house with roll roofing/polythene sheet or salvage | 3 | 5 | 6 |
| Grass/stick/wattle house with corrugated or sheet metal, warp | 3 | 5 | 25 |
| Grass/stick/wattle house with thatch/straw/other vegetation | 5 | 5 | 6 |
| Grass/stick/wattle house with roll roofing/polythene sheet | 2 | 2 | 8 |
| Others | 13 | 9 | - |
| Total | 100 | 100 | 100 |

### 4.2.1 Occupation of household heads

The occupation of a household head is important due to the source of the household's income. If a farmer does not have a regular income, it is believed that he is more likely to harvest more from the natural resource to make ends meet. This is therefore likely to create more conflicts between users and between users and the forest. A majority of the community members were farmers (Table 8). The most common occupation combination was farming (which involved both crop production and livestock keeping) and the use/sale of forest products and casual labour which indicate low income.

**Table 8: Occupation of Households**

| Occupation combination | % frequency |
|---|---|
| Farming | 17 |
| Farming/forest products/labour | 34 |
| Farming/forest products | 25 |
| Fishing/farming/business | 12 |
| Mining/farming/forest products | 8 |
| Forest products/small business | 4 |

## 4.3 Types of forest products harvested

The results showed that firewood was the most commonly (30%) harvested forest product followed by fodder (20%), then poles and posts and herbal medicine (Table 9).

Table 9: Types of forest product harvested from the forest

| Types of products harvested | % frequency |
|---|---|
| Poles and posts | 15 |
| Firewood | 30 |
| Fodder | 20 |
| Medicinal plants | 15 |
| Wildlife | 2 |
| Honey | 5 |
| Water | 3.0 |
| Charcoal | 6 |
| Stones | 2 |
| Sisal | 2 |
| Fish | 2 |

The results show that a majority of farmers (42%) did not have any particular preference of species so long as they were able to harvest the product they wished (Table 10). This is an indication that even the not so much valued species are in danger due to indiscriminate harvesting. Another possibility could be that the highly valued species have been over harvested and are now scarce so the farmers have to resort to what is available. This lack of options and indiscriminate harvesting has created further conflicts among users, between users and managers and between users and the conservation of the forest resource.

**Table 10: Types of tree species commonly harvested**

| Tree species harvested | % frequency |
|---|---|
| *Cypress/pines/eucalyptus* | 7.3 |
| *Grass* | 16.4 |
| *Juniperous sp* | 5.5 |
| *Olea sp* | 18.2 |
| *Mangroves* | 3.6 |
| *Teclea sp* | 3.6 |
| *shrubs/herbs* | 3.6 |
| *any species* | 41.8 |

## 4.4 Human conflicts

Several factors were identified as the major sources of human-to-human conflicts among the forest users. These included legal claim of forest products, establishment and following of rules governing the use of the forest, restrictions on quantity of forest products harvested, infractions, inadequate land, rights of forest use and products.

### 4.4.1 Conflicts among actors

A majority (51%) of community members mentioned that over the last two years (prior to the date when the data was collected) there had been cases of conflicts among actors. The main nature of conflict identified was the increasing scarcity of land for the growing population and higher demands for forest products which therefore led to a scarcity of the forest resources. The second major source of conflict was by the forest regulators[1] who felt that communities were the main causes of forest destruction (Table 11).

**Table 11: Nature of conflicts among the forest users and regulators**

| Nature of conflict | % frequency |
|---|---|
| Non payment of permit | 7 |
| Regulators feel community is cause of forest destruction | 23 |
| Dissatisfaction among members due to some engaging in forest destruction | 7 |
| Conflicts due to scarcity of land/ forest resources | 43 |
| Increasing poverty, greed, jealousy | 3 |

[1] Kenya Forest Service, Kenya Wildlife Service, The County Council etc

| | |
|---|---|
| Poaching forest products | 7 |
| Over exploitation of forest products | 3 |
| Harsh conduct of forest regulators | 7 |

Members of the community all agreed that there were conflicts among them and between them and regulators. About 32% felt that the level of conflicts had increased, 50% felt that the level of conflicts had remained the same and 17% thought that the levels had decreased significantly. This means that an average of 82% (32%+50%) felt that the conflict level among the forest users was generally high. Members of the forest community also felt that the conflicts were disruptive of normal activities of the forest (17%); 50% said that the conflicts only caused disruptions on certain occasions and 33% said that conflicts were channeled in ways that were not disruptive of normal activities.

### 4.4.2 Conflicts over legal claims

Forest users had different legal claims on forest products (Table 12). Most members of the community used the forest irrespective of the rules laid down for its harvest (de facto).

**Table 12: Legal claim of forest product use**

| Legal claim | % frequency |
|---|---|
| De jure (*by right as established by law)* | 23 |
| De facto (*as exists, not necessarily by legal establishment* | 34 |
| De jure and de facto( *formal right and are exercising it)* | 25 |
| Contrary to formal law | 18 |

These results showed that legal claims resulted to conflicts especially through individuals who harvested forest products contrary to the law (conflict with law regulators of the forest), as exists and not necessary by legal establishment (conflict with regulators who followed legal establishment, conflict with communities who protect the forest). For instance, some of the established legal claims were obtaining licensing for use and harvesting of forest resources and seeking request from KFS for forest product collection. What is evident in these legalities is that some members of the community/ies did not necessarily follow the rules and they continued using the forest. Although 83% agreed that there are rules affecting the harvesting of forest products and 80% agreed that there

were rules regarding the quantities harvested, these rules were rarely followed. The data collected showed that more than half of community members rarely or only sometimes followed rules (table 13)

Table 13: Percentage of individuals who follow rules

| Follow rules | % frequency |
|---|---|
| Rarely or never | 22 |
| Sometimes | 28 |
| About half the time | 2 |
| Most of the time | 24 |
| Yes almost always | 24 |

The main infractions by community members included stealing forest products (36%); non payment of forest product fee (22%) and through destructive harvesting (21%). Only 2% of the community members claimed not to have violated any forest rules (Table 14). The use of unacceptable technologies were mainly the use of machetes and axes and power saws to cut down trees yet the community members are not allowed to use these sort of tools to enter the forest. Community members also lit fires in the forest to harvest honey yet according to the law, it is illegal to light a fire in the forest.

**Table 14: Types of infractions**

| Types of infractions | % frequency |
|---|---|
| Stealing prohibited forest products | 36 |
| Use an unaccepted technology | 7 |
| Non payment of fees | 22 |
| Destructive harvesting | 21 |
| Harvesting in prohibited area/time | 8 |
| Harvesting indigenous species | 2 |
| No infractions | 2 |
| Entering shrines | 1 |

Majority of these infractions (stealing of forest products, use of unacceptable technology, destructive harvesting and harvesting in prohibited areas) were mainly (80-100%) done at daytime. This is also worthy of note since the

members of community are allowed to enter the forest during the day but never at night. The implication here is that either there is very little control by the forest managers or that it is possible to compromise the forest managers. Only very few (28%) broke the rules after 6 pm and before 6.00am when no members were allowed in the forest.

Most infractions were mainly done all the year round. The reasons for committing the mentioned infractions were varied (Table 15).

**Table 15: Reasons for committing the infractions**

| Reasons for infractions | % response |
|---|---|
| Refusal to pay permit | 9 |
| Indigenous species are high quality | 3 |
| Scarcity of products outside forest | 9 |
| Entry is restricted | 4 |
| Inadequate forest surveillance | 20 |
| Poverty/low incomes | 32 |
| To harvest more products | 9 |
| Lack of alternatives | 1 |
| Ignorance/greed of people | 6 |
| Scarcity of dead branches and other products in forest | 7 |

The above results (table 15) indicate that poverty and low income (32%) was the major reason for committing infractions which could be attributed to over dependence on forest products and the inability to pay for harvesting permit. Inadequate forest surveillance (20%) was also high and this could be attributed to scarce resources in terms of personnel and financial constraints on the government (KFS, KWS) to cover all the forested areas. The Kenya Forest Service has only about 1 forest guard to man 3000 hectares of forest. The guard often lacks facilitation in terms of transport facilities, arms, ammunition and no means of communication. Other reasons mentioned such as the need for high quality indigenous species may be linked to the ban by the government on the harvesting of products and the illegal nature of harvesting some species.

## 5. Conclusions and Recommendations

Results from the study indicate that few demographic factors affect the use and condition of the forest. Population change for example was found to significantly affect the condition of the forests. The more the number of people in a given settlement, the more their dependence on the forest and therefore the higher the level of destruction. This has led to a decrease in the density in some forests. The ban on the harvesting of forest products by the government curtailed, to some extent, the use and harvesting of some products thus some forests remained the same or slightly improved in terms of increase in density. Results further indicated that there was no significant relationship between other demographic factors such as wealth, level of education, ownership of land and even acreage of land on the use and harvesting of forest products. The implication here is that irrespective of whether or not a farmer is wealthy, educated, and whether or not they owned land, their dependence on the forest products remained the same.

The results from the demographic factors indicate that forest communities will continue to use and scramble for the scarce forest resources. The implication being that conflicts will continue and as the population grows, conflicts are likely to worsen. There is therefore need for the government and other forest regulators to harmonize the utilization and harvesting of forest products in a way that there is sustainability. The recently introduced Forest policy that will include community members in the decision making regarding forest use and conservation should take into account the community needs and find ways of sustainable harvesting to avoid further conflicts.

Other conflicts regarding forest legislation should also be harmonized. For example, rules laid down by law should be practical and should take into account the forest needs of the communities. Participatory Forest Management principles should be initiated and followed so that communities can co own and co manage forests adjacent to them so as to ensure less infractions and more legal utilization. Forest communities should also be involved in protection and policing of forests since the government cannot police all the forests effectively.

Whereas there have been suggestions on ways to increase density and species diversity within the forests, conservation measures must take into account the forest needs of the communities. The total ban imposed on the harvesting of the forest products as a way of increasing forest cover and reducing destruction may have worked but only to a small extent and only in areas where control is tight. On the other hand, destruction has been higher due to the 'illegal' harvesting or poaching of products. There has also been an increase in the timber black market which has further created a niche for poachers to invade thus increasing forest /human conflicts.

Finally, decentralising powers of decision making from centre to local level institutions will maximise the involvement of local communities to ensure reduction of conflicts and improve the sustainable management of the forests.

**REFERENCES**

Barrow, C.J, 1999. Environmental Management: Principles and Practise. London, Routledge

Castro and Nielsen, eds. (2004). Natural Resource Conflict management Case studies: An Analysis of Power, Participation and Protected Areas. Forest Ecology and Management 193 (2004) 427-428.

Castro, A.P. and Nielsen, E. (2001). Indigenous People and Co-Management: Implications for Conflict Management. Environmental Science and Policy 4 (2001) 229-239.

Kigenyi, F. Peter Gondo and John Mugabe. 2002. Practice Before Policy: An Analysis of Policy and Institutional Changes Enabling Community Involvement in Forest Management in Eastern and Southern Africa. NRI and IUCN, Nairobi
Ochieng-Odhiambo, M (2000). Oxfam Karamoja Conflict Study:A Report. Oxfam. Kampala

Knox A., Meinzen-Dick R., and Hazell P. 1998. Property Rights, Collective Action and Technologies for Natural Resource Management. CAPRi Working Paper No. 1. IFPRI, Washington DC

Okoth-Ogendo, H.W.O. (2000) Legislative Approaches to Customary Tenure and Tenure Reform in East Africa.

Ongugo, P.O (2004) Unpublished PhD Thesis. Livelihoods and Institutions for Sustainable Natural Forests: the case of Mt. Elgon Forest, Kenya

Ostrom, Elinor and Mary Beth Wertime (1995). The International Institutions and Development Framework. Workshop in Political Theory and Policy Analysis. Indiana University, Bloomington.

Rocheleau, D. and Edmunds, D. (1997). Women, Men and Trees: Gender, Power and Property in Forest and Agrarian Landscapes. World Development, Vol. 25, No. 8, pp. 1351-1371, 1997.

Sarin, M. (1998). From Conflict to Collaboration: Institutional Issues in Community Management. In: Poffenberger, M. and McGean, B (1998). Village Voices, Forest Choices: Joint Forest Management in India. Oxford University Press. Oxford.

Sayer J., Elliot C., Barrow E., Gretzinger S., Maginnis S., McShane T. and Shepherd G. 2005. Implications for Biodiversity Conservation of Decentralized Forest Resource Management. In: Pierce C.J., Capistrano D. and C. (Eds). The

Politics of Decentralization: Forests, Power and People. Earthscan Publishers, UK. Pp. 121-137

Shackleton, S, Campbell, B, Wollenberg, E and Edmunds, D, 2002. Devolution and Community Based Natural Resource Management: Creating Space for Local People to Participate and Benefit? Natural Resource Perspectives paper No. 76. Overseas Development Institute

Wass, P. (2000). Kenya's Forest Resource Assessment. EC-FAO Partnership Programme (1998-2002) Project GCP/INT/679/EC. Addis Ababa, Ethiopia.

Wiebe, K.D. and Meinzen-Dick, R. (1998). Property Rights as Policy Tools for Sustainable Development. Land Use Policy, Vol. 15. No. 3, pp. 203-215, 1998.