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Studies on the Role of Markets Solutions to Natural Resource Conservation: A case of Junperus Procera in Marakwet District. Joshua K. Cheboiwo[1] and David Langat [2]

1.0 Introduction

Marakwet District is one of the 17 districts of the Rift Valley Province. It borders West Pokot to the North, Trans Nzoia, to the West, Uasin Gishu and Keiyo to the South and Baringo to the East. The district measures about 1709 Sq.km and consists of 4 divisions Kapcherop(462 sq.km), Chebiemit(509 Sq.Km, Tirap (529 Sq.Km) and Tot (209 Sq.Km). The district fall into three geographical zones the highlands, transitional escarpment and Kerio Valley. In the highlands the rainfall range from 1,000mm to 1300mm, transitional escarpment experiences 850mm to 1000mm and valley less than 850mm per year. The plateau measures about 2800m above sea level that rises to about 33500m at Cherangany Hills. Kapcherop, Tirap and Chebiemit divisions cover most of the Cherangany Hills that hosts the bulk of the public and private forests in Marakwet District. The district is relatively hilly with deep gorges cut by fast flowing tributaries of various rivers. Farming along steep river gorges and hill sites is unfavourable due to high soil erosion and need for intensive terracing. Cherangany Hills forms an important watershed in Western Kenya, western escarpment is an important source of rivers that drain to Lake Basin, Moiben and Chepkaitit), those that drain northwards to semi-arid lands include Kerio, Chesegon, Embobut, Embomon, Arror and Morun, The population of Marakwet District was 156,303 in 1999 and was estimated at 174,766 in 2005. Kapcherop, Tirap and Chebiemit that cover most of Cherangany Hills account for 77.5% of the population. Agriculturally, the highland produces several food and cash crops such as maize, potatoes, wheat, tea and pyrethrum. Livestock include improved and traditional beef producing cows, wool producing merino sheep and traditional sheep. The Kerio Valley is classified as marginal agricultural potential zone and main crops grown include maize, millet,cotton and horticultural crops under irrigation. Livestock activities include beef cattle and goats.

Farmers in the highland have relatively low population density and large farms. These farms host significant natural forests mostly on hillsides and river courses. Among the important indigenous trees to be found on both public and private forests are Africa Pencil Cedar (*J.*

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procera, East Africa Yellow Wood (*P. latifolius*), Mueri(*P. africana*) and Mkorombozi (*Hagenia abyssinica*). Planting of cypress is widely adopted for marking boundaries and enclosing homesteads.

2.0 Problem Statement

The increasing population dependent of on-farm activities has increased clearing of land under indigenous tree cover been to create agricultural fields. Various high value indigenous species such as Cedar are likely to be drastically reduced or wiped out of farms because of the eminent conflict between farmers financial and subsistence needs on the existing land base and conservation of these species. It is clear that the future of Cedar on farms may depend on its increased proportional contribution to the overall household subsistence and financial needs.

The best approaches may involve market-based solutions that ensure that the farmers get tangible benefits from conservation of indigenous tree especially Cedar. This is a diversion from recent farm forestry development approaches that concentrated on material subsistence and intangible benefits. Although such approaches may have positively influenced tree planting and conservation culture among land owners, current situation where over 46% of Kenyans are classified as under poverty line (GOK, 2001) may call for new approaches that address poverty among land dependent rural population. The Millennium Development Goal targets to reduce poverty by 2015 in the developing countries while promoting environmental sustainability (UN, 2000). Similarly, the Kenya Government poverty reduction strategy policy (PRSP) proposes multiple strategies to improve the wealth of Kenyans among them the wise use of natural resources (GOK, 2001). However, the potential role of market based conservation approaches in natural resource conservation is least understood at the moment. The basic theory underlying the market based conservation is simple, create markets for tree products in order to increase the value that landowners place on it and hence motivate them to conserve and manage them better. Similarly, benefits generated by Cedar trees to farmers will motive them to invest its conservation on farms. This is attested by studies that have shown that economically valuable forests do provide incentives for local landowners to protect tree stands and environmental services (Scherr, 2000). In contrast, high prices for forest resources in communal/public lands is known to accelerate their harvesting that has made many forestry agencies and conservation organizations highly resistant to the development of local commercial enterprises for fear of accelerated forest resource depletion (Contreras-Hermosilla, 2002; Rice et al, 2001).

realizing full benefits from their forest resource management efforts but also ensure that those who overcome barriers benefit more than the resource owners. On global scale it is widely argued that making local commercial production illegal, despite active demand inadvertently leads to forest degradation, encourages corruption and undermines the rule of law whereas forest market development can positively contribute to local livelihoods and community development (Scherr et al, 2003).

3.0 Research Goal/Purpose

Promote market driven conservation of Juniperus procera on farms through income generation by efficient processing, utilization and marketing of its various products.

3.1 Broad Objectives

To evaluate the potential of market based conservation approaches in the promotion of Cedar on farms in Marakwet District and its replication elsewhere in the country.

3.2 Specific Objectives/Activities

1. Carry out socio-economic survey on households having Cedar on their farms in selected Kapcherop Division in Marakwet District.
2. Carry out sample surveys on Cedar resources on farms
3. Study markets and marketing systems for Cedar product in Western Kenya
4. Evaluate existing policies and regulatory structures that affect trade in Cedar products.
5. Recommend actions for promotion of market driven solutions to motivate farmers to conserve Cedar on farms.

4.0 Study Site, Methods and Sample Frame.

The study was done in October 2003 in Lelan location of Kapcherop Division. The study site has an average altitude of 3400m above sea level. The survey comprised three components: socioeconomic, forestry resource and Cedar products market surveys. The socioeconomic and forestry resource surveys were done concurrently on selected farmers and farms.

Stratified sampling procedure was adopted where the sample area was divided into three transects to cover the households along the major water streams, middle upland and those at the hillsides. Forestry resources generally differed mostly in composition across the farm transects. The glades and open spaces were more abundant on the upland and hillsides than riverside transects. Surveys

were done on randomly selected farmers and farms in the selected transects. A total of 53 households were interviewed using a structured questionnaire that included household characteristics, income opportunities and forestry land use activities. The forestry resource survey involved stem and regeneration potential counts and measurement of diameter and heights of dominant species.

Point sampling was used in the sampling Cedar resources at the farm level where sample plots were established on the forested farm transects. In the forested transects, temporary sample plots (20mX20m) were established. The following tree resource information was collected : Species composition, tree mensurational characteristics (tree- shape, Diameter at breast height (Dbh) and height), other information noted included the tree growing niches, age of the tree, regenerations, saplings and human impacts.

The marketing survey involved some random interviewing farmers on the various Cedar products both for domestic consumption and sale. On traded products information on processing, distribution merchants and major outlets was collected from the farmers, power saw operators, and merchants operating in the study area. Similarly, product flow from study area to major outlets in Kisumu and Bungoma the main Cedar product markets in Western Kenya. The surveyed was intended to capture processing costs and gate prices at the farm and as well the transfer costs, wholesale and retail prices of major Cedar products.

5.0 Study Results.

5.1 Households Characteristics.

The mean age of the household heads was 49 years and the mean number of household members was 5. Most of the sampled households have lived in the study area for an average of 45 years. Households on average owned about 27.2 hectares in the study area and another 4.4 hectares elsewhere mostly in Uasin Gishu District. The price of land was approximately Ksh 70,000 per hectare

The farmers reported that most of them moved to Uasin Gishu and other former white settler districts in between 1960 and 1970 where they had purchased fertile lands. The out-migration accelerated in 1970's when merino sheep rearing the main income generating land use then was abandoned when wool markets collapsed to concentrate in maize and wheat farming in the newly purchased farms in the former settler districts. However, the populations of migrant families in Uasin Gishu and other settler districts have steadily increased over the last decades forcing some family members to return to the study area where their main on-farm economic activities are mostly forestry and agriculture. However, sheep keeping has remerged in 2000 due to high demand for wool by emerging textile

firms under AGOA initiative. Many farmers have since opened up large tract of land for sheep farming.

The sample household land use distribution results show that livestock and settlements accounted for 46% of the total land area. Land occupied by trees was second accounting for 44% whereas land under crop was least accounting for 10%. The average agricultural incomes amounted to Ksh.85835 of which livestock accounted for 51% and crops 49% of the total.

The area being high altitude is marginal zone for maize farming thus the main agricultural crops include, maize, potatoes, cabbages and pyrethrum. The leading crop in income generation among the sample households was potatoes (58%), followed in that order by pyrethrum (25%), whereas maize and cabbages followed in that order.

The livestock kept by the sample households include cattle and sheep. Each household on average kept about 24 cattle and 55 sheep. In 2002/2003 season each households sold on average about 2.9 cattle and 12 sheep generating an income of about Ksh 42723 with cattle accounting for 58% and sheep 42% of the income respectively.

6.0 Natural Tree Resources On-Farms

6.1 Composition of Tree Resources on Farms

The dominant species is *Juniperus procera* found scattered or in clusters and on average cover slightly above 20% of individual farms and accounts for 60% of the forests on the farms. *Juniperus procera* occurrence is dominant in both stages of sapling and seedling in the farms surveyed. The other indigenous species found on the farms included *Rapaenae Melaphloes, Hagenia abbysinica, Dombeya torida,and olea capensis.* (Table 1 and 2).

Table 1: Relative Occurance of some indigenous species recorded on farms in Lelan Location Marakwet District.

Species	Relative occurance (%)	Remarks
Juniperus procera	80%	
R. melanophloes	7%	
Hagenia abbyssinica	3%	
Olea capense	2%	
Dombeya torida	1%	
Others	7%	

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Table 2: Characteristics of Farm Tree Resources in Lelan Location, Marakwet District

Tree Species	Volume m3	DBH (cm)	Height (m)
Juniperus procera	0.731(.13)	25.37(17.73	19.00(9.28)
Olea capensis	0.864(.10)	51.77(26.08)	30.69(13.66)
Ficus natalensis	0.874	45.00	30.00
Rapaenae melanophloes	0.751(.11)	30.93(33.67)	16.09(9.03)
Nuxia congesta	0.787(.11)	32.50(20.85)	15.50(5.74)
Euclea divinorum	0.52	9.00	8.00
Maythenus heterophylla	0.597(.05)	11.50(2.12)	2.00(.00)
Hagenia abbysinica	0.862(.08)	50.28(27.08)	26.67(9.82
Dombeya torida	0.871(.06)	48.75(20.38)	28.25(7.96)
Total	0.745(.13)	27.78(20.77)	19.38(9.57)

6.2 Evolution of Cedar on Farms

Sample households reported that prolific emergence of young Cedar stands on their farms occured between 1960 and 1970 (72%), between 1980 and 1990 (24%) and 1990-2000(4%). The reasons offered by the farmers was the general out-migration to settler farms and the collapse of wool markets that drastically reduced the number of merino sheep forcing more farmers seek new income opportunities in the former settler farmers. However, with declining economic opportunities in former settler areas and emergence of markets wool markets and horticultural produce in urban areas has attracted more people within the last decade leading to more land being opened for pasture and cultivation of crops.

On the view of the proliferation of Cedar trees on farms, 56% of households did not consider it as a problem to their farming activities whereas 44% reported to that it is infectious weeds that need to be controlled. The farmers carried some the following silvicultural operations on Cedar forests to reduce competition to pasture and agricultural crops: thinning (42%), pruning (54%) and pollarding (4%). The products the respondents harvested from Cedar forests included polewood (54%), sawnwood (32%) and fencing posts (14%).

7. 0. The Future of Cedar on Farms

Majority of the respondents (90%) reported that they would maintain Cedar forests on their farm whereas only 10% were planning to reduce them to create room for pasture and crop farming. The importance of Cedar forests in provision of materials for domestic uses and environmental services were cited by 54% of the respondents as the main purpose for their retention on farms 46% cited

income generation. However, 98% of respondents reported that good Cedar prices are likely to encourage them to conserve and manage Cedar forests on farms.

To attract investors and merchants into Cedar processing and trade in its products 86% of the respondents wanted the government to facilitate establishment of processing enterprises in the district and encourage freer harvesting and movement Cedar products in the country. Formation of producer associations to market Cedar and other farm forestry products in distant markets generate higher incomes to farmers was cited by 16% of the respondents.

7.1 Problems in Harvesting and Transfer of Products

All the sample households reported to encounter some problems in harvesting and processing of Cedar trees on their farms. The nature of the problems reported were permits system reported by 72% and harassment and bribe seeking by police when transporting Cedar products to distant markets (28%).

7.2 Main Buyers of Cedar Products

The main buyers of Cedar products reported were neighbours (42%), local merchants (34%) and distant merchants (24%). The entry of both local and distant merchants is significant and attests to the increasing trade on Cedar products. However, most farmers felt that there was need for more buyers to enter the trade in order to enhance competition and overall demand for the various products and hence higher prices and incomes from Cedar resources.

On market and price information, most farmers reported that they were aware of markets and prices for Cedar products in the main regional markets Eldoret, Bungoma and Kisumu (92%). The distant markets were reported to offered better prices for Cedar products as compared to local buyers (94%). The results reveal that farmers are aware of existing markets and prices for major Cedar products in the regional markets. Their participation in regional markets is likely to earn them higher incomes under freer trade conditions. This is because farmers are likely to benefit from competition from Cedar resources and by extension their conservation efforts than the otherwise.

8.0 Markets and Marketing Opportunities for Cedar Products

Due to administrative prohibitions and decrees on Cedar felling and processing most lucrative tiling and saw milling enterprises closed long time ago due uncertainty in procurement of raw materials and ability to meet consumer orders. The closed enterprises used to produce premium sawnwood for floor

tiles and other valuable products for specialized markets and even export. The collapse of the saw milling enterprises has left fencing posts as the main tradable Cedar product with high demand in local and regional markets. Other Cedar products have limited markets and rarely traded includes sawnwood, roofing shingles and poles. Roofing shingles are produced from either the Cedar bark or wood and have recently become popular among the residents in the study area. Cedar sawnwood is rarely traded in the region due to severe restrictions on processing and movement through permits systems.

Cedar fencing posts for use in fencing farms, residential estates and houses in urban areas are in very high demand. Its ability to endure moist conditions, termite attack and ease in nailing makes it a first class fencing post material. Stockists in regional markets reported severe shortage of Cedar fencing posts and most of them were stocking inferior Eucalyptus posts. In contrast, at the farm level, farmers frustrated punitive and restrictive government decrees on processing and movement of Cedar products have resorted to burning large Cedar trees on their farms to free land for agricultural activities.

These developments have left Cedar with no competitive market except conversion into low value fencing posts through wasteful processing by local artisans using crude tools. Revival of Cedar based industries through investments in well-equipped and efficient micro-enterprises that produce high value products targeting upper markets uses and users is highly recommended.

9.0 Distribution of income in Cedar Trade

There is general difficulty in movement of large consignment of Cedar posts by farmers and small-scale traders from farms to distant regional market outlets as compared to well connected and risk taking traders. The merchant usually use 7 tonne lorry that carry between 1000-2000 posts depending on their sizes. The merchants reported to pay bribes at police road blocks mounted along major road networks. The North Rift consumers that neighbour Marakwet mostly farmers and urban developers in Uasin Gishu and Trans Nzoia districts get posts deliveries from various small scale traders that use porous routes.

The distribution of the consumer price of consignments delivered to Kisumu indicate that a farmer in Marakwet District received relatively low consumer price share (28%) whereas the rest was shared among on-farm processing agents (9%), transfer merchants (27%), transporters (18%) and wholesalers (18%). The farmer's consumer price share may not fully compensate for the cost of

keeping the tree on the farm for such a long time thus indicating that the marketing system penalizes the farmer more that it encourages.

Table 3: Distribution of Consumer price in the Value Market Chain

Agents	Consumer price share (%)	Remarks
Farmer	28%	Returns to tree owner
Processing agents	9%	Felling and splitting
Transfer Merchant	27%	Purchase and transfer
Transporters	18%	Payment for lorry owner
Wholesalers	18%	Storage and sale

Merchants are well informed on procedures for seeking permits and well connected to overcome any obstacles on the route to regional markets at some reasonable costs in terms of bribes. Thus extra transfer costs in terms of time and financial outlays being forced into the marketing system penalizes the farmer and consumers as the two principal players the merchants and wholesalers try as much to maintain their trading margins.

10.0 Concluding Remarks

Despite the abundant natural tree resources on farms, the existing regulatory framework is hostile and punitive to emergence of vibrant trade in Cedar products in the region as it introduces rent seeking and other inefficiencies in the marketing system. Despite the farmers willingness to conserve Cedar resources and reasonable returns expectation the regulatory and marketing systems in place may not provide sufficient motivation for farmers to conserve Cedar resources on farms into the future.

Freer marketing environment and initiation of local processing enterprises to add value to Cedar resources is highly recommended. The development will encourage competition among merchants and promote investments value adding processing of newer high value products such as constituted wood, floor tiles and internal finishing panels from Cedar roundwood. These developments will not only enhance incomes to land owners in the long run but is likely to encourage them to conserve and mange better Cedar resources on their farms.

The above observations are supported by several recent studies that found that current conservation strategies not only impoverished small forest producers but have as well threatened local forest based enterprises. Kaimowitz, (2003) observes that the current illegal or restricted status of private indigenous forests make local producers prey to excessive fines, threat of jail and other oppressive behaviour by those in authority. Similarly, they put them in weak position to negotiate price or term

of deals with buyers and suppliers and as well ineligible for technical assistance or credit. It is reported that command and control administrative strategies are still in use in many countries despite the lack of evidence that excessive regulations have led to less deforestation or more conservation management (Merino, 2002). In India excessive regulatory control placed on harvesting of sandalwood on private farms infuriated many farmers who choose to cut down any sandalwood that grows wild in their farms (Kumar and Saxena, 2002). Similarly, farmers in Brazil are reported to kill mahogany wildings that sprout on their farms to avoid complications related to CITES regulations (Richards, et al, 2003).

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