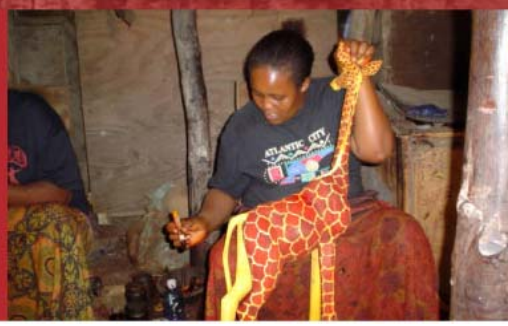

Growing farm timber:
practices, markets and policies

The Meru timber marketing pilot programme case studies and reviews

Sammy Carsan and Christine Holding

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FOREWORD

Smallholder timber is an important value asset for thousands of rural people in East Africa dependent on a scarce forest resource base. This report highlights clear pathways to promote farm timber production practices, marketing and policies so as to support farmers and timber businesses. To fill the supply gap left by the diminished forest plantations, strategic marketing demands farmers broaden their tree species portfolio and expand tree cultivation on farms. On the other hand, timber businesses have to reinvent their businesses to remain profitable by sourcing timber from farms. The required market planning however ought to improve on the current timber value chain where smallholders suffer little supply channel power and market position.

The technical case study reviews on marketing, policy and farm timber practices provides important findings seeking multi-sectoral partner engagement to drive the research and development agenda on farm timber marketing. The Forest Action Network (FAN) and the World Agroforestry Centre (ICRAF) partnership to undertake research, policy advocacy and extension work at a pilot level in Meru, identifies useful lessons and pathways to inform and guide policy in Kenya. This study goes further to evaluate cross regional smallholder timber marketing experiences to cross fertilize information and support emerging policy frameworks.

The ultimate goal of the study is therefore to share key findings and hopefully support market and policy development for smallholder timber farmers and businesses. It is our view that the contents of this study will help sustain and strengthen the involvement of different stakeholders on farm timber marketing.

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The participatory appraisals would not have been possible without the contribution of expertise and time by Paul Njuguna and Peter Muigai who facilitated the biomass inventories and surveys. Many thanks to Paul Opanga and James Onchieku, for facilitating case studies on *Grevillea* marketing chain and timber milling recoveries. The coffee society in Meru central and the British American Tobacco representatives are recognized and thanked for their field logistics support. Much appreciation to the Chief of Njuki Njiru location, Nathan Kiumbe for his dedication and support during community visits and meetings.

From a research stand point, we cannot overstate the importance of timely, carefully researched cases in contributing to a substantive study. We acknowledge the help of research support unit at ICRAF, Ric Coe and Peter Muraya in facilitating data collation, interpretation and management. The support by Nelly Mutio, Alexious Mutua, Sallyanne Muhuro and Caleb Orwa in helping in data entry, collation and retrieval systems is much appreciated. Special thanks to Stella Muasya for providing budget allocation and information support on linked project activities at the Trees and Markets theme (ICRAF).

We are intellectually indebted to our participating farmer timber marketing groups in Njuki Njiru and Igoki Locations, extension staff, researchers who made the study possible through their time and willingness to share their knowledge and experiences on farm timber marketing. We express our thanks to many colleagues who provided valuable guidance and programmatic support to facilitate the pilot initiative: Jonathan Muriuki, Ard Lengkeek, Roeland Kindt, Esther Mugure, Lucy Mwaura, Ann Mbora, Steve Franzel, Bashir Jama, Steve Ruigu, Caleb Orwa and Mark Owaga to name just but a few.

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LIST OF ACRONYMS AND ABBREVIATIONS

ASAL:	Arid and Semi Arid Lands
BAT:	British American Tobacco
DBH:	Diameter at Breast Height
FD:	Forest Department
FAN:	Forest Action Network
FAO:	United Nations Food and Agriculture Organization
ICRAF:	World Agroforestry Centre
KEFRI:	Kenya Forestry Research Institute
KFMP:	Kenya Forestry Master Plan
KFWG:	Kenya Forests Working Group
KIFCON:	Kenya Indigenous Forest Conservation Project
KTDA:	Kenya Tea Development Agency
KWS:	Kenya Wildlife Service
MDG's:	Millennium Development Goals
MOU:	Memorandum of Understanding
NGO:	Non-governmental Organization
NMK:	National Museums of Kenya
NRM:	Natural Resource Management
UNEP:	United Nations Environment Programme
UNESCO:	United Nations Educational, Scientific and Cultural Organization
PRSPS:	Poverty Reduction Strategy Papers

BACKGROUND

This report comprises of a series of four part study to investigate the potential of farm-level timber marketing by exploring current production practices, marketing challenges and policy evolvement. The study was conceived out of a baseline study conducted by ICRAF and concerned stakeholders especially after the ban on forest logging in 1999. The Meru timber marketing pilot programme, implemented jointly by the World Agroforestry Centre, the Forest Action Network, the Kenyan Ministry of Agriculture and Rural Development and FAO, was initiated on a pilot level to address issues of farm timber supply. The programme under the advocacy programme on natural resource management supported by *Sida* is based on a series of interlinked research, advocacy and extension activities. This report details research surveys, case studies and policy assessment outcomes in four chapters and programme components:

- Farm timber supply: Component 1.2.1
- International, experiences and relations to policy: Component 1.2.2
- Local timber market: Component 1.2.3
- Future policy options: Component 1.2.4

The component chapters were selected based upon smallholder timber marketing programme stakeholder consultations processes and is pegged to the joint ICRAF/FAN memorandum of understanding and budget. ICRAF facilitated the study through several partnerships such as the Ministry of Agriculture and Rural Development, Forest department, Kenya Forest Research Institute (KEFRI) and FAO amongst others.

The chapters seek to integrate and support both policy advocacy and extension work on smallholder timber marketing while highlighting issues for future policy directions. The first chapter assesses smallholder timber resource audit along farmer livelihood strategies. The potential of existing woody resources to meet wood demands is highlighted while underpinning needs for the sub sector market development.

Chapter two of the report reviews international smallholder timber practices and attempts to relate Kenya's emerging smallholder practices with other experiences from the rest of the world. Chapter three and four of the report takes a keen look at a case study on marketing *Grevillea robusta* in Kenya and identifies key opportunities and challenges to growing the market. The policy overview seeks to inform forest and forestry product policy on key development pathways.

In a nut shell, the report traces the changing fortunes of forestry products in Kenya and seeks means to support smallholder timber production practices and businesses in improving farm timber value chain. In doing so, the importance of multi-sectoral engagement is sought to realize an integrated approach to redressing emerging issues on the sub sector. More importantly, the role of trees in farming systems is again more usefully highlighted as a household livelihood asset through well planned marketing.

CHAPTER ONE

COMPONENT 1.2.1

1.0 FARM TIMBER SUPPLY

1.1 INTRODUCTION

Timber from natural forests is increasingly over logged and is now less available due to emerging environmental and social-economic concerns. Industrial plantations make up only about five percent of the total forest area but provide 35 percent of the world's wood supply (FAO, 2001). Expansion of plantation forests is limited because of competition from alternative land uses. Trees grown on agricultural land on the hand provide a growing source of wood supply. According to the Kenya Forestry Master Plan (KFMP) woody trees on farm exceed trees in indigenous and plantations forests combined. Farmer tree production is no longer seen along narrow environmental goals rather the practice assumes a livelihood goal with trees as real value strategy asset. However, most efforts to enhance small-scale timber production have focused on planting or growing trees while marketing has received little attention and is poorly understood. Farmers and many development projects often start planting trees without knowing the market. This study investigates Kenya's timber supply with a particular focus on farm timber supply while taking a departure on the traditional forestry timber supply.

The total area of Kenya's closed canopy of indigenous forest is 1.24 million hectares (Wass, 1995). Plantation forest cover is about 165,000 hectares. The country's gazetted forest cover is under 2%. Forest land is under a continuous threat of excisions for agriculture, settlement and over logging. In a survey of forest estate conducted in 1999, it was found that 50,000ha in the west of the Rift Valley and 5,700 hectare in the east of the Rift Valley had either been excised or proposed for excision in the last five years. The general state of management in the plantation sector was low; with *none* of the forest blocks visited having a management plan (Njuguna *et al*., 1999).

According to the Kenya Forest Master Plan estimates (Appendice1), if the then current trends continued, by the year 2010, the majority of timber and poles would be sourced from farms. The Master Plan proposed a comprehensive set of measures to facilitate improved management of the forest estate including closer linkages between industry and farm tree growers that could provide the rural population with increased earnings from sales of wood and other industrial raw material and from the various steps in tree-product harvesting, transport and processing (KFMP, 1994).

Tree planting on farm or agroforestry[1] has a strong tradition in the country. As trees on natural forests decrease, trees planted on farms have increased. Despite this

[1] Agroforestry is defined as a dynamic, ecologically based natural resource management system that through the integration of trees on farm and rangeland diversifies and sustains smallholder production from increased social, economic and environmental benefits.

importance, it's only recently that the role of trees has started to be recognized. Farm biomass inventories reveal regular density of 7.5 m^3 per ha in the central agricultural areas of the country; with this rising to 17.07 m^3 per ha, in mixed stand agroforestry systems (Njuguna, *et. al,* 1999). Timber trees on farm now offer farmers a new entrepreneurial opportunity. However, the emerging farm sourced timber business presents farmers, timber businesses and customers with new challenges and opportunities. Little is known on the current sourcing and marketing processes of timber from farms. Less is known of the actual and potential returns to farmers, the structure and efficiency of the marketing chains; and the sustainability of the farm based resource.

This study presents the results of a farmer household and tree biomass survey, focusing on the impact of timber and firewood sourcing at farm level. Farmer tree management challenges and opportunities are highlighted together with an indicative tree biomass resource assessment. The two series of studies were conducted in timber marketing pilot activities on the eastern slopes of Mount Kenya during 2001–2004. The study was informed by participatory farmer assessments in Meru where farmer poor tree valuation, over harvesting and low incomes received were isolated as key impediments to growing the enterprise.

1.2 SURVEY OBJECTIVES

In order to better understand the dynamics of timber harvesting and sales at farm level in Meru. This study sought to:

1. assess the sustainability of on farm timber supply
2. determine the current rates of harvesting from farms
3. assess the actual and potential returns of merchantable wood from farms

1.3 STUDY AREA

Meru Central is one of the 13 Districts in Eastern Province of Kenya with a high tree planting culture on farm. It lies between latitudes 1^o 30' South and 0^o 35' North and between longitudes 30^o20' and 39^o5' East (Pelley*, et al.,* 1985). There is a strong tradition of agroforestry in the district with the planting and retention of a variety of multipurpose trees on farms. Farm biomass inventories reveal regular density of 7.5 m^3 ha^{-1}, rising up to 17.07 m^3 ha^{-1}, in similar mixed stand agroforestry systems (Njuguna, Holding, & Munyasya, 1999).

The topography ranges from 5200 m above sea level (Mt. Kenya) to the flat lands of Giaki/Gaitu and lower Nkuene, Igoki and Abogeta of 400 m above sea level. Most agro-ecological zones found in Kenya are found in Meru (Pelley, *et al.,* 1985). These include: UH1 and UH2 (pyrethrum/dairy zone), UM1 (tea/dairy zone), UM2 (coffee zone), UM3 (marginal coffee zone), LM3 (marginal cotton zone), LM3 and LM4 (sorghum/millet zone) and LM5 (ranching zone).

The climate and rainfall is greatly influenced by Mt. Kenya and the Nyambene Hills. The short rains occur between March and May and the long rains from October to December

(Pelley *et al.,* 1985). Rainfall varies from 2 600 mm annually in the upper highlands of Mt. Kenya to 500 mm in the lower dry parts of the district.

1.3.1 Agriculture

Meru District is one of the districts with high agricultural potential in Kenya. It has a population of 500 000; over 80 % of the people (Aprox. 90 000 farm families) live in the rural areas. Successful and productive rain-fed agriculture, however, is limited to a comparatively small part of it, but the output is one of the highest in the country (Jaetzold and Schmidt, 1983). The average farm size is 2 ha (Ministry of Agriculture, 2000).

Meru people predominantly practise mixed farming, i.e. crop cultivation and animal husbandry. Cash crops include: coffee, tea, tobacco, cotton, miraa (*Catha edulis*) and macadamia nuts. Maize, beans, potatoes, sorghum, pigeon peas, green grams, cassava, yams, arrowroots and millet are used as staple crops. Oil crops produced in the area include sunflower, cotton, groundnuts and soybeans (Ministry of Agriculture, 2000). There are 100 large-scale farms (over 20 ha) and ca 90 000 small-scale farms.

The coffee and cotton zone characterize the main agricultural production zones in Meru. Further, they broadly represent the agro ecological zones widely defined by distinct agro-climatic factors. The names of the main zones refer to the potentially leading crop grown here. There are however other crops that can be grown as well. The generalized agro-ecological zones in Kenya are based on the FAO characterization of 1978. The two zone groups are more appropriately distinguished by temperature and moisture levels experienced**.** They are also characterized based on the probability to meet the water requirements for the leading crops i.e. the climatic yield potential. The zones are roughly parallel to the Braun's climatic zones of the precipitation/evaporation index. The overall rainfall means show variability of 1500-2400 m for coffee zone and 1200-1400 m for the cotton zone. Topography is varied with ranges of 1280-1680 m for the coffee zone and 910-1280 m for the cotton zone

Table 1: Rainfall and temperature characteristics in the coffee (UM 2) and cotton (LM3) zones of Meru district.

Agro-Ecological zone	Altitude (m)	Annual mean Temp. (^{o}C)	Annual av. rainfall in mm	60% reliability of rainfall		60% reliability of growing period	
				1st rains in mm	2nd rains in mm	1st rains in days	2nd rains in days
Main coffee zone (UM 2)	1280-1680	20.6-18.2	1500-2400	450-800	450-800	135-155	135-155
Cotton zone (LM3)	910-1280	22.9-20.6	1200-1400	450-600	450-600	105-115	85-105

Source: Jaetzold & Schmidt (1983)

The overall rainfall means show the variability for 1500-2400 mm for coffee zone and 1200-1400 mm for the cotton zone. Topography is also very varied with ranges of 1280-1680 m for the coffee zone and 910-1280 m for the cotton zone.

1.3.2 Forests

The district's forest blocks cover a total area of 86,955 ha. The main species in the gazetted indigenous forests include: *Brachylaena sp., Calodendrum capense, Catha edulis, Cordia africana, Croton macrostachyus, Croton megalocarpus, Ficus thonningii, Hagenia abyssinica, Juniperus procera, Lovoa swynnertonii, Markhamia lutea, Milicia excelsa, Ocotea usambarensis, Olea capensis, Olea europaea ssp. africana, Premna maxima, Prunus africana* and *Vitex keniensis (KWS, 1999).* The plantation forests in Meru cover a total area of 4302 ha comprising*: Cupressus lusitanica, Pinus patula, Pinus radiata* and *Eucalyptus species.* Native species, *Vitex keniensis and Cordia africana* have also been planted in designated plantation areas (Ministry of Natural Resources, 2000). Large-scale charcoal production and illegal logging continue to heavily impact on the natural forests. Some of the most targeted species include: *Ocotea usambarensis, Juniperus procera, Olea europaea ssp. africana* and *Hagenia abyssinica* (KWS, 1999).

1.4 MATERIALS AND METHODS

A cross-sectional survey was designed to assess smallholder timber production in Meru Central District. Actual timber production levels (biomass inventories) were assessed together with respective household decision making processes. Both qualitative and quantitative techniques were applied in the twin study.

Several survey techniques were combined to conduct the household study. Individual farmer, face-to-face interviews, farm walks, focus group discussions and key informant interviews (local administration, forest and agricultural department staff, firewood traders and local managers in private sectors with a direct interest in firewood supplies e.g. British American Tobacco (BAT) and Kenya Tea Development Agency (KTDA) were used to ascertain farmer decision making on timber and firewood marketing.

The interview tool consisted of a structured questionnaire with open-ended questions. A checklist of points for probing on particular issues was used to introduce a greater degree of interaction on the part of the interviewee and especially to guide the focused group discussions.

A biomass inventory was conducted on the same farms to assess the number of tree stems and volumes while relating these to use, planting niches, diameter and age classes. Recording and observation schedules were used to enumerate all the timber tree species on the farms. In most cases, a 100% enumeration was done except in homogeneous hedges and woodlots where sampling was done. The diameter at breast height, (DBH), was measured to the nearest centimetre for all the species. The woody species were classified depending on growing niches on farm, main uses, natural or planted, approximate age, tree shape and form. From the stem form, useable volume calculations were estimated. The unit of analysis for the biomass survey was the farm.

Target farmers for interviews were randomly drawn from two administrative divisions within Meru Central District. The two Divisions also represent two distinct agro-ecological zones (coffee and cotton/tobacco zones), which were delineated as

representing the problem statement. Three locations (villages) were randomly selected as they were anticipated to provide the most representative sample from the rather large geographical Divisions. As there were no readily available lists of farmers at the location level from which to draw samples, several alternative sampling frames, were investigated for aptness. These included: list of farmers from local administrative leaders, records of land ownership from the Ministry of Lands and Settlement, Ministry of Agriculture and Rural Development, catchment groups and lists of farmers from local farmer institutions such as coffee and tobacco cooperatives. The latter was used to draw a sample as it was deemed most updated and representative. Computer generated random numbers were used to select a sample list of three to four farmers to be interviewed per village. A total of 35 farmers were randomly selected for household interviews out of which 31 farms were taken for tree biomass assessments.

Quantitative data was keyed in to *Ms excel* and analysis executed using *analyse it for excel* statistical package. This following section interprets, compares and discusses the results, implications and issues arising from the analysis of both survey components.

1.5 RESULTS AND DISCUSSION

1.5.1 Farm size

The 35 farms sampled in the survey had an average size of 1.8 ha ranging from 0.1 hectares to 11 ha. The smallest farm was found in the coffee zone while the largest farm was found in the cotton/tobacco zone.

Table 2 : Farm sizes surveyed

AeZ	Respondents	Total area in Ha's	Ave. farm size in Ha.
coffee	20	20.27	1.00
cotton	15	42.61	2.80

1.5.2 Smallholder tree sales

This section discusses actual sales at household level and the farmers' future planting plans, according to their perspectives of the likely future developments in the timber and firewood markets. It was found that seven species representing one fifth of all tree species inventoried are often sold at smallholder farm gate to different customer and business types. Woody materials from farms are mainly sold in three forms: as firewood, in logs, or as standing trees[2]. A variety of different volume assessments are used[3],

[2] Poles were not found to be traded in these zones; they are mainly cut for domestic use.

[3] Firewood sales units are dependent largely on the customer or business types. Neighbors buying for various uses such as weddings and other festivities buy tree pruning as bundles often bought on estimate of 'how much bundle can be carried on the back' – a back load. A back load is estimated as 25 kgs (KIFCON 1993). However, the cartload predominates as the major measure of firewood in the two zones surveyed. Key informant information indicated that a cartload is roughly equivalent to a stack. Firewood stacks, are however, not a standard measure, and can vary between customers and location. KTDA factories buy trees whole; cut, cross cut and stacks of 4ft x 4ft x 4ft. at Ksh 120 ($1.6), costing its own labour and transport in the production of the stack at about 300 Ksh ($4.2), so total cost to the factory is estimated at Ksh 450 ($ 6.3) per stack. KTDA factories collect the firewood from farms, payment is deferred until it is received at the factory. Farmers travel to the factory (an average of 50 kms) to receive payment. Stacks prepared and sold by farmers independently in Gaitu area measure: 4ft x 3ft x 3ft. A farmer prepared stack sells at Ksh 200 ($ 2.8) per stack.

during the transactions between farmers and customers, to determine the sale price of a tree in these different forms. All transactions are on a cash basis. However, there are isolated cases where credits and exchanges are preferred. Parents for example sell firewood as part payment or *in lieu* of school fees. Also boarding schools buy firewood in stacks delivered to their premises. In these cases payment includes transport.

'Whole" or standing tree is the preferred mode of selling trees from farms. Negotiation on sales is per tree 'standing on farm', with no processing or conversion. Buyers cut and cross cut, and carry timber from farms. Branches and slabs resulting from timber recoveries are left with the farmer depending on price negotiation; if the buyer carries these products then the price of the tree is adjusted upwards. Prices paid for standing trees, were in addition to estimated volume, a function of distance, (transport costs) to be incured.

The household survey confirmed that *Grevillea robusta* is sold for firewood as whole trees and logs. It provided a range of flexible uses and therefore yielded the highest returns per household. An average of Ksh 3757[4] was earned for 16 households identified during this survey. The total income to the 25 households reporting commercial sales in the last two years was: Ksh 88,255 equivalent to an average sale of KSh 1,165 per household per year.

Table 3 shows the number of households engaged in commercial transactions and number of stems sold in the last two years. Comparison is made with tree harvesting for domestic use in the coffee and tobacco zones. Results show that for households engaged in commercial trees sales, almost twice as many trees are sold per household as are felled for domestic use. In the coffee zone total trees per household felled on average during the last two years were: 58, of which 59% are sold and 41% are for domestic use whereas, in the cotton zone, total trees per household felled on average during the last two years were: 76, of which 68% are sold and 32% were for domestic use. Proportionally, more trees are sold per household in the cotton zone.

Table 3: Trees felled for commercial and domestic use in last two years in the cotton/tobacco and coffee zones

AEZ	No. of respondents	No. of farmers selling trees	Total No. of trees sold in last 2 yrs	Ave. No. of stems sold /HH in last 2 yrs	No. of farmers felling trees for domestic use	Total No. of trees felled for domestic use (last 2 yrs)	Av. No. of trees for domestic use last 2 yrs/HH
Cotton zone	15	6 (40%[5])	314	52	11 (55%)	262	24
Coffee zone	20	9 (45%[6])	307	34	17 (85%)	409	24
Total	35	15	621	43	28	671	24

Transactions experienced at farm level, indicate that 14 (56%) of all farmers interviewed had recently sold trees on their farms for the very first time, 11 (44%) reported having

[4] Exchange rate for Kenya shilling to dollar: 1 US($) is equivalent to 70 Kenya shilling
[5] 40% of the sampled households in the cotton zone
[6] 45% of the sampled households in the coffee zone

been selling trees on farm on a continuous basis. *Grevillea robusta* was identified as the single most readily traded species grown on farm. Market demands included: firewood, split timber, logs and standing tree.

These findings sharply contrasts those of Tyndall (1996) which indicated that timber yards, furniture shops, and saw-millers were reported as saying that *Grevillea* timber was underrated and misunderstood by the public. Five of the six sawmills then surveyed showed that only about 2% of their business was in *Grevillea,* and all of that through species order only. Tyndall's study showed that saw-millers believed that the market share of *Grevillea* would probably grow by 20 % in the next five to ten years because the supplies of *Pinus patula, Cupressus lusitanica* and *Ocotea usambarensis* from forests were rapidly declining.

1.5.3 Customers and business types transacting at farm level

Seven customer and business types were identified for the traded forms of firewood, logs and standing trees. They include: furniture makers, saw millers, Kenya Tea Development Agency (KTDA) factories, local hotel operators, boarding schools and traders from the lower Arid and Semi Arid Lands (ASAL) to the South East of the survey area. Sawmillers and 'neighbour' customers' constitute the largest market for farm tree resources, while KTDA tea factories occupies a third of the customer base.

All of the customer types, except boarding schools, were found to come to the farm level to buy trees. 19(90%) farmers indicate that customers source for woody material from the farms, while only 2 (10%) farmers sought customers for their trees. Farmers reported that "*Seeking for buyers*" was an unfavorable way to conduct business, as the buyers take advantage of offering very low prices as they can '*read on the farmer's face, their desperation'*. They have little bargaining power when seeking market for their tree products. In terms of distance from the customer business to the farm, the overall average distance was recorded as 28 kilometers. The furthest recorded customer was a furniture maker from Nairobi: 300 kilometers away. Transport costs are heavily factored in negotiations along the timber supply channel. Transport represents a significant proportion of the final cost of timber reaching the market.

1.5.4 Gender and intergenerational influences on tree marketing

In cases where land subdivision is imminent, but has as not yet taken place to the next generation, tree planting decisions are postponed until such a time when eventual land ownership is clarified. The household survey found that in the villages surveyed, conflicts on tree ownership may even occur after land subdivision has taken place. Instances were recorded where household heads cleared all the trees on the farm prior to subdividing to their sons. Usually men who subdivide land to their sons view the trees as their property, and prior to subdivision fell them, leaving their sons to subsequently plant their own. Men often determine tree sales for both timber and firewood. Women are allowed to sell trees if there are urgent household problems like illness. Continuous pruning by women for firewood is allowed. The survey confirms previously conducted PRAs in the area (Mariene, 2000) that tree management and harvesting decisions in the Meru are gender biased.

Thus in the understanding of local customary law, trees remain the property of those who have planted and do not pertain to the land. The survey found that due to differentiation between land and tree ownership, sons who have been allocated sub-divided land, with no secure title may be reticent to plant trees. This corresponds with Tyndall (1996), where it was found that the head of a farm portion was about 40 years old at first planting, which indicated that a man is in his late 30's before he inherits land.

1.5.5 Tree planting and retention on farm

From the farmers' responses and on farm observations, *Grevillea robusta* is the most abundant species on farm in the combined cotton and coffee land use zone. Average number of mature harvestable *G. robusta* trees observed per farm during the household survey was 137. However, comparing the cotton zone with an average of 200 harvestable *Grevillea* trees per farm and the coffee zone with approximately 89 trees per farm the former has become a more important source of *Grevillea* timber and firewood than the latter (Figure 1). In the cotton zone, in addition to *Grevillea robusta* , the most frequently occurring species are: *Militia dura, Senna siamea, Persea americana, Mangifera indica, Combretum molle, and Croton spp.* (Figure 1). In the coffee zone, the most frequently occurring species in addition to *G. robusta* are *Eucalyptus sp., Trichilia emetica, Persea americana* and *Vitex keniensis* (Figure 1)

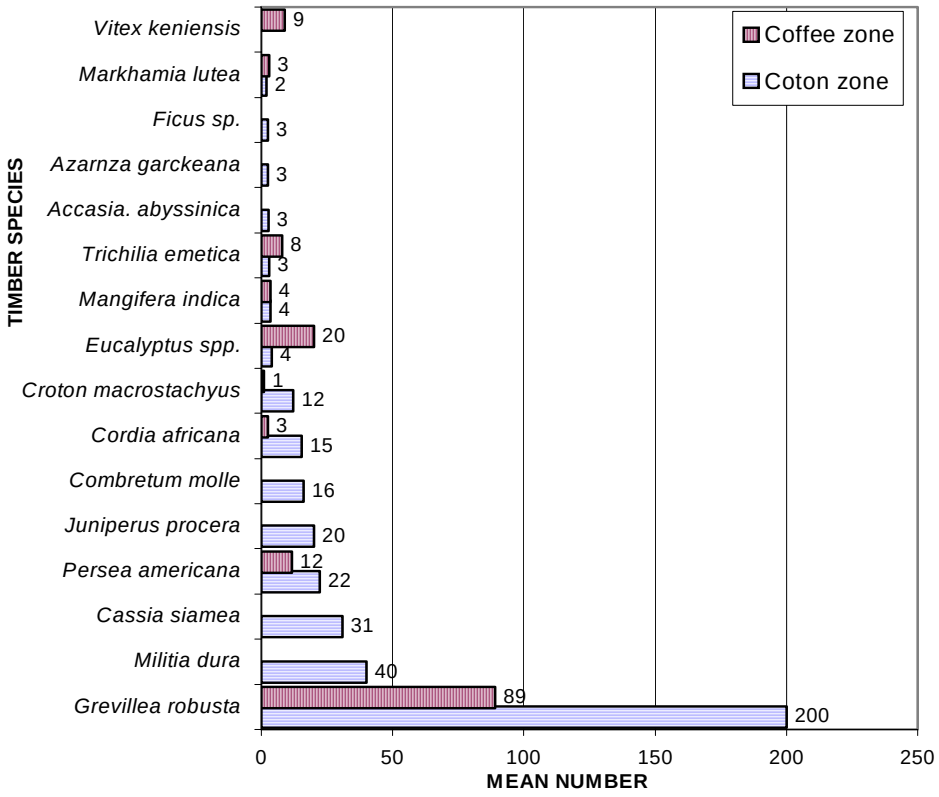

Figure 1: Mean number of timber trees per farm in the coffee-cotton zone

The species compositions for the two zones also differ, in terms of numbers and variety. Cotton zone farmers interviewed records 21 species; coffee zone farmers recorded 19 species. These findings coincide strongly with Oginosako (2001[7]) where it was noted that, from an ecological perspective the marginal coffee and cotton zones have the most trees, while the cotton zone has the most species. From this survey, the average number of trees in the combined zones per household in addition to *G. robusta* were[8] : *Cassia siamae (31), Combretum molle (16), Persea americana (14.5), and, Eucalyptus spp. (12).* It was further observed that, ungrafted fruit trees like *Persea americana* and *Mangifera indica* previously grown as a source of fruits, were now being converted to timber and firewood for commercial purposes in the lower zone.

The greater variety and number of trees in the cotton/tobacco zone could be attributed to the larger farm size and agricultural practices in the area. Farm size in the cotton/tobacco zone is approximately three hectares compared to one hectare in the coffee zone (Table 1). There is also more extensive cultivation in the cotton/tobacco zone compared to the coffee zone, the cotton zone retaining a higher number of remnant woodland species. In both zones, it was found that indigenous trees tend to be left on farm longer and are not readily used for commercial purposes. These trees have other values attached for example for medicinal use and are respected for their long term presence, as well as respect for the persons who retained or/ planted them. The legal requirement for felling indigenous trees is also held to be more prohibitive than for exotics.

From the biomass survey, the no of stems and volumes recorded across the age class range in the survey area indicates a near normal trend in the region, indicating a continuous tree planting practice (Figure 2).

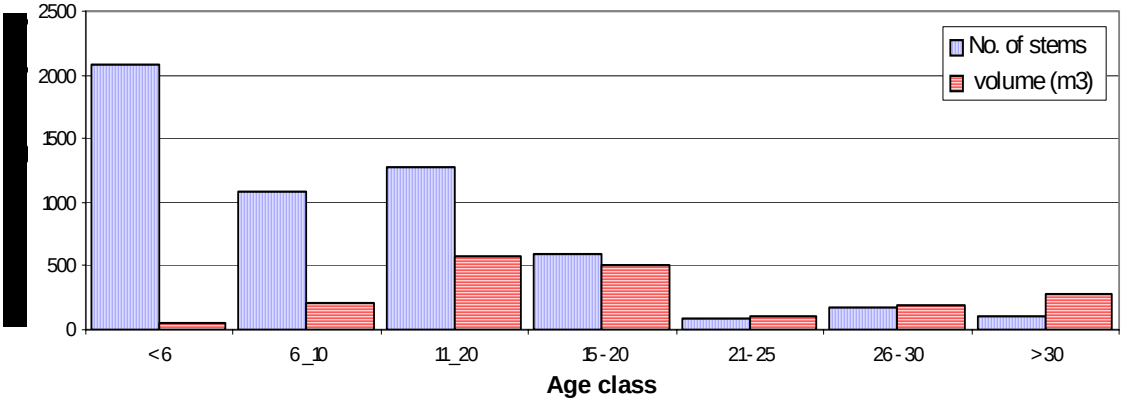

Figure 2: Age class distribution of trees and volumes (cotton and coffee zones)

[7] Oginosako (2001): Found out that the highest number of trees and shrubs occur in the marginal coffee and cotton zones – however though, they have the largest number of trees, they have a fewer number of species. Indigenous species represented a higher percentage of all trees in the lower zones, whilst exotic species are a higher percentage in the upper zones.

[8] Not included in the average data are the single species results from one household of *Militia dura,(40 trees)* and *Juniperus procera (20 trees).*

1.5.6 Farmers tree species and 'preferred use' rankings

Farmers were asked in an open ended question to specify their species choices for different use categories. Data show that several tree species combinations are used in agroforestry systems to achieve specific and simultaneous use. Farmers ranking on species against preferred use categories in the two zones were recorded as: cash; firewood, construction, furniture, livestock fodder, timber, fruit and poles. Results indicate a deliberate shift from trees for environmental benefits and services as promoted by extension packages in the 1980's to tree products with a market value. Tree cultivation for reasons like windbreaks, soil and water conservation have become a secondary objective to the current primary objective of tree planting for cash and investment. Indeed the survey found out that, many of the trees currently being harvested for timber were planted by farmers for other reasons such as: crop shading, soil conservation, wind breaks and not in anticipation of disposal to the local timber markets. The biomass survey indicates that a clear majority of on farm tree production is nonetheless made up of timber potential trees with poor access to timber markets.

A more specific assessment on the number of trees and volume found in the coffee and cotton zones was analyzed to denote the inherent potential and curious differences. Biomass inventories in the sample of 16 farms in the coffee zone recorded a total of 2,176 stems out of which 1,116 (51%) stems were mainly used for timber production while 432 stems were classified as firewood (20%). The total volume was 627 m^3 out of which 432m^3 were for timber production (69%) while fruit trees had 112 m^3 (18%). In the coffee zone, firewood specific trees were recorded as only having 33 m^3, representing five percent of the volume of trees on farm (Figure 3).

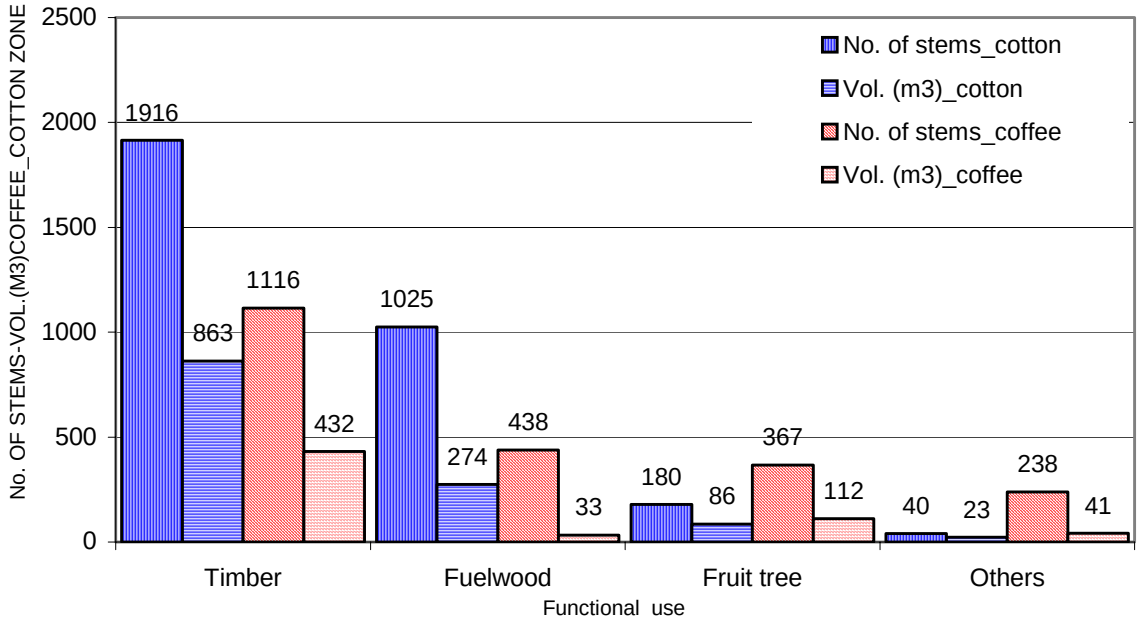

Figure 3: Number of stems and volumes in the cotton/tobacco and coffee zones

Biomass inventories on the sample 15 farms surveyed in the cotton zone recorded a total of 3,216 stems out of which 1,916 (60%) stems were mainly used for timber production while 1025 stems were classified as fuel wood (31 %). The total volume was

1284m^3 out of which 863 m^3 were for timber production (67%), while trees primarily planted or retained for firewood production were 265m^3, representing 21% of the volume of trees on sampled farms (Figure 3).

Due to the limited sample size in the two zones the results are held to be indicative and extrapolation is cautioned. The household survey provides for a broader overview on actual use of trees, as multiple responses were gathered from respondents. In the survey, firewood is rated the second most important use, however due to the emphasis on a single main use, the biomass survey indicates that the number of stems and actual volume of trees available on farm with a specific firewood use in the coffee zone is very small - trees actually planted specifically for firewood are few. However in the cotton zone, there are firewood species that are currently being exploited that have been on the farmers' fields as woodland remnants. They include: *Combretum molle, Acacia abbyssinica, Cussonia sp. Azanza garckeana.* It's interesting to note that no plans were mentioned to replant additional numbers of these species. Generally, many trees can be felled for firewood, no matter their "primary" use or produce. Towards this end, there is an emerging concentration on a narrow range of fast growing exotic species to meet commercial timber and firewood demands across the zones.

1.6 CONCLUSIONS

On farm timber has the potential to contribute to the regional wood industry and small-holders livelihoods in the area surveyed. Trees sold on farm are not only a source of income for farm families, but also cushion farmers when regular farm enterprises fail. There are however serious knowledge gaps hindering equitable farmer participation in the timber and firewood markets. Often, outsiders with better market networks gather the greater benefits from smallholder timber value chain.

It is evident that farmers are willing and able to plant a wide variety of tree species, particularly when their direct benefit to the household is clear. There is a heavy reliance on *Grevillea robusta* and other exotics such as *Eucalyptus* to respond to market demands for firewood and timber. Diversification of fast-growing species would enhance farmers' product options and the sustainability of the landscape. Farmers' tree planting activities are also limited by lack of coordination of germplasm supply, leading to a limited diversity and quantity available at farm level.

The survey leaves no doubt that that farmers are shifting tree planting plans to respond to market signals. Of those farmers engaged in selling trees, the number of trees sold from the farms was found to be twice as many as those used for domestic purposes. The marketing aspect of trees grown on farms needs to be more recognized by managers, policy makers and planners in the sub sector.

Firewood was noted to be a sizable portion of the overall wood product market. Quantification of the same was difficult due to lack of standard measures used in firewood transactions. The local hotels, food outlets and schools are significant firewood consumers in the farm neighborhoods. However, they are not major players in the overall firewood market and their demands can be met without any significant effects on

farm timber supply. The major players in the firewood markets are the agricultural based industries such as tea and tobacco factories. Without substantial and continuous support to the farmers, through regular germplasm supply or various modalities of tree growing contracts, there is cause for concern for tree over-harvesting or 'mining' in the region.

Results confirm that a combination of tree product commercialization and land subdivision factors are influencing farmer-preferred tree planting niches on farm. The current wood extraction rates in Meru central were shown not to be sustainable. Some farmers seem aware of the potential negative impacts of over-harvesting on their local environment and are lobbying for better regulation of timber and industrial firewood harvesting in the region. There is a need to identify enhanced tree cropping systems that are compatible with the principle agricultural enterprises of the two zones surveyed.

It was noted that farmers market their firewood and timber as individuals according to specific household needs. Farmers, prefer this flexibility, and are currently disinclined to organize trees sales as a group. However groups have been successfully used as conduits for technical (tree management, mensuration and valuation) and marketing information, and as an entry point for raw materials sourcing from farms.

The combined household and biomass surveys provided useful insights into the prevailing issues. Much was learnt on the methodology of combining these complementary components. The survey size was not large, and larger surveys would be useful to further corroborate these findings.

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CHAPTER TWO

COMPONENT 1.2.2

2.0 EXPERIENCES ON SMALLHOLDER TIMBER MARKETING: A LITERATURE REVIEW

2.1 INTRODUCTION

Timber tree cultivation on small-scale agricultural farms in East Africa in general and Kenya in particular is a well accepted practice. An estimated 500 million to 1 billion smallholder farmers grow farm trees or manage remnant forests for subsistence and income worldwide (Scherr, 2004). Timber production in small-scale farms herein referred to as 'Smallholder timber'[9] is typically practiced within subsistence crop and livestock production systems. Trees are planted along farm boundaries, in the cropland, along the contours and sometimes as woodlots. The choice of species to plant usually varies on individual farmer interest, land size and other factors such as the tree species compatibility with crops, duration to maturity (usually fast growing exotics are preferred to 'slow' growing indigenous species) and the ability to provide a highly valuable wood.

In the central highlands of Kenya, *Grevilea robusta* dominates farmlands as a key species used for timber and fuel woods particularly due its fast growth and crops compatibility. There are about 200 *Grevillea* trees per farm in the cotton zone of Meru central district (Chapter one, Oginosako *et. al*, 2006). Trees grown for timber is simultaneously used to meet many individual farmer households needs including provision of: windbreaks, shade, aesthetics and as boundary markers. Pruning and pollards are used to provide fire wood for lighting and heating. Scherr, *et al*., 2003, pointed out that farm grown trees function as a "safety net", providing low-cost sources of food, fuel, fodder and housing materials for thousands of small scale producers. Further, farm trees are known to increase agricultural productivity when grown as windbreaks, fodder banks, live fences, or nurse trees for perennial cash crops. For a long time, *Grevillea robusta* has been grown along coffee bushes in Kenya to provide shade and on farm boundaries to act as windbreaks. An agroforestry study conduced in central highlands of Kenya found that, in a maize and beans field with a row of *Grevillea* on the boundary is slightly more profitable than maize and beans alone (Tyndall, 1996). Farmers are noted to be rational producers wanting to maximize on available unit of land. Tree and crop mixes are chosen in a spatial pattern to provide simultaneous household benefits. Thus small scale farmers seek to produce a 'portfolio' of products at different income or risk categories (Scherr, 2004). However, a major challenge for rural development in Kenya and other developing countries is how to re-invent efficient markets that serve small-farm timber producers now that the practice of agroforestry is relatively well accepted.

[9] Smallholder timber is defined as all timber competitively produced and marketed often on a limited proportionate scale to any one given agricultural enterprise or farmland holding. The choice of a given timber enterprise on farm is selected amongst competing farm enterprises

It is against this backdrop that this study sought to conduct a broad literature review to understand practices in different parts of the world. It was anticipated that the exercise would indeed help inform and cross fertilize local Kenyan and indeed East African smallholder timber experiences.

2.2 MATERIALS AND METHODS

Broad literary material on forestry and tree products marketing was consulted to gain a deeper understanding of the various experiences on smallholder timber marketing the world over. Required information was collected and collated through diverse information channels including electronic format through internet searches, hard copy material from library references and through exchanges by consultation of expertise in similar and related field.

The paucity of detailed descriptive information was however encountered and somewhat limited a deeper understanding of practical experiences elsewhere. Nonetheless, the experiences gathered were cross validated and better informed by locally emerging practices already under study.

2.3 DISCUSSIONS

Literary work on forest and tree products market value seems to suffice whenever the broad topic is touched. Though known to be important, thick qualitative and quantitative description of product marketing is found to be emerging. Current tree products information is only captured through tree databases such as those by the FAO and the World agroforestry Centre (ICRAF), where specific product and tree information can be obtained. Regional specific information on experiences of smallholder's participation in local or emerging markets for tree products is found to be scantily documented. Therefore even though farm timber has proved its potential to absorb losses from forests and provide ready alternative source of timber for both small, medium size and even large-scale enterprises, the source has remained unproven and undocumented. There are many speculations on how it functions, how it will grow and how big it will get. In Kenya, demand for sawn-wood has been projected to grow from 203,000 m^3 in 1990 to 262,800 m^3 in the year 2020 (KFMP, 1994).

Source: FAO, 2005

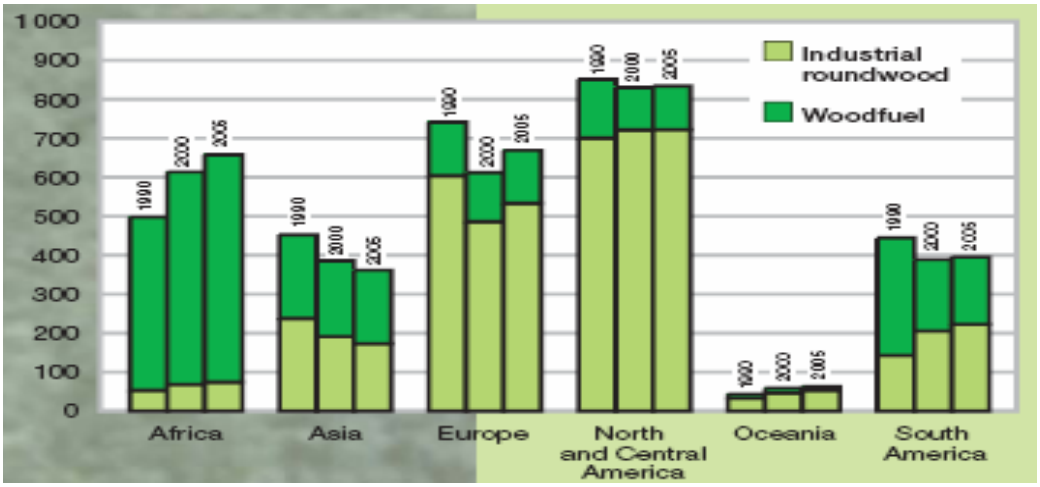

Figure 4: Trends in wood removal, 1990–2005 (million m3)

Global wood removals were forecast to amount to 3.1 billion cubic metres in 2005, similar to the total removals recorded for 1990 and averaging 0.69 percent of the total growing stock. While Asia reported a decrease in wood removals in recent years, Africa reported a steady increase (Figure 4). It is estimated that nearly half of the removed wood was wood fuels. Informally or illegally removed wood, especially wood fuel, is not usually recorded, so the actual amount of wood removals is undoubtedly higher (FAO, 2005).

Demand and supply forecast in Kenya remain poorly informed by systematic study. There is a gap in providing reliable information for both smallholder tree growers and small timber businesses. The background information check found information provided through case studies on various aspects of the sub sector such as information on production and marketing aspects of forest and tree products. Case studies on marketing particular tree species product in Kenya are especially poorly documented.

Poor market access is often summed up as a key bottleneck to smallholder enterprise development. For instance, in discussing opportunities to redress the priority goal of reducing poverty and hunger problems stipulated in the millennium development goals, the Global Donor Platform for Rural Development, observes that 60 percent of the rural populations in Africa live in areas of good agricultural potential and poor market access, while only 23 percent live in areas of good agricultural potential and good market access. The remaining 18 percent live in the most difficult environment with poor agricultural potential (GDPRD, 2005). Indeed, Holding & Roshetko (2003), observe that, poor prices on key agricultural crops such as coffee, cotton and sugarcane, make farmers view trees on farms as an alternative cash generating farm enterprise. Smallholder farmers have therefore not fully utilized their competitive advantage to accessible market segments.

FAO (2003), notes that local communities now control at least 25 percent of the developing world's forests and in forest-scarce countries local farmers are actively growing trees for commercial use. In Kenya, it is estimated that the amount of woody biomass material on farm-lands is more than that of indigenous and plantations forest

combined (KFMP, 1994). However, for a long time trees grown on farm have not traded commercially as compared to trees grown on government plantation and indigenous forests. Smallholder timber tree production in the highland agroforestry systems of Meru, discussed in this study, provides a typical scenario of tree product 'portfolio' from farms used for domestic and trade purposes. The farming system is characterized by subsistence tree and crop production as an integral part of the system. The tree and crop enterprise units are interdependent and seem to play a crucial role in supporting livelihoods for thousands of farm families. Certain favorable marketing factors such as proximity to local markets, price advantages and lower costs of tree cultivation could be promoted to improve smallholders' local market position.

It is upon research to generate information to bridge the gap on available data demonstrated by failure of different authors to provide a convincing link on the role of trees and forest products in poverty reduction and environmental management. More needs to be done to particularly understand the intricate linkage of poverty, environmental degradation, economic growth and development and tailor them to people-centered processes such as the PRSP's and MDG's.

2.4 LITERATURE OVERVIEW

Agriculture and forestry are no longer thought of as mutually exclusive activities, yet national and international statistics are only kept on the differentiated land cover of these systems and even the data on the extent of integrated agroforestry systems are not available (Simons & Leakey, 2004). More significantly, the integration of crops, livestock and trees within smallholder farmer systems is often not clearly understood in terms of outputs and inherent sustainability. FAO (2003), notes that local communities now control at least 25 percent of the developing world's forests and in forest-scarce countries local farmers are actively growing trees for commercial use. The importance of tree stocks outside forests got the attention of FAO to initiate a global inventory of 'trees outside forests'. Preliminary results show that in Punjab, India, farm trees account for 85% of the province growing stock while in Sri-Lanka over 70% of industrial wood comes from trees outside forests (FAO, 2000). Collated evidence depict that, despite the fact that trees on farm often play an important role in the livelihoods of the rural population, especially of women, they are often overlooked, both in forest resource assessments and in policy and decision-making processes. It is now well recognized that Africa, Asia, Latin America and Oceania are some of the world's regions with the greatest potential for on farm tree domestication to contribute to sustainable human development (Simons & Leakey, 2004).

In Ethiopia, estimates of the potential benefits from the sustainable harvest of *Eucalyptus* poles from household managed woodlots in Tigray suggest an annual average return of approximately 370 EB (US$ 98) per capita, approximately half of the per capita Gross Domestic Product in Ethiopia in 1998, (Jagger & Pender, 2003). Similarly, in Uganda, farm grown *Eucalyptus* is preferred to meet household needs of fuelwood, poles and timber for building due to its fast growth and coppicing characteristics while investment in tree planting is hypothesized to be a potential

development pathway out of poverty in the low potential areas and particularly in areas with relatively good market access.

An upland communities census conducted in the Philippines in 1989 revealed that 77% of households relied on upland farming which is dominated by cash crop usually grown in mixtures with fruits and forest trees (Damasa, *et.al*, 1999). *Gmelina aborea* is found to be an attractive timber species to Philippines farmers due to it's fast growth (Bertomeu, 2004). While in Thailand, annual production of *Tectona grandis* (Teak) fell by approximately 87% between 1971 and 1985.

Logging in Indonesia has been carried out for more than 20 years and millions of cubic metres of woods have been extracted from the forests. Government policies on opening logging have multiple objectives: to open remote communities and regions, create jobs, source of income for country development, country defense, etc. The process of deforestation with serious impact to the environment is shown to be driven by complex demographic, biological, social, and economic forces.

In Kenya, concerns have been raised about the long-term sustainability of timber logging in the plantation forestry. For many years, the country relied on plantation and indigenous forests to meet most of her timber requirements. Logging of certain species such as *Cuppressus lusistanica* and *Pinus patula* from government plantations gave local timber businesses a competitive edge due to certain favorable factors such as economies of scale attained by bulk harvesting from plantations, government subsidy and ease of business entry and exit. However, challenged by planting backlogs, logging malpractices, frequent fire outbreaks, plantation and indigenous forest logging proved unsustainable. The state was forced to impose a logging ban in 1999 resulting to a significant timber supply crisis.

Other countries experiencing mixed fortunes in the plantation forestry sub sector help reinforce emerging lessons. For instance, in Malaysia, poor planning resulted in the failure of many plantation initiatives. The financial returns from a 35,000 hectare plantation of *Acacia mangium* established between 1985 and 1987 were not sufficient to cover loan repayment since many species proved unsuitable for the purpose they were planted for, similarly no market was found for roundwood harvested from several thousands hectares of *Gmelina aborea* planted in Sabah in the 1980's. The wood was sold at price covering cost of harvesting and transportation only (Bertomeu, 2004).

In Uganda, *Maesopsis eminii* attracts increasing attention because most of the natural forests have disappeared or are highly degraded. In addition, the remaining timber plantation area is smaller than 4,000 ha and owing to the steadily improving political and economic situation, the demand for construction timber and the prices are steadily increasing. However, management models for *Maesopsis eminii* are lacking. This is one reason why exotic timber species like *Eucalyptus grandis* and *Pinus caribea* are preferred by plantation investors in the region (Buchholz *et al*, 2005). Kenya's forestry master plan estimates that 40% of the woody biomass found outside forest is from planted trees. The total volume of trees planted by farmers equal that of closed canopy indigenous and plantation forests combined. It is estimated that farmlands and

settlements on average contain on average about 9.3 m^3/ha of woody biomass, increasing at an annual rate of about 0.5 m^3/ha (KFMP, 1994). As farmlands timber emerge to absorb losses in forests, woodlands and bush lands. The demand for sawn wood was projected to grow from 203,000 m^3 in 1990 to 262,800 m^3 in 2020. Projected total demand for wood in the high and medium potential districts is poised to rise form 15,084,000 m^3 in 1995 to 30,679,000 m^3 in the year 2020 (Table 4).

Table 4: Projected demand for wood in the high-potential & medium-potential districts ('000 m^3)

	1995	2000	2005	2010	2015	2020
Firewood	7993	9251	10686	12251	13889	15593
Wood for charcoal	5085	6298	7351	8511	9726	10972
Poles	948	1111	1308	1544	1823	2153
Industrial wood	1058	1209	1378	1543	1709	1961
Total wood demand	15084	17869	20723	23849	27147	30679

Source KFMP, 1994

Wood production on farmlands and settlements consist of 20% timber, 7% pole and 73% fuel wood. The accessible sustainable annual wood production is 5.4% (KFMP, 1994). Projected wood supply from farmlands in the high and medium potential zones is projected to increase from 64% in 1995 to over 80% in the year 2020. Deficits were envisaged to accumulate in year 2005 and steadily decline by year 2020 as more trees growing is undertaken on farms (Table 4).

Fast tree growth in high potential and medium potential areas makes tree growing a feasible agricultural land use option. Secure land tenure along well-defined property rights structures is a pre-condition for long-term investments on the land. In the Philippines, favourable market conditions have induced small-scale farmers to grow trees for the market. Fast rowing trees such as *Gmelina arborea, Acacia mangium* and *Paraserianthes falcataria* are planted with annual crops on farms and fallow lands (Bertomeu, 2004)

Demand for timber is rising along the rapid population growth. Since the indigenous forest area is still shrinking, smallholder timber marketing on Kenyan highland farms offers certain key advantages over plantation and indigenous forest logging in general. The only substantial increase in tree planting acreage and wood volume is occurring on farmland. Little effort is required to get farmers to invest in tree planting and in addition availability of market for timber is large and steadily growing. On the other hand, businesses sourcing timber from farms could increase their competitive advantage through several alternative means: firstly investing on training programmes for their employees would help improve on timber recoveries (currently between 25-30%) and reduce the current wastage (Onchieku, 2001).

Timber trees can be managed and harvested during periods when labor demands for other activities are low. Farm trees can increase agricultural productivity when grown as windbreaks, fodder banks, live fences, or nurse trees for perennial cash crops. Local producers may be more familiar with local product and processing preferences, composed of particular tree species mix and spatial pattern – capable of producing multiple streams of income. Those streams may derive from harvesting different products from a multi-purpose tree, by harvesting at different ages, or harvesting from a different mix of species. Low-income producers need a 'portfolio' of products in different income/risk categories, including agricultural and non-farm enterprises (Scherr, 2004)

Management of the natural resource base in a sustainable and integrated approach is however essential for achieving sustainable tree production on farms. In this regard, it is necessary to implement strategies aimed at protecting different types of production systems and to achieve integrated management of environmental resources such as soils and tree genetic resources. Unsustainable tree production often characterized by over-harvesting of trees, have raised concerns over the optimal farm productivity per unit land over vast farmer production systems in central highlands of Kenya. Sustainable farming practices, to include crop diversification for cash and food crops, timber and agroforestry tree products (AFTP's) needs to be adequately informed.

Several factors are driving the need for farm grown timber around the world. For instance, in the Phillipines, the collapse of natural forest logging in the 1980s resulted in a shortage of lumber, now fast growing trees and shrub species are grown as part of a wide variety of land use systems including tree fallows, woodlots, tree plantations, agro forestry systems, isolated/scattered tree plantings and shrub secondary forest areas (Damasa, *et.al*, 1999). In Ethiopia, questions have been asked over smallholder farmer concentration on cereal production around the Tigray highlands despite low returns (Jagger, *et. al*, 2003). Whether to shift production to include woodlot management for greater income generation opportunities, and a positive impact on biodiversity preservation and environmental sustainability are important research questions.

In Cameroon, nearly 75% of the population lives in rural areas, 95% of which are agricultural smallholders. Therefore, in the framework of a rural development strategy – as articulated in the Poverty Reduction Strategy Paper, tackling rural poverty would necessarily involve improving smallholders' livelihoods**.** Tree crops are an important source of employment and revenue for smallholders in Cameroon and are also some of the most important traded commodities (World Bank, 2002). Tree crops, as opposed to other cash crops, present significant opportunities in terms of economic growth and poverty reduction in rural areas, because they can be part of integrated sustainable farming systems carried out at the village level (targeting directly the poorest groups of the population).

Improving smallholder commodities competitiveness, beckons increased productivity. Indeed Graham, (1945) observes that timber on farm in Kenya is a crop no less than wheat or coffee, on most farms there are areas of fair land on slopes too steep to be cultivated annually. These if not wanted can be made to yield a return in timber.

However, critical tree farming lessons point out that tree planting should not be promoted on the assumption of a uniform rural population. Smallholder farmers are often a heterogeneous group of rural dwellers with very different socio-economic conditions. Indeed subsistence oriented farmers, whose main objective is food security and risk reduction, have been found to shun fast growing tree species due to competition with food crops.

In the larger central highlands of Kenya where the other components of this study was related to, its reported that on a per hectare basis a row of *Grevillea* reduces maize yields by about 5%. However, maize and beans field with a row of *Grevillea* on the boundary is slightly more profitable than maize and beans alone (Tyndall, 1996)

2.5 CONCLUSIONS

Most information on smallholder timber was found to be site specific and scattered among different institutions and sectors, including informal sectors. However the lessons are similar and can be cross fertilized. The existing body of knowledge needs to be strengthened through more research to help draw even clearer parallels. Though most literature dwells on promoting tree planting as one of the solutions to counter the problems of deforestation; economic and social impacts are not clearly delineated to inform and facilitate planning. Further information on quantitive on farm tree resources is particularly limited and is fragmented on case studies with curious methodologies. Nonetheless, the impacts of failed plantation forestry practices and the critical role played by farm timber to fill the gaps are clear and seem well reconciled.

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CHAPTER THREE

COMPONENT 1.2.3

3.0 LOCAL TIMBER MARKET: *Grevillea* Timber Marketing In Meru, Kenya

3.1 INTRODUCTION

Grevillea robusta (silver oak) timber trees are near abundant in many small-scale farms in Meru Central district of Kenya. It was adopted by coffee planters from the very earliest days of the industry in Kenya and by 1910 the Forest Department had started planting it in mixed stands with cypress. In the 1940's, it was widely recommended as a timber tree for planting at altitudes below 2,000 metres, while cypress was recommended for higher altitudes (Graham, 1945).

The species is therefore well accepted and established in subtropical and tropical highland environments (Harwood, 1989). In densely populated zones, it is an important source of fuel wood and income from sale of construction timber. *Grevillea* is popular with farmers because it provides valuable products, it is easy to propagate and can grow in low fertility soils and does not compete with adjacent crops. Annual growth rates of two metres in height and two centimeters in diameter over the first five years are commonly achieved in a number of countries where climate and soils are suitable (Harwood, Booth, 1992; Kamweti, 1996). Production in Kenya and Meru in particular, has gained prominence owing to plantation logging bans.

The timber is used for household building, livestock pens and fuel wood material amongst other uses. Use of the wood for domestic purposes has to some extent limited *Grevillea* timber enterprise development. The situation has in the past been compounded by an over reliance on plantations forests for timber supply. For along time, the timber was considered an inferior wood due to it's perceived poor durability and susceptibility to pest attack on storage. The wood therefore despite having fine grain properties with easy workability and clean polish compared unfavourably with species such as *Cuppressus lusistanica* and *Pinus patula,* sourced form forest plantations. Logging of these species from government plantations gave local timber businesses a competitive edge due to certain favorable factors such as economies of scale attained by bulk harvesting from plantation forest, huge margins as payments were based on royalty rates- a token price made for the timber value to complement government subsidy. Under these circumstances small-scale private timber producers were effectively locked out of competitive timber marketing. Delivering of logs to mainstream timber buyers (mainly timber yard owners, furniture makers) was not an economical option for farmers as prices were rock bottom. In addition, the quality of timber trees form farms was poor due to inferior silvicultural management practices by farmers. Smallholder timber production was therefore relegated to serving subsistence household timber needs.

However, plantations logging proved unsustainable and in 1998, the government imposed a ban on all logging activities from forests. The local timber industry was shattered and many businesses closed down. The ban is still in force and current timber supplies are largely sourced from smallholder farmers. Farmers therefore have a huge opportunity to tremendously improve their margins on farm grown timber, their marketing strategy however seems not to work to their advantage as they remain losers in on farm timber business. Several critical factors are responsible for this predicament. *Grevillea* farmers have poor market information, limited capital to process wood, poor storage skills and poor wood valuation techniques. Farmers also suffer limited tree management skills owing to non-existent or poor quality tree tending extension messages.

Meanwhile, demand for fuel wood, pole wood and industrial wood is rising along the rapid population growth. Since the existing forest blocks is shrinking and can no longer be relied upon as the principle source to meet the growing demand. Wood must be produced in other places particularly the farms. The Kenya Forestry Master Plan estimates that 40% of the woody biomass outside forest are from planted trees and that the total volume of trees planted by farmers equal that of closed canopy indigenous forest and plantation forests combined. It is further estimated that farmlands and settlements on average contain on average about 9.3 m^3/ha of woody biomass and it is increasing at an annual rate of about 0.5 m^3/ha (KFMP, 1994).

3.2 STUDY OBJECTIVES

- To understand the nature and structure of farm sourced *Grevillea* timber market
- To highlight critical market growth factors
- To investigate critical smallholder timber market drivers

3.3 METHODOLOGY

To broadly understand *Grevillea* timber markets, initial farmer participatory meetings and a rapid market assessment were used to collect and collate market related factors. A checklist of issues was used both during focused group discussion with farmer and individual business visits around East of Mount Kenya to facilitate in-depth interviews. Out of the 247 business enumerated during rapid assessments six selected businesses representing timber yard owners, saw millers and furniture makers were purposefully selected on a criterion of long dealership on *Grevillea* and amount of timber traded. Supply channels mapping from producer farmers to diverse business outlets was carried out while mapping constraints and opportunities. Observations techniques was used to verify timber species transacted.

3.4 DISCUSSION

Smallholder farmers in Meru produce a sizeable amount of *Grevillea*. It is estimated that up to 200 stems of *Grevillea* of size 30 dbh are available per hectare in the cotton zone. However, standing volumes are of different quality due to use of traditional and sometimes deficient silvicultural methods. To benefit from their investments, farmer and

timber businesses in Meru, will require a comprehensive marketing strategy to position themselves profitably in the competitive timber business. Such a strategy should especially see farmers rise from being rather passive participants in the product value chain to key beneficiaries of a well planned farm enterprise. In order, to stake a claim for more channel power and beneficial margins several critical success factors are emergent. They are:

- Land and tree tenure
- Sound knowledge on *Grevillea* timber tree production management
- Farmer-led market analysis
- An understanding of consumer characteristics
- Screening useful distribution channels
- An understanding of *Grevillea* timber production economics
- Development of a preliminary marketing mix

3.4.1 Land and tree tenure

Tree crop production is usually long term enterprise as such; secure land tenure is a pre-condition for *Grevillea* timber investments. Farmers will shy from the long rotation crop unless they are sure that the investments will benefit them or their children. Even where tenure is secure, there exists legal or policy handicaps to tree utilization from farms for example issuance of certificates of origin before tree felling impedes farmer tree planting activities. When it comes to tree sales at the farm level, selling decisions are based on land ownership. Conflicts often occur when land subdivision has taken place with no proper tree property right arrangements even within households. A clear policy on the tree property rights is often lacking to give useful economic allocation to trees planted on farms. Timber businesses are therefore constrained when sourcing trees from smallholder producers.

3.4.2 Grevillea management practices

Though widely grown in Meru, trees are poorly managed for timber production. Poor silvicultural practices and limited technical support from extension services is attributed to this situation. Tree pruning and thinning are particularly, poorly done. It is however estimated that a huge proportion of *Grevillea* is used to meet most of the household energy needs of heating and cooking. Planting material is also suspect and is often obtained from other farmers' nurseries, community nurseries and institutions nurseries such as forest department. Tree growing is often practiced on mixed planting system with agricultural crops in the high potential zones of the district. In the medium potential zone such as the cotton zone with relatively larger agricultural land and crop polycultures, tree planting is mostly done on farms external boundaries, on single line planting, or block planting. Production of quality logs that would compete favorably in the timber market is therefore curtailed. From the farm perspective, there appears to be an over-reliance on *Grevillea* for most timber related household and market requirements. Other potential species have not been utilized adequately to meet these needs. Fast growing timber species such as *Eucalyptus sp., Casuarina equisetifolia, Maesopsis eminii* need to be tried to diversify the timber enterprise on farm. Many rural farmers

have the competitive advantage of available land, labour and tree planting culture to maximize tree production on farm.

3.4.3 Farmer and small business market analysis

Market liberalizations require market intelligence systems to assess gainful market trends and know how to grow ones market share. Many small holder timber businesses however remain dependent on traders (middlemen) for market information. This has led to poor timber valuation and pricing with meager margins to the farmer. Farmers and timber businesses may require systems to help them examine the *Grevillea* timber market and assess which market segments will be worth a planned marketing effort. Certain key questions could be investigated, such as:

- What is the relevant market?
- Where is the product in it's *product life* cycle?
- What are the key competitive factors in the industry?

The demand for *Grevillea* timber multi-segments to neighbour farmers, saw millers, local institutions such as tea factories, tobacco factories, furniture makers, schools, hospitals and others. The different market segments are largely accessible to the farmer as proved by over harvesting of *Grevillea* in many parts of the district with little marketing efforts. Market analysis is however needed to identify market segment with the highest returns on least marketing effort. Institutional buyers such as tea factories, tobacco factories, furniture makers, schools, hospitals are currently thought to be better buyers than individuals due to their consistent demand. Trees are bought at the farm gate. The market is noted to be growing with future supplies expected from increased farmer planting. Future sales are expected to come from existing customers and other new users. The trade was noted to have grown from smallholder timber trade between neighbour farmers to trading to saw millers, local institutions etc. However, awareness and education are required on the properties of farm grown *Grevillea* to dispel misinformation. Farmers could capitalize on the word of mouth and use of existing buyers to spread the word out and dispel the myths of poor quality on storage. They could market its fine polish qualities and ease of workability as important aspects of the wood especially for furniture makers and the construction industry. Pricing of farm timber to the different client groups is important so as counter competition and improve margins to be ploughed back to improving quality.

Certain selected distribution channel will suffice to provide better sales volume than others since all the timber is purchased from farms. This will help farmers gain a competitive advantage ahead of the competition and in the next stage of the product life cycle. As the product matures market segmentation will be intense and all possible channels of distribution should be considered using a mass-market strategy. Farmers can employ an *end-game strategy* to cash in on the current situation where logging ban on forest plantations effectively locks out plantation timber supplies. For farm grown *Grevillea,* timber quality and pricing will be critical basis for competition. For farmers hoping to reap bigger margins, quality of timber bole has to be ensured through proper tree tending practices.

3.4.4 Grevillea timber consumer analysis

Grevillea timber has been looked down upon as a commercial wood for a long time now. On the other hand, *Cupressus lusitanica* and *Pinus patula* have been the preferred timber obtained from the forest plantations. The need category for *Grevillea* timber include: farmers saw millers, furniture makers, fuelwood, wood carvers, timber yard owners, tea factories, schools, hospitals and others. Most buyers are inadequately aware of *Grevillea* wood qualities. Often, trees meant for timber are chopped into fuelwood reducing the end value of the tree. Middlemen trading *Grevillea* from farms practice poor timber seasoning and storage, the wood is often warped and splits are common. Wood preservation through wood treatment is poorly done hence storage pest destroy a lot of quality timber (Opanga, 2002).

Buyers of *Grevillea* timber from farms are mainly middlemen acting as agents for saw-millers or timber yard operators, institutions (schools, tea factories, and hospitals). Users comprise of mainly new home builders, boarding schools, hotels, community buying furniture. The buying process entails: Farmers are usually approached by middlemen or 'neighbor' buyers. Word of mouth amongst different buyers is used to locate a target farmer with enough trees on farm for sale. Key purchase influencers include middlemen, farmers and transporters.

Defining differences between alternative timber species for different users is found to be a difficult task for different buyers especially if they are not experts. *Grevillea* timber is a high involvement product due to the level of purchase planning which is usually high. Determining customer's behavior on *Grevillea* timber is critical. A geographic characterization of the market would for instance focus on urban centre localities where many construction works are going on, hotels, hospitals, schools and other institutions requiring wood are situated.

3.4.5 Screening useful distribution channels

Channels of distribution are avenues to reach the consumer. The channel is important as it determines price and profit margins of a business. For farm *Grevillea* several channels involving different intermediaries are used:
Farmer-neigbour/ schools/hotels/ hospitals
Farmer-intermediary-furniture maker-consumer
Famer -intermediary-new home builders (construction)
Farmer-intermediary-patrice makers-tea factories
Farmer-intermediary-timber yard owners- furniture makers-showroom-consumers

The channel sketch (Figure 5) gives insights on the retail price that must be charged to make profit. Everyone who touches the product takes a cut, which is called their margin. The selling price is not the ultimate price but price between intermediaries at each level of the chain. The intermediary buys *Grevillea* from the previous level and takes a margin based on the sales price to the next level. The margin is not based on cost. At each level, a channel participant adds value and incurs costs by felling, splitting timber, transportation, preservations, stocking, planing and furniture making for the consumer.

% Mark up on selling price (SP) = (mark up/selling price)* 100

Preceding distribution level selling price= selling price*(1-mark up %)

Each channel has its own channel margin mathematics. By understanding the math one is able to make a choice of the most profitable channel. Channel power is very important in selecting where to sell. If a product has a unique demand, producer has the power to outline the terms of the relationship. If not, channel intermediaries dictate the terms and take as much margins as possible. In the *Grevillea* timber trade, power of the channel has shifted from farmers to agents buying trees from farms as they provide a bulk of the logistical support to facilitate sourcing.

Source: Opanga, 2002

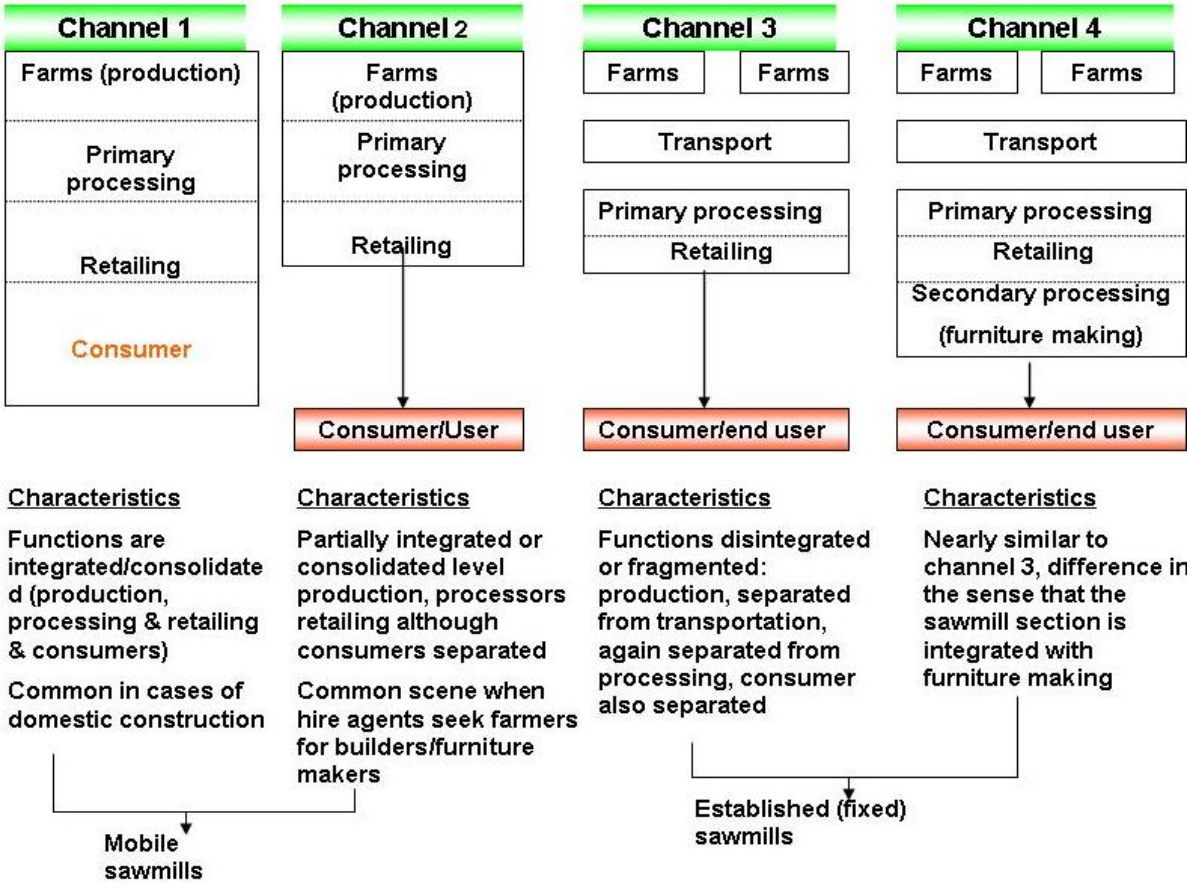

Figure 5: Schematic presentation of smallholder *Grevillea* value chain

3.4.6 Developing a marketing mix

Based on the consumer, market, competition, distribution channel analysis an action plan need to be put in place for appropriate marketing mix for *Grevillea* timber. The mix is referred to as the *four P's* of marketing: product, price, place and promotion. Tinkering with one P means that the marketing strategist must alter all the other P's in some way, because one P affects the others. Techniques to boost *Grevillea* timber marketing could include: *Line extension*: *Grevillea* timber sales could include fuel wood sales from cut off tree branches or through timber yard operators who would stock firewood along timber sourced from farms. *Focused differentiation*: *Grevillea* from farm has often been confused with illegal logged material from forests plantations. Ways to help distinguish

material would help farmers market more of the timber. Brand naming would suffice to create some sort of differentiation on farm *Grevillea* timber. Creative advertising and promotion through word of mouth has already proven useful means to sell farm timber. Currently, *Grevillea* timber makes most sales to the construction industry as shown in the market analysis. A *push and pull strategy* could be used to encourage timber yard owners to stock and sell *Grevillea* products to consumers. Buying agents for timber yard operators and institutions could be targeted for increased sales. Personal selling need be enhanced to effectively address buyer needs and create loyalty. Public relations could be enhanced through local community meetings (*baraza*), through churches and local administration to create good will.

Finally, the current pricing of *Grevillea* could be used as a *penetration strategy* to gain market share in the hope of controlling the timber market as a low cost producer. Subsequent pricing decisions would significantly help differentiate *Grevillea* timber from the competition.

3.4.7 Grevillea timber production economics

Timber production on farm is a long gestation period enterprise. The opportunity costs on the limited land may be too high compared to the current prices of timber from farms. As such, unrealistically high sales volume of timber is done to break-even. The marketing process urgently needs a profitable solution. Market research is needed to investigate current returns on farm timber as compared to other crop enterprise production. Little information is available on the opportunity costs and the profitability of certain crop combinations particularly on small-scale farms characteristics of the region under study. Use of household labour and resources is often not a factored cost in the production process hiding the real costs of the enterprise. The enterprise is further too dependent on intermediaries for its economic functionality; farmers are not able to access profitable markets directly or wield any channel power. Their eventual margins remain minimal risking the profitability and sustainability of the whole enterprise.

3.4.8 Grevillea market competitors

Farm sourced *Grevillea* timber can in many aspects be regarded as an emerging sub sector with some unique marketing strategy hiccups. The product has a formidable potential if managed in an orderly manner and receives necessary institutional support. Already *Grevillea* supports the wood industry with different timber products. Because it is a relatively new market compared to plantation logging, it is largely unproven and there are many speculations on how it will function, how fast it will grow and how big it will get.

Table 5: Projected demand for wood in the high-potential & medium-potential districts ('000 m3)

	1995	2000	2005	2010	2015	2020
Firewood	7993	9251	10686	12251	13889	15593
Wood for charcoal	5085	6298	7351	8511	9726	10972
Poles	948	1111	1308	1544	1823	2153
Industrial wood	1058	1209	1378	1543	1709	1961
Total wood demand	15084	17869	20723	23849	27147	30679

Source: KFMP, 1994

The average wood biomass inventory is 7.9 m^3/ha on farmlands and settlements. The annual increase in wood biomass in farmlands and settlements is about 0.46 m^3/ha over the original farmlands and part of the farmlands (KFMP 1994).

Going by the Kenya Forest Master Plan, farmlands timber has emerged to absorb losses in forests, woodlands and bush lands. Projected total demand for wood in the high and medium potential districts is poised to rise form 15,084,000 m^3 in 1995 to 30,679,000 m^3 in the year 2020 (Table 5). Projected wood supply form farmlands in the high and medium potential zones is projected to increase from 64% in 1995 to over 80% in the year 2020 (Table 6). Deficits are envisaged to accumulate in year 2005 and steadily decline by year 2020 as more trees growing is undertaken on farms (Table 6.)

Table 6: Projected wood supply and demand in the high-potential and medium-potential districts under the master plan scenario ('000 m3)

	1995	2000	2005	2010	2015	2020
Sustainable wood supply						
Indigenous forests	1942	1916	1909	1909	1909	1909
Forest plantations	2149	2600	2402	2840	3245	3815
Farms and settlements	7437	10386	13375	16421	19479	22553
Subtotal	11528	14902	17686	21170	24633	28277
Farms as % of the sub-total	64	70	76	78	79	80
Wood from clearings & substitutes	1648	1917	2118	2430	2754	3086
Total wood supply	13176	16819	19804	23600	27387	31363
Wood demand	15084	18024	21041	24294	27786	31527
Wood surplus/deficit	-1908	-1205	-1237	-694	-399	-161

Source: KFMP, 1994

3.4.9 Critical market attractiveness factors on Grevillea timber

Fast tree growth in high potential and medium potential areas such as Meru makes *Grevillea* tree growing a feasible agricultural land use option. However, secure land tenure seems a pre-condition for long-term investments on the land. Demand for timber is rising along the rapid population growth. Since indigenous forest area is shrinking, smallholder *Grevillea* timber logging offers certain advantages over forest logging in general. These amongst others include:

- There is twice as much woody biomass outside than there is inside gazetted forest. Control and use of these resources is on the hands of farmers. The only substantial increase in forest acreage and wood volume is occurring on farmland. In high potential areas the woody biomass already equals that of indigenous forest and commercial forest combined (KFMP, 1994).
- Little effort is required to get farmers to invest in tree planting and markets for timber is large and steadily growing.
- Farmers could benefit more by selling timber directly to urban consumers (combine both backward and forward integration) and eliminate the cost of selling through middlemen. Contractual arrangements could be sought with established saw millers to supply farm timber. On the other hand, businesses sourcing timber from farm could increase their competitive advantage through several alternative means: firstly investing on training programmes for their employees would help improve on timber recoveries (currently between 25-30%) and reduce on the current wastage.
- Simple trainings on machinery maintenance, safety and usage would help improve timber processing and save on the frequent costs of repairs and huge fuel consumption.
- Simple grading on processed *Grevillea* timber could attract a premium on quality aspects e.g. knot free timber. Improved timber storage practices in yards could result in more income from warped and bent timber planks.
- Many businesses hire felling and splitting machines, transport and casual labour for loading operations. These outsourced operations don't offer quality services in return, quality is compromised and income is reduced, even though this may be compensated through the forgone costs of investing and maintaining machine operations.
- Farm *Grevillea* could be sold in many forms including firewood, poles, lumber and for carving. Market diversification and product line extensions are therefore abundant.

The KFMP summarizes several market factor arrangements that could suffice to enhance smallholder timber marketing (Table 7).

Table 7: Qualitative comparison of the current trends and master plans scenarios

	Effects under current trends	Effects under the master plan
Tree tenure	Restrictions on tree harvesting remain	Restrictions on tree harvesting on private land removed
Technical knowledge e.g. on the competition between trees and agricultural crops	Inadequate for making confident farm-level decisions	Knowledge improved through research and demonstration plots, allowing confident decisions to be made
Wood stocks and production from farms	Increasing mainly through farmer's own initiatives	Increasing but at a much higher rate through the programme
Non-wood tree products from farms	Low value does not encourage further investments	Value improved through research and new technology
Institutional support	Un-coordinated and inadequate; lack of extension materials	Integrated, move adequate, farm forestry extension package developed

Source: KFMP, 1994

Several levers further combine to give *Grevillea* timber a marketing edge. These entail:

- Consumer awareness and preference for sustainable timber
- Large plantations management challenges e.g. fire risks, planting backlogs
- Experience developing from out grower, group schemes e.g. Poplars in India, *Eucalyptus* in South Africa, hardwoods in Ghana

3.5 CONCLUSION

Smallholder timber trade is an emerging sub sector offering many opportunities and challenges. Current marketing of *Grevilllea* timber requires marketing planning support to redress customer concerns about product features, performance and reliability. Given time though, farmer learning and experience curves will grow to allow for more competition in the sub-sector. The key issues to be addressed meanwhile hinge on access to key market segments and means to penetrate and attain a market leadership position. Competitive strategies keyed either to focused low-cost differentiation seems viable for farmers to attain this due to their relatively low-cost factor endowment. However this still requires investment on farmer entrepreneurial skills and resource capabilities.

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CHAPTER FOUR

COMPONENT 1.2.4

4.0 POLICY LINKS FOR GROWING SMALLHOLDER TIMBER MARKETS

4.1 INTRODUCTION

For a long time now, trees grown on farm in Kenya have not benefited from a ready market as compared to trees grown on government plantation for the same purposes. The plantation blocks used to provide up to 300 m^3/year of wood to the wood industry in the past. As such, there was an over reliance on government plantation forestry for all the wood requirements. Timber from government forests was heavily subsidized and only royalty prices were paid for bulk harvest. The subsidies led to excessive logging and wastages. This was already an indicator of inefficiency and the ban on logging had to be imposed in 1999 to save the already degraded forests. However, illegal-logging continued after the ban leading to key forests timber species degradation (KWS, 1999). Timber prices went up resulting to a near market failure. Many saw-millers, timber yard owners, large furniture makers and timber businesses closed down despite the government measure on zero rating timber import duty. Little investment on forestry, poor planning and failure to adhere to the forestry master plan recommendations are key factors which precipitated the supply crisis.

Little attention was given to farm tree production to complement demand on forestry material despite the Kenya Forestry Master Plan (KFMP, 1994) projected, that by the year 2010, the majority of timber and poles would come from farms. The Master Plan proposed comprehensive set of measures to facilitate improved management of the forest estate. This included recommendations such as: "Closer linkages between industry and farm tree growers that could provide the rural population with increased earnings from sales of wood and other industrial raw material and from the various steps in tree-product harvesting, transport and processing". Forest plantation coverage was at 160,000 hectares in 1994, this was reduced by 40,000 hectares through excisions for settlements in the late 1990s. By the year 2000, only 74,000 hectares were planted. Planting backlogs stood at 46,000 hectares. This was attributed to the ban on the *shamba* system between 1986 and 1996, unsustainable harvesting in the late 1990's and slow replanting rates (Kagombe & Gitonga, 2005).

This study indeed reinforces the value of volumes of timber on smallholder farms. Biomass inventories undertaken in Meru reveal regular density of 7.5 m^3 per ha in the central agricultural areas of the country; with this rising to 17.07 m^3 per ha, in mixed stand agroforestry systems (Njuguna, *et. al.,* 2000).

4.2 SMALLHOLDER TIMBER FARMING

Though trees grown on farm offer the potential to supply the wood industry with substantial amount of wood, this study highlights the peculiar policy related circumstance related to production and marketing. This study (Chapter one) on timber

supply from farms reveal that trees grown for timber are also used to meet other individual farmer household needs. Pruning and pollards are used to provide fire wood for lighting and heating at the household level. Deformed trees and other poorly managed trees unsuitable for timber are chopped up for firewood and sold to neighbors, local hotels and tea factories in the area (used for curing tea). Trees grown on farms also provide other functional services such as windbreaks, shade and aesthetics. They are also used as boundary markers to settle disputes. The choice of species to plant usually varies on individual farmer interest and land size capacity but may also be determined by other factors such as the tree species compatibility with crops, duration to maturity (usually fast growing exotics are preferred than 'slow' growing indigenous species) and the ability to provide a highly valuable wood. Though the socio-economic role seems innumerable the functional role of farm grown trees is poorly mainstreamed even in the country's Poverty Reduction Strategy Paper and National Plans.

Furthermore, even though the value of farm timber resource is clear, the sub-sector has not benefited through a clear policy and institutional framework. For instance the sub sector is found to be regulated by many pieces of legislation such as the Timber Act, Forestry Act, the Environmental Act, the Water Act, the Agriculture Act, the Coffee Act, and formerly the powerful Chief's Act. The principal legislation which governs the conservation, management and utilization of forest and forests products is however the Forestry Act (FAN, 2000). It nevertheless remains unclear whether to place trees on farm under forestry laws or under agriculture laws since the practice is on agricultural land. This has largely served as a disincentive to investing farmers.

Marketing regulations have further dampened investment on the sub sector as it's difficult to transport timber across districts due to permits requirements and traffic police harassment. Charcoal making remains illegal and still denies many smallholders the opportunity to market their wood. Another production related constraint is poor farmer tree planting support programmes. This is now a serious concern as farm timber 'mining' continues in several parts of the country such as Meru, Embu, Kirinyaga where large wood consumers such as tea factories, tobacco factories have continued to source the wood needs.

The supply of wood from farms is therefore in dire need for a holistic assessment to ascertain if its allocation will meet the demands of the wood industry in Kenya. The allocation will be deemed efficient if the benefits from the use of the wood are maximized. A systematic farm wood stocks assessment could help determine levels of production that will maximize benefits for both producers and consumers. This is done by comparing biomass volumes and harvest levels. As farm timber markets are emerging and policy directions unclear, this study analyzes key value steps to grow the sub-sector while making certain recommendations.

4.3 METHODOLOGY

The policy study involved key stakeholder workshops and consultations at different levels. Local farmer, foresters, agriculturalist and administration participatory meetings helped inform emerging issues toward sustainable farmer tree production. National forestry organizations such as Forest Action Network and Kenya Forest Working Group helped in follow up and discussions on the new forestry policy and Act. Key stakeholder in-depth interviews, conducted in Meru were used to collate information on the local timber business level operations and along the value chain. Critical secondary information on business development and farmer marketing was derived from the FAO manual on tree and forest product enterprise development amongst other literature. Key emerging lessons were collated through a tasked working group and synthesis provided. The Kenya Forestry Master Plan provided a comprehensive background document on Kenya's forestry development.

4.4 DISCUSSION

During 1996–2000, there has been a one percent per capita increase in wood demand worldwide (Scherr, 2004). The wood supply crisis is particularly severe in several tropical countries. There are logging bans in natural forests and plantations, which make timber from these sources illegal. Large plantations are difficult to site as they incur risks, for example fire. Insufficient technical expertise and incomplete information about different species' growth potential are severe constraints for plantation investors. In Uganda, management information for preferred exotic species such as *Eucalyptus grandis*, *Pinus caribea* and *Pinus oocarpa* is readily available unlike for *Maesopsis eminii* which is the only fast-growing native timber species in Uganda (Bucholz *et.al*. 2005).

The case study on marketing *Grevillea* in Kenya revealed that farmers are unable to estimate the quantities of wood and value of their trees and there is poor knowledge of tree management including silvicultural techniques for high-quality timber production. Farmers could not pinpoint a definite market for timber and did not perceive organized timber markets. They received low prices for tree and tree products and also pointed to poor conditions of roads and lack of capital as hindrances to tree selling.

A saw-miller assessment conducted during this study found out that, mobile saw-millers were strategically placed in marketing on-farm timber (Onchieku, 2006)**.** The saw-millers are more knowledgeable than farmers but have logistical problems acquiring timber and logs from farmers. They need more information on better tree use and on available supply of trees and logs from farm. The saw millers also require to improve output efficiency and to find methods of adding value to timber.

A key lesson followed through the study include the fact that trees on the farm act as an important asset for to many rural dwellers, however they lack the necessary knowledge, capital or legal rights to exploit market opportunities. A participatory stakeholder problem analysis mapped several issues surrounding the low returns often obtained by farmers on marketing smallholder timber (Figure 6).

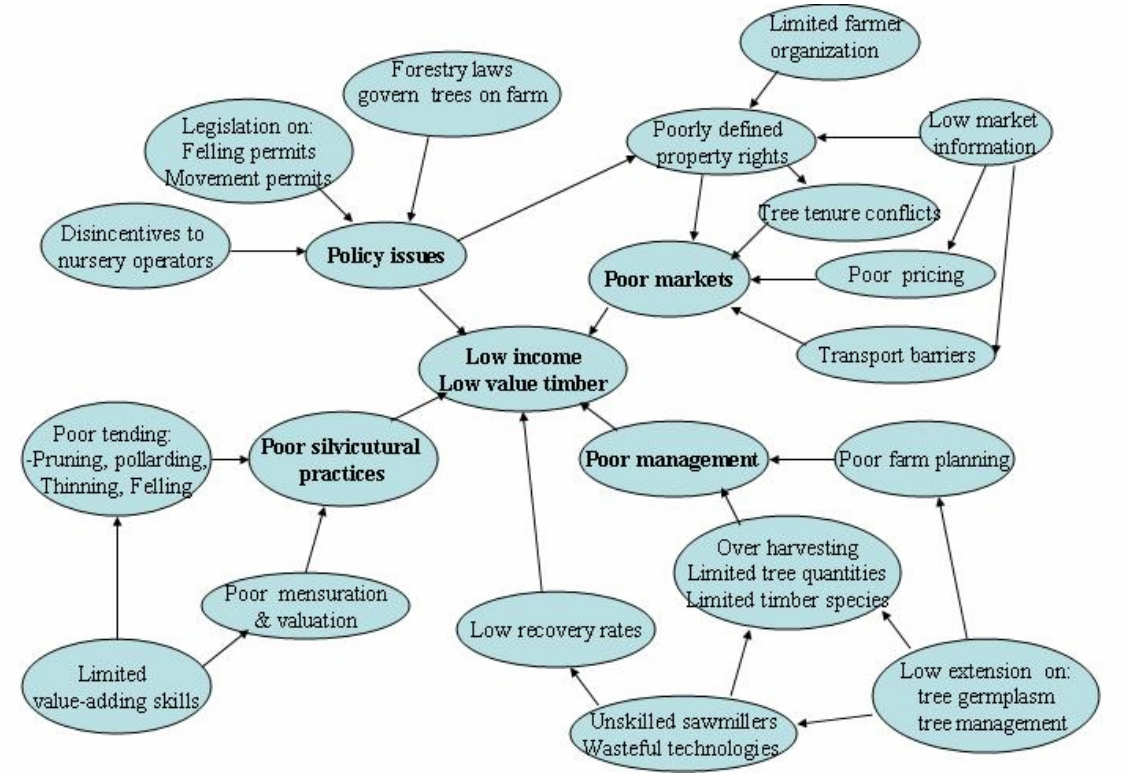

Figure 6: Smallholder timber issues related to low income and low value timber

The problem mapping helps to review and assess key value chain factors that help inform emerging policy for smallholder timber and forestry products sub sector in general. The analysis takes due consideration of the internal and external smallholder timber markets with a view of identifying key areas for improvement to grow the sub sector. These include:

- A value chain analysis
- Performance analysis
- A SWOT analysis

4.4.1 Value chain analysis

This analysis describes the activities taking place in a business and relates them to the competitive strength of the business. Influential work by Michael porter (1980) suggests that enterprise activities could be grouped under primary activities and support activities. The chain consists of a series of activities that create and adds value. They culminate in the total value delivered by a product. Thus for farm sourced timber the primary and support activities are depicted as:

Primary activities

Inbound logistics

For *Grevillea* timber the standing trees are sourced from individual farmer holdings. The purchase usually is per standing tree. Negotiations are undertaken on the amount of

timber recovery that goes to the buyer and the amount left with the farmer. Log costs will vary upon negotiations.

Operations

Already purchased standing trees on farm are consolidated felling and milling exercises commenced. Chainsaw operators or mobile bench sawyers are hired for timber processing. Care has to be observed to limit crops destruction and other property on farm. Enough labor is required to facilitate felling, splitting and timber collection on farm. Tree location on farm has to be carefully evaluated for felling and splitting operations. Trees on valley bottoms are difficult to transport as logs and are better spilt at their site using chainsaws.

Outbound logistics

Once logs processing is finalized on farm, usually there is no adequate in house storage of timber and they may just be stack on a space within the homestead next to the wall of the main house or just within the compound. Labour to stack and load is needed. Tractor-trailer and lorry transport is often used to ferry timber destined for urban centers and supplying timber yards, furniture makers, construction sites etc. Porters using cart transport are used to transport timber locally for example to neighbors and local hotels.
Access roads to the farms, which are usually earth roads, have to be assessed for ease of accessibility and related logistics sorted.

Marketing and sales

This function takes place at different levels, right from the farm level where the farmer sells timber trees, then the individual businesses buying timber from farms which in turn either sell the timber directly e.g. timber yards selling the timber to construction industry or furniture makers who further process the timber for furniture. Furniture makers may also purchase timber directly from farms integrating many of the functions afore-mentioned.

Service

This function is non-existent for smallholder timber businesses. Individual businesses are currently capitalizing on the huge timber demand and no semblance of follow-up on customer satisfaction is currently provided. As a result little product differentiation is found among businesses. The market does not pay for premium quality timber thus little grading and niche marketing.

Support activities

The primary activities described above are facilitated by support activities such as**:**

Timber sourcing

This function lies with individual consumers at different levels. The supply has changed from forest blocks sourcing to sourcing trees scattered over many small farms, (some businesses are able to adapt and some are not). For the construction consumers, they may procure timber directly from farmers or from timber yard operators in urban locations. On the other hand timber yard owners may use middlemen to purchase logs

from farmers or do direct sourcing from farms. Furniture makers may also source directly from farms or use middlemen or timber yards to source all their wood requirements. Mobile benchers and chainsaw operators provide felling and splitting services on hire. Tractor and lorry transporters provide a critical function for timber yard businesses who may not have truck transport of their own and for distant consumers across districts especially requiring timber for construction. Transport costs remain an important consideration for determining margins along the value chain.

Technology

Little technology improvements are found in milling and marketing timber from farms. The use of mobile benches and free hand chainsaw is however common. Current number of sawmills nationwide and their potential, based on numbers before the logging ban were categorised as follows: large (>5000 m^3/yr), medium (2-5000 m^3/yr) and small (<2000 m^3/yr), although whether mobile bench saws (at e.g. 2-500 m^3/yr) are included as small sawmills is not clear. Chainsaw milling operations (at <200 m^3/yr) are not included. Recovery rates are provided at approximately 40% for large sawmills, 30% for medium sawmills and 25% for small sawmills, though other studies have indicated recovery rates of 30-40% for bench saws and chainsaw milling (Onchieku, 2002). Milling attachments used on chainsaws and which have the potential to increase recovery rates such as, frame mills, Granberg's, Alaskan, Mark III and the Small Log Mill are not available and not used (Pascieznik & Carsan, 2006).

Human capital

There is an urgent need to enhance farmer timber tree management skills on farms to improve recoveries. Farmers are not organized for the market, are unaware of timber valuation, pricing and demand and have little negotiating ability as they function as individuals selling three to five stems at a time. The market system is also not organized to receive produce from farms. Further, tree management on farm is poor, producing poor boles that don't fetch good prices. Many saw millers employ casual unskilled labor resulting to enormous wastages on recovery. There is poor handling of chainsaws resulting in frequent accidents and high maintenance costs. In addition, timber seasoning is found to be poor amongst wood processors and timber businesses (Pascieznik & Carsan, 2006).

Infrastructure

Smallholder timber marketing faces many infrastructural challenges and constraints. These are identified as socio-economic, technical, logistical and legislative. These will fragment along the different stages of production, harvesting and logging, primary processing, quality control, marketing and utilisation. Improvement could be realized through training of farmers on tree management, training of chainsaw/sawmill operators on improvements on timber quality and maintenance of machinery.

4.4.2 Competence analysis

Core competencies are those capabilities that are critical to a business achieving competitive advantage. For smallholder timber marketing, competitive advantage is sought by the individual business at their level of operation. The whole value chain starting from the farmer level ought to seek means of benefiting from certain competitive

advantages at their operations. Smallholder timber marketing offers certain key advantages that could help grow the sub-sector over plantation logging. These include:

- There is twice as much woody biomass on farm than there is inside gazetted forest. Control and use of these resources is on the hands of farmers
- Little effort is required to get farmers to invest in tree planting and in addition availability of market for tree is large.
- The only substantial increase in forest acreage and wood volume is occurring on farmland.

Some of the examples where chain participants could improve their core competencies and enhance smallholder timber benefits include:

- Farmers could source elite planting material and increase their planting quantities. Clonal planting material (e.g. *Eucalyptus* from S. Africa done by Mondia) is fast growing and will provide returns within a shorter period compared to seedlings. Right management practices e.g. thinning and pruning could also be used to improve timber quality. Farmers could also fetch more income by selling primary processed timber than the current practice of selling whole standing trees. This could be done through small investments on machinery or even through more inexpensive ways like hiring existing mobile benchers and chainsaw millers. Capital to undertake the associated farm level operations could be sourced through micro finance facilities which provide softer lending terms tailored to individual circumstances. Farmer groups could benefit from collective bargaining power and group collateral.
- Farmers could also explore opportunities to sell wood directly to urban consumers (combine both backward and forward integration) and eliminate the cost of selling through middlemen. Contractual arrangements could be sought with established saw millers to supply farm timber. On the other hand, businesses sourcing timber from farm could increase their competitive advantage through several alternative means: firstly investing on training programmes for their employees would help improve on timber recoveries (currently between 25-30%) and reduce the current wastages.
- Trainings on machinery maintenance, safety and usage would help improve timber processing and save on the frequent costs of repairs and huge fuel consumption.
- No grading is done on processed timber to attract a premium on quality timber e.g. knot free timber, or proper seasoning. Timber storage is also poorly practiced with poor techniques on stacking wood planks. Many yards as a result suffer lesser income from warped and bent timber planks. Many businesses hire felling and splitting machines, transport and casual labour for loading operations. These outsourced operations don't offer quality services in return, quality is compromised and income is reduced, even tough this may be compensated through the forgone costs of investing and maintaining machine operations.
- There is a need for businesses to support smallholder timber tree planting programmes and if possible commence own out-grower schemes. This would ensure sustenance on farm logging operations. This would further enhance the business 'corporate social responsibility'.

4.4.3 SWOT analysis

SWOT (Strengths, Weaknesses, Opportunities and Threat) is a useful tool for auditing the overall strategic position of a business and its environment. Strengths and weaknesses are internal factors, while opportunities and threats are external factors

impacting on a business. A broad synthesis of the factors impacting on smallholder timber marketing is highlighted in the SWOT analysis in Table 8:

Table 8: SWOT analysis on smallholder timber marketing

Strengths	**Weaknesses**
Consumer preference for sustainable grown timber Logging bans in natural forests and plantations Large woody biomass on farm Farmers willing to invest in timber tree planting Limited initial investment Easy local market access	Poor tree valuation techniques & tree management Lack of capital Poor germplasm access Poor farm planning, small scale operations Poor infrastructural network in the rural areas Poor market access, market intelligence systems
Opportunities	**Threats**
Policy change in favor of farm forestry 1% per capita increase in wood demand Microfinance facilities Available research support from: ICRAF, KEFRI Increased capabilities through farmer group formation	Unfavorable legal provisions Over harvesting practices pest and diseases due to inferior germplasm Government regulations on tree felling Land sub-division.

From the SWOT analysis, smallholder timber marketing is indeed found to be a multi-sectoral activity with many challenges requiring pursuit through many alternative and complementary approaches. Though thick qualitative and quantitative description has often been missing to characterize said production practices, other players in the sub-sector including; tree nursery operators, small timber businesses, chainsaw operators, timber yard owners, tea factories local administration, micro finance providers and other smallholder timber marketing facilitators all seem to have very specific issues with regard to farm grown timber. A social, technical, economic and environmental analysis of the entire smallholder timber practice is often a useful means to inform interventions.

Careful evaluation of particular lessons arising from any given settings, however gives impetus in shaping timely and useful operations. Thus important recurring lessons from the onset of the pilot study include but are not limited to the following aspects:

- Improvements of not only technological options, but also activities that create awareness on expected and improved returns
- Improve knowledge, farm management skills and local planning procedures, for optimal use of available resources to include value adding
- Support for farmer organizations, networks in collective action, that enhance local institutional development to redress common constraints
- Address important policy aspects, embedded legislation and issues that inform necessary policy

Any one given circumstance is unique and consensus in arriving at optimal solution may be a hard task requiring sustained follow ups to improve farmer management skills, resource base and policy issues. Conceived projects should be holistic and yield multiple benefits for smallholder timber producers, small scale chain saw operators, timber yard owners, and the many timber consumers (Figure 7). It is further recognized

that a number and variety of environmental, economic and social factors underlay successful smallholder timber enterprises.

To redress the multiple challenges addressed earlier in the problem mapping several interventions are prescribed to address the root cause of the problem and help bring real change. Figure 7 shows seven interventions identified during participatory stakeholder meetings in Meru. They include: policy advocacy, farmer timber networks, efficient markets and marketing systems access, germplasm exchange, farmer and timber business trainings and on farm demonstrations.

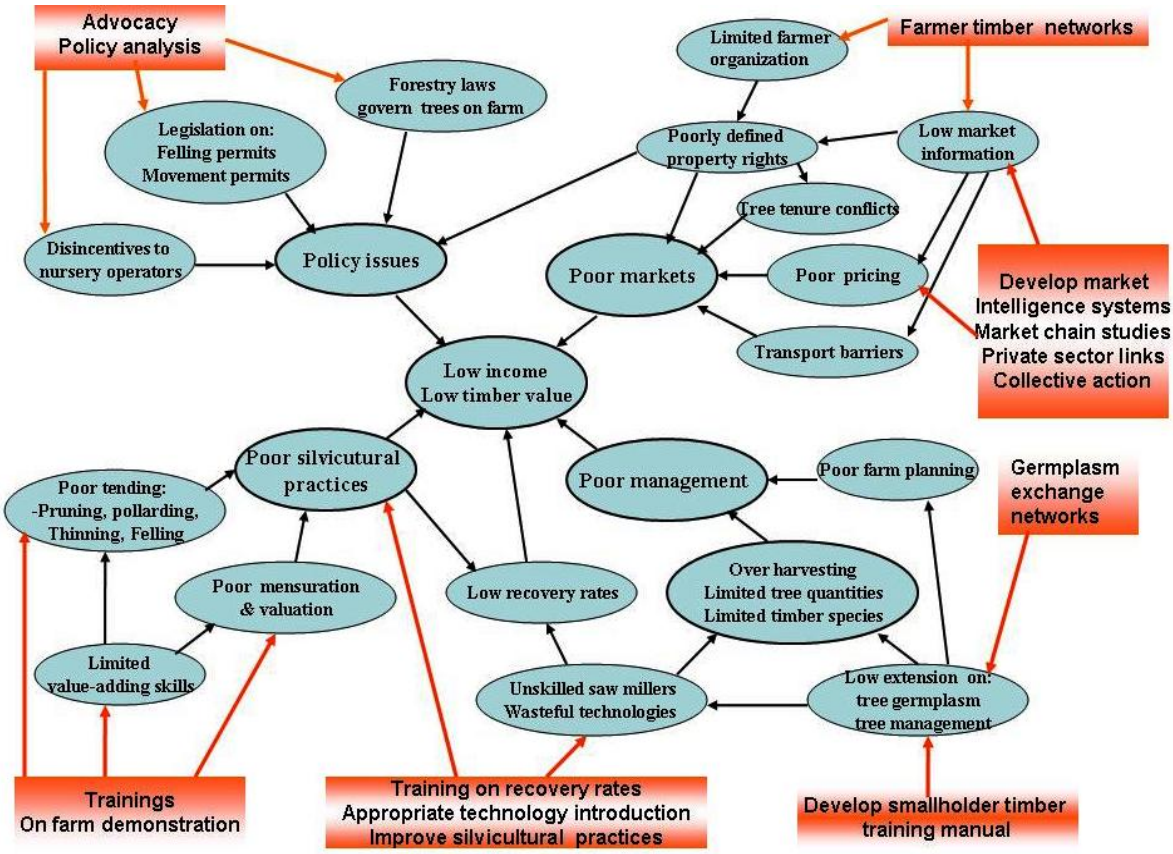

Figure 7: Possible means to address low income and low value timber

Emerging symptoms of resource degradation need be monitored. Current over harvesting patterns with characteristic indiscriminate felling of timber tree on farm poses a risk of depletions of farms tree resource base. Moreover over-harvesting and low management practices at farm level offer minimal social and economic benefits to farmers and the entire community. To cope with ever increasing demands to produce more food, individual farmers are often forced to effect drastic changes in a manner threatening to the very sustainability of smallholder timber production. It is now upon research to develop means of evaluating whether current land management practices will lead towards sustainable smallholder timber production or away from it. Relevant information for better land management will be required to harmonize food production with the often-conflicting interests of economics and the environment. Long term

environmental and social concerns associated with current outputs need be evaluated to ensure cross-generational equity.

4.5 CONCLUSIONS AND RECOMMENDATIONS

Farmers are poised to reap benefits from smallholder timber if they could harness their competitive advantage as depicted from the smallholder value chain analysis. This will mainly be through farmer groups' formation, market intelligence systems and harnessing capital to engage in backward and forward integration of market functions thereby increasing benefits. There is an urgent need to take cognizance of the current policy provisions on growing smallholder timber in Kenya under the new forest policy. Several policy-related issues are recommended to improve current smallholder timber marketing practices. These broadly include:

- Proactive farmer organization even through informal marketing associations to attain farmer bargaining power, better inform policy and bring about a more competitive smallholder timber business environment.
- With liberalized markets formal market information systems are non-existent and farmers businesses have to gather their own market information. Timber price guideline can be obtained from the Forest Department however often there is mismatch with the actual market price (prices are either higher lower than the quoted price).
- Credit facilities are elusive particularly for farmers and small businesses producing limited timber quantities. Large lending institutions consider small businesses too risky for credit facilities furthermore, many lack collateral and cannot service the high interest rates provided by the banks.
- Legal requirements on tree felling and timber movement permits often increase costs of transaction on timber. Traders often complain of traffic police harassment and incidences of bribery even with movement permits.
- There is no quality control system therefore producers or businesses insisting on quality cannot claim a premium on selling.
- Export market for smallholder timber is non-existent as local demand surpasses supply together with limited market information.
- Planting programmes are largely smallholder based, institutional support is needed to sustain genetic integrity of species planted, tree management on farm and critical linkages with the industry.

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APPENDICES

APPENDIX 1: ACCESSIBLE SUSTAINABLE WOOD SUPPLY, CURRENT TRENDS (`000 M3

	1995	2000	2005	2010	2015	2020
Indigenous forests						
Timber	518	508	498	488	478	468
Pole	259	254	249	244	239	234
Fuelwood	1166	1143	1120	1098	1076	1053
Woodlands and bushlands						
Timber	119	118	117	116	115	115
Pole	535	531	527	523	520	516
Fuelwood	10585	10508	10430	10352	10274	10196
Farmlands and settlements						
Timber	956	**1205**	**1465**	**1724**	**2014**	**2292**
Pole	335	422	513	603	705	802
Fuelwood	6146	7746	9418	11079	12947	14731
FD forest plantations						
Timber	1591	**1870**	**1584**	**1624**	1711	1992
Pole	177	208	176	180	190	221
Fuelwood	354	416	352	361	380	443
Total						
Timber	3184	3701	3664	3952	4318	4867
Pole	1306	1415	1465	1550	1654	1773
Fuelwood	18251	19813	21320	22890	24677	26423

Source: KFMP 1994

APPENDIX 2: TREE FORMS AND PARAMETERS FOR VOLUME FUNCTIONS

For computing the tree volume, the tree species were classified into four different types on the basis of stem form and branching habit. The useable volume of a tree was calculated using the following equation:

$\ln (v) = a + b \ln (d)$

In which v is a useable volume, (Dm3), d is diameter at breast height (cm), and a & b are constants. Constants a and b for different tree types were as follows:

Tree type	Parameter a	Parameter b	Reference
1	- 2.2945	2.5703	Laasasenaho 1982
2	-1.7322	2.3992	Pukkala 1989
3	-1.6493	2.3567	Pukkala 1989
4	-1.6840	2.2406	Pukkala 1989

APPENDIX 3: WOODY BIOMASS SURVEY

NUMBER OF TREES AND DENSITIES IN THE TARGET REGION

The total number of trees with a potential for timber production enumerated in the 31 farms in the two zones was 5,395 in an area of 58.14 hectares. This gave an average of 174 timber/potential timber trees per farm in the region which translates to 92.79 stems per hectare.

The 15 farms enumerated in the coffee/tobacco zone had a total of 3216 stems in an area of 44.08 hectares. This resulted in an average of 214 trees per farm and a density of 76.96 stems per hectare. In the coffee zone, the 16 farms had 2179 stems in an area of 14.06 Ha. The number of trees per farm was therefore 136 stems per farm and a density of 154.98 stems per hectare.(in the body)

Table 9: Number of trees and densities in the region

Zone	No. of farms	Total area (Ha)	Total Number of Stems	Stems/farm	stems/Ha
Cotton/Tobacco	15	44.08	3216	214.4	72.958
Coffee	16	14.06	2179	136.19	154.979
Totals	31	58.14	5395	173.967	92.793

Tree volumes

The enumerated 31 farms with an area of 58.14 Ha had a total volume of 1,910.955 m^3 thereby giving an average volume of 61.6 m^3/farm and 32.86 m^3 per hectare.

The 15 farms in the Cotton/ tobacco zone had a total of 1283.706 m^3 thereby giving an average of 85.6 m^3 per farm and 29.12 m^3 per hectare. The 16 farms in the coffee zone had 627.249m^3 resulting in an average of 39.20 m^3 per farm and 44.61m^3 per hectare.

Table 10: Average volumes in the region

Zone	No. of farms	Total area (Ha)	Total Vol. (m^3)	Vol./farm (m^3)	Vol./Ha (m^3)
Cotton/Tobacco	15	44.08	1,283.706	85.58	29.122
Coffee	16	14.06	627.249	39.203	44.612
Totals	31	58.14	1,910.955	61.636	32.863

APPENDIX 4: COMMON TREE SPECIES ON FARM: MOUNT KENYA AREA

Table 11 Encountered species with number of occurrences and average total trees on farm
(*Source Oginosako et. al., 2006)*

Botanical name	**Places where species was encountered & Average trees number on farm per species**			
	#	**%**	**rank**	**Average trees number per farm**
Grevillea robusta	183	13.2	1	70
Persea Americana	105	7.6	2	8
Musa sapientum	103	7.5	3	110
Eucalyptus saligna	100	7.2	4	56
Cupressus lusitanica	89	6.4	5	30
Mangifera indica	82	5.9	6	10
Croton megalocarpus	74	5.4	7	31
Carica papaya	57	4.1	8	53
Citrus sinensis	37	2.7	9	18
Eriobotrya japonica	36	2.6	10	9
Macadamia tetraphylla	35	2.5	11	12
Citrus limon	27	2.0	12	3
Commiphora eminii	27	2.0	12	45
Cordia Africana	27	2.0	12	9
Jacaranda mimosifolia	27	2.0	12	13
Psidium guajava	27	2.0	12	7
Schinus molle	24	1.7	17	9
Acacia mearnsii	19	1.4	18	89
Croton macrostachyus	18	1.3	19	13
Senna siamea	16	1.2	20	88
Vitex keniensis	16	1.2	20	13
Azadirachta indica	15	1.1	22	4
Bridelia micrantha	15	1.1	22	9
Terminalia brownii	13	0.9	24	23
Casuarina cunninghamiana	12	0.9	24	21
Juniperous procera	12	0.9	24	22
Acacia xanthophloea	11	0.8	27	27
Melia volkensii	11	0.8	27	7
Acacia tortilis	10	0.7	29	25

Acrocarpus fraxinifolius	10	0.7	29	2
Markhamia lutea	10	0.7	29	14
Tamarindus indica	9	0.7	29	9
Annona cherimola	8	0.6	33	7
Erythrina abyssinica	8	0.6	33	2
Acacia nilotica	7	0.5	35	77
Ficus natalensis	7	0.5	35	17
Ficus sycomorus	7	0.5	35	8
Prunus Africana	7	0.5	35	5
Kigelia Africana	6	0.4	39	2
Olea Africana	6	0.4	39	4
Pinus patula	6	0.4	39	25
Senna spectabilis	6	0.4	39	54
Berchemia discolor	5	0.4	39	5
Leucaena leucocephala	5	0.4	39	30
Balanites aegyptiaca	4	0.3	45	4
Commiphora Africana	3	0.2	46	9
Eucalyptus saligna	3	0.2	46	18
Podocarpus falcatus	3	0.2	46	4
Sapium ellipticum	3	0.2	46	25
Spathodea campanulata	3	0.2	46	5
Acacia polyacantha	2	0.1	51	4
Calliandra calothyrsus	2	0.1	51	7
Milicia excelsa	2	0.1	51	2
Milletia dura	2	0.1	51	49
Piliostigma thonningii	2	0.1	51	11
Terminalia mentally	2	0.1	51	2
Trichilia emetica	2	0.1	51	9
Zyzigium guinesis	2	0.1	51	4
Acockanthera chemperi	1	0.1	51	4
Albizia gummifera	1	0.1	51	3
Catha edulis	1	0.1	51	46
Celtis mildbraedii	1	0.1	51	5
Croton dichogamous	1	0.1	51	1
Cussonia holstii	1	0.1	51	7

Ehretia cymosa	1	0.1	51	6
Euclea divinorum	1	0.1	51	3
Fagara microphylla	1	0.1	51	1
Ficus benjamina	1	0.1	51	1
Rawsonia lucida	1	0.1	51	4
Sesbania sesban	1	0.1	51	5

Source: Oginasako et.al 2006

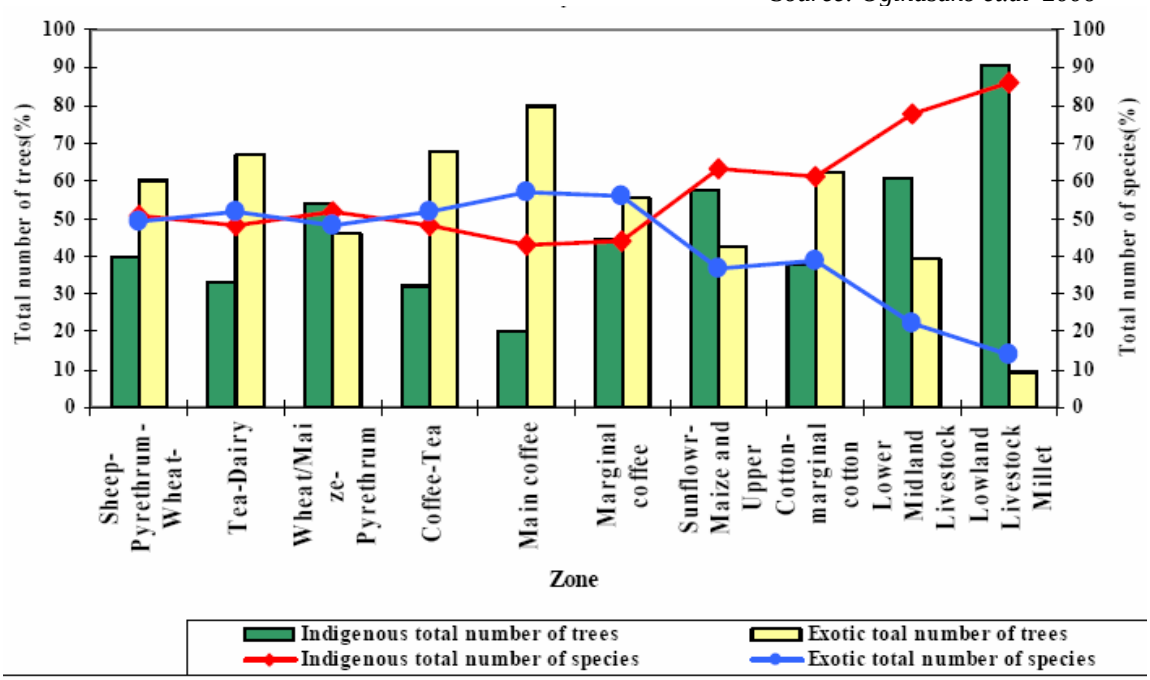


Figure 8: Percentage number of trees and species in all zones of Mt. Kenya

Appendix 5: Meru map: Agro-ecological zones

Source: Oginasako et.al 2006

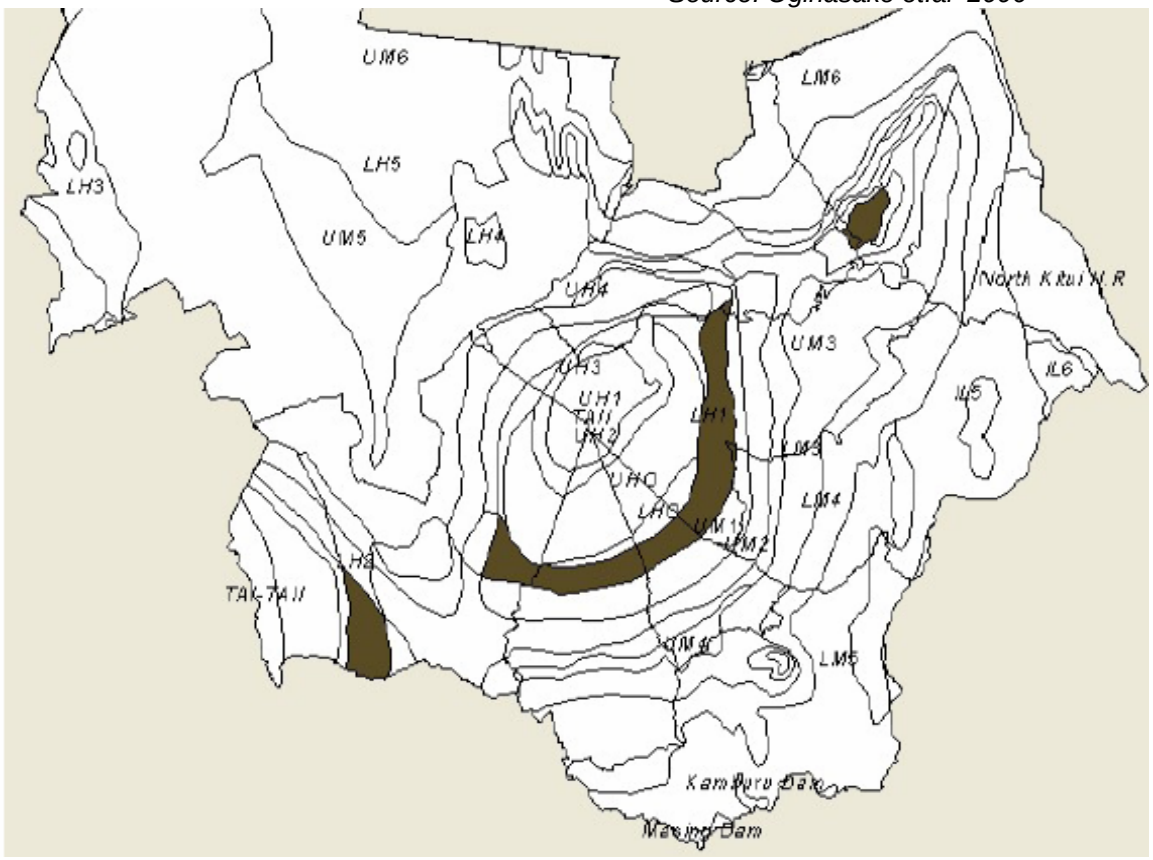
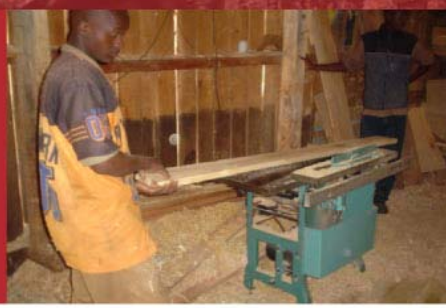


Figure 9: Meru map showing main agro ecological zones

Growing farm timber:
practices, markets and policies
The Meru timber marketing pilot programme case studies and reviews



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