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Smallholder Tree Growers Income Opportunities from Farm Forestry Products in Western Kenya

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The study is based on surveys done between September 2005 and January2006 on production, marketing and potential markets for various tree products in western Kenya. The study was aimed at addressing the inadequate or fragmented information on production, marketing and demand for various tree products grown by smallholder farmers. The study revealed that farm forestry in western Kenya is a multibillion shilling sector business thanks to recent moratorium on harvesting of trees in public forests and emerging market niches. The emerging markets include increased firewood demand from Kenya Tea Development Agency (KTDA) affiliated tea processing factories that are shifting from use of expensive furnace oil to firewood fired boilers and the recent shift by Pan Paper Mills (PPM) to buy pulpwood and firewood from farms. The potentials of farm forestry products range from firewood, industrial roundwood, charcoal, transmission poles and construction poles. The findings indicate that charcoal traded produced from *Acacia mearsii* was 25,200 tonnes per year with a retail value of Ksh 380 million. Industrial firewood demand for industries in Eldoret and sugar belts is estimated at 44,000 tonnes valued at Ksh 55 million per year. The 19 tea factories in the region have combined demand potential of 360 million tonnes of firewood with factory gate value of 360 million per year. The combined intake of firewood and pulpwood by PPM was 500,000 tonnes per year with an estimated value of Ksh 520 million. Power and telecommunication sector annual demand was estimated at 212,000 pieces of semi-processed polewood with an estimated value of Ksh 170 million. Sawlog demand by saw mills and mobile benchsaws was estimated at 200,000m^3 per year valued at Ksh 300 million. Construction polewood dominant in Kisumu at Kondele and Nyalenda are sourced from Vihiga District and has an estimated annual turn over of 42,000 pieces valued at Ksh 25 million per year. The study revealed high potential for market driven farm forestry sector in western Kenya. Suggestions are made for improved production praetices, harvesting and processing technologies and market infrastructure.

Keywords: farm forestry, forest products, market opportunities, incomes

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1.0 Introduction

Recent studies have shown that farm forestry is a multi-billion Kenya Shillings-sector business with high potential growth in future (KFMP,1994, Ngibuini, 2003, Angwenyi and Kamau, 2003). Farm forestry in western Kenya[1] has remained largely a subsistence activity for a long time. The recent moratorium on harvesting of trees in public forests and the increasing demand for forestry products has accelerated the emergence of farm forestry as an important alternative source of various forest products. The potential markets for farm forestry products range from domestic firewood, industrial roundwood, charcoal, industrial firewood for tea, textile and food processing industries, semi-processed power or telegraphic transmission poles, and construction polewood. Less traded products include non timber products such as tree seeds, medicinal parts (roots, leaves, bark), fruits, dyes gums and resins. Several studies show that commercialization of farm forestry in Kenya is not developed among smallholder farmers and thus its contribution to the improvement of rural livelihoods has not been fully appreciated (Nyamai, 2003; Cheboiwo et al, 2003). Among the challenges facing farm forestry includes the urgent need for transformation from its present disorganized subsistence state into a dynamic and vibrant commercial oriented sector. The key obstacles to its transformation process include; poor access to improved high quality planting materials, slow adaptation to product specialization, low level of species diversification, lack of skills in tree crop management and inappropriate post harvests practices. However, the transformation of farm forestry sector will be possible if there are reliable market opportunities for its range of tree products, its ability to penetrate into emerging tree products markets and development of competitive marketing systems. This is because the days when tree growing interventions emphasized biological productivity and natural resource conservation disregarding the importance of markets are gone (Russel and Franzel, 2003).

[1] Western Kenya in this documents refers to areas west of Rift, western and Nyanza provinces

1.1 Study Justification

Despite the acknowledged importance of markets in promoting a self-sustaining and viable farm forestry sector, information on the demand and projections for farm forestry products are fragmented or unavailable. This puts farm forestry development agents into an awkward situation because farmers have to make serious and well informed investment decisions among the competing alternative land uses considering dwindling land sizes among land owners. The study was aimed at documenting information on the potential markets and tree product marketing data for use by farmers and other stakeholders to make informed farm forestry investment decisions in Western Kenya.

1.2 Study objectives

The specific objectives of the study were:

1. To collection and documenting information on existing and potential markets for a range of tree products from farms;
2. To highlight some unique characteristics associated with farm forestry in relation to existing market niches.

1.3 Materials and Methods

1.3.1 Data Collection

Market surveys were carried out between September 2005 and January 2006 in Rift Valley, Western and Nyanza provinces targeting major wood consuming industries and other market niches for tree products. Semi-structured questionnaire and checklist format was used. The surveys covered selected sawmills, firewood consuming enterprises, charcoal producers, timber treatment plants, tea factories, textile and sugar processing enterprises. The saw mills surveyed were those that were still partially operational and those closed. The data collected included the current roundwood intake, sources of roundwood materials, prices, future projections and problems associated with products from smallholder farmers. Primary information was supplemented by synthesized secondary information from publications on wood based industries and tea industry from Kenya Tea Development Agency (KTDA). The study also incorporated relevant data

from earlier studies done between 1999 and 2004 on wood based enterprises and marketing systems for tree products.

1.3.2 Data analysis

The data from the three sources: Questionnaires, checklist information and secondary information were aggregated to give an overview of the demand for several market niches for tree products in western Kenya.

2.0 Results and Discussions

2.1 Charcoal

2.1.1 Trends in Charcoal production and trade

The survey revealed that several actors are involved in charcoal production from woodlot harvesting operations (clear felling, bark stripping, sizing) stacking, covering, burning, sorting and bagging. According to charcoal producers an hectare of well-stocked seven to eight years old *A. mearnsii* woodlot produces approximately 1000 bags of charcoal. The study revealed that approximately 840,000 bags or 25,200 tonnes of charcoal from *A. mearnsii* is produced and traded in the western Kenya annually valued at -Kshs 290 million and 380 million taking gate price of Ksh 350 and retail price of Ksh 450 (Cheboiwo, 2003). Based on discussions with key informants it is evident that the aggregate charcoal outputs in the region especially from *A. mearnsii* will decrease because of farm subdivisions and replacement of woodlots with other land uses though especially in former EATEC estates.

Charcoal is one of the most widely traded farm forestry products in western Kenya in terms of volume, value and distances moved (Cheboiwo, 2003). Most the traded charcoal is produced from *Accacia. mearnsii* woodlots grown in Uasin Gishu, Keiyo, Trans Nzoia, Nandi and Lugari districts. Recent studies show that there is an upward trend in gate and retail charcoal prices in western Kenya pointing to its growing scarcity. This could be attributed to rapid urbanization and reduced supplies from non-sustainable harvesting in rangelands and land clearings. The farm gate charcoal prices

between 1999 and 2005 rose from Ksh 130 to 350 per bag[2] whereas the retail prices in the regional markets rose from Ksh 180 to 450. Mature standing stock of *A. mearnsii* woodlot rose from Ksh 45,000 to Ksh 105,000 per hectare during the same period. *A. mearnsii* woodlot owners and other charcoal producers have immensely benefited from increased prices for woodlots and charcoal at the farm and market outlets. This is because farmers share of consumer price at Kisumu and Eldoret was estimated at 39% and 26% respectively exclusive of charcoal processing costs (Cheboiwo, 2003).

2.2.0 Industrial Firewood Markets

2.2.1 Textile and Food Processing

There are many textile and food processing industries that use firewood energy for their processing operations in western Kenya and source all their wood energy requirements from farms. Based on our surveys- most of the sampled industries reported that they were facing severe firewood shortages because farmers prefer to sell their trees as high value products such as poles or convert into sawnwood than sell them as lowly priced firewood. A large number of industries located in Eldoret town use firewood (Table 1).The annual estimated demand from the sector is 58,540 tonnes valued at over Ksh 70 million.

Table 1: Firewood Demand by Textile and Food Processing Industries in Western Kenya

Name	Distances*(Km)	Intake in tones	Unit price in Ksh	Total cost in Ksh
Rupa Mills	120	2,000	800	1,600,000
KenKnit	100	1,700	1,000	1,700,000
Corn Products	120	18,200	1,250	22,750,000
Lessos creameries	100	4,700	1,500	7,050,000
Arkay Industries	120	600	1,100	660,000
Kabras Mills	100	1,000	1,300	1,300,00
Western Sugar Mills	160	15,840	1,300	20,592,000
Homalime	100	14,500	,1000	14,500,000
Total		58,540		70,152,000

*Distances is measured in two way travel in kilometres from the factories to the collection points

2.2.2 Industrial Firewood for Tea Processing Industries

[2] A bag of charcoal weighs approximately 30-40kgs

Tea farming is one of the most important commercial agricultural activities being undertaken by farmers in the country and is currently served by 54 tea factories managed by Kenya Tea Development Agency (KTDA). Western Kenya has 19 out of the 54 smallholder tea factories managed by KTDA. Most private tea factories are self-sufficient in firewood needs but KTDA managed factories are dependent on marketed firewood(Angwenyi and Kamau, 2003). Most KTDA factories according to the survey were not fully converted to use firewood but some still use furnace oil to meet up to 30% of their tea processing energy demands. The combined annual potential firewood demand for the 19 KTDA factories in western Kenya is estimated at 363,960 m^3 with an estimated value of Ksh 360 million (Table 2). Most of the sampled factories are facing severe firewood shortages.

To counter the shortage and improve longer term supply conditions, some tea factories are giving incentives to farmers to grow trees through provision of free seedlings and extension services. As one of the long term strategy to ensure sustained supply of firewood some factories intend to buy or lease land for their energy plantations. Farmers within the vicinity of these factories have greater market access and opportunities to supply firewood for tea processing.

Table 2: Potential industrial firewood demand by Tea factories in Western Zone[3]

ZONE	Factories	Green Leaf Intake(tons)	Black tea(tons)	Annual firewood demand in m^3	Firewood values in Ksh
8	Tegat	10,173,642	2,218,096	40,695	40,694,568
	Momul	10,584,952	2,505,145	42,340	42,339,808
	Litei	9,397,168	2,207,157	37,588	37,588672
	Kapkatet	8,210,473	1,971,028	32842	32,841,892
9	Kapset	9,344,246	2,218,033	37,376	37376984
	Kapkoros	12,614,340	3,218,033	50,457	50,457,360
	Mogogosiek	12,965,021	3,141,362	51,860	51,860,084
10	Sanganyi	10,690,383	2,573,970	42,761	42,761,532
	Nyansiongo	7,640,007	1,888,203	30,560	30,560,028
	Kebiriko	6,225,391	1,487,927	24,901	24,901,564
	Tombe	7,288,780	2,236,985	29,155	29,155,120

[3] These are administrative zones as defined by KTDA

	Nyankoba	7,288,780	1,744,891	29,155	29,155,120
11	Ogembo	11,679,221	2,809,673	46,716	46,716,884
	Nyamache	12,040,517	2979,100	48,162	48,162,068
	Kiamokoma	8,394,425	2,017,802	33,577	33,577,700
12	Chebut	9,305,521	2,178,603	37,222	37,222,000
	Mudete	8,132,592	1,962,421	7,850	7,850,000
	Kapsara	226,681	33,414	906	906,000
Total		90,990,078*	39283010	363,960	363,960,3120

Source: Source: KTDA Quarterly Report (2004). The total value is based on average price of Ksh 1000/m^3 * $1m^3$ is used to convert green tea into 250 kilograms of black tea

2.2.3 Industrial Firewood for Pulp and Paper Industries

There are two pulp and paper manufacturing mills in western Kenya that use firewood, the Pan African Paper Mills (PPM) at Webuye and Highlands Paper Mill in Eldoret. The firewood driven pulping facility at PPM requires 250,000 m^3 whereas Highland Paper Mill demand 4000m^3 per year(Table3). The combined annual firewood demand in the sector is estimated to be worth Ksh 379 million per year. Farmers neighboring these factories are better placed to benefits from the large firewood market niches

Table 3: Industrial Firewood Demand by Pulp and Paper Industries

Industry	Capacity in m^3	Current gate price Ksh/ m^3	Total Cost in Ksh/yr
Highland Paper Mill	4000	1200	4,800,000
Pan African Paper Mills	250,000	1500	375,000,000
Total			379,800,000

2.2.4 Transmission Polewood Markets.

2.2.4.1 Semi-Processed Polewood Markets

The major polewood treatment plants in the region include International Timber Treatment EATEC Ltd (ITT-EATEC) which owns two treatment plants at Eldoret and Londiani with installed capacities of 100,000 and 40,000 pieces per year respectively. The Eldoret plant is currently operating below capacity and Londiani plant is unoperational because of shortage of semi-processed polewood. Telecommunication Company of Kenya (TELKOM) subsidiary the Gilgil Complex has maximum installed capacity of 108,000 of treated poles per year. There are other new entries into the transmission pole treatment such as:Timsales Ltd of Elburgon, Tipsy of Eldoret and

Gilgil based East Africa Cabro and each has an installed capacity of 50,000 treated poles per year.

The western Kenya treatment plants have a combined capacity of 362,000 treated poles per year. At the time of the survey, the mean value of unprocessed pole at the farm gate was Kshs 2000.00. The value of this market was estimated at Kshs 724million/yr (Table 4). These industries are faced with serious shortage of semi-processed polewood that has drastically reduced their operational levels to below 20% of the installed capacities. This is attested by the fact that most of the sampled firms currently source their semi-processed polewood from tea estates in Kericho a return distance of over 400km that instead of their desired economic return distances of between 100 and 150km.

Table 4: The Semi-processed Transmission Polewood Markets.

Enterprise	Location	Annual Capacity	Unit price	Current value in Ksh
TTI-EATEC	Eldoret	100,000	2000	200,000,000
TTI-EATEC	Londiani	40,000	2000	80,000,000
TELKOM-GTI	Gilgil	72,000	2000	144,000,000
Timsales	Elburgon	50,000	2000	100,000,000
EA Cabro	Gilgil	50,000	2000	100,000,000
Tipsy	Eldoret	50,000	2,000	100,000,000
Total		372,000	2000	724,000,000

2.2.4.2 Farmers Potential in Semi-Processed Polewood Markets

Polewood supplies from public forests in recent years have dwindled due to declining area under Eucalyptus and poor management practices in public plantation forestry sector. Wood treatment plants prefer eucalypts (*E.grandis* and *E.saligna*) of 10 to 12 years, straight with uniform taper and minimum branching. Raw poles are deemed appropriate when they have attained a butt end diameter of 8.75cm and a length of 12m. Farmers have great potential to supply a significant amount of polewood needed by the increasing number of treatment plants in western Kenya from their existing plantations and woodlots. However, supplies are likely to rapidly rise in the near future when the

recently established plantations and woodlots by farmers in Central and North Rift between 2000 and 2006 mature. It is estimated that over 2,000 hectares of intensively managed *E. grandis* with an estimated stock of over 1.6 million stems have been planted by farmers in western Kenya within the last 5 years and more planting is projected to take place into the future (Cheboiwo, *etal*; 2006). Some companies such as TTI-EATEC are already looking into the possibilities of contracting farmers within a radius of 120 kilometers to supply them with semi-processed polewood.

2.2.4.3 Markets for Treated Transmission poles

There are two major buyers of treated transmission poles in Kenya, Kenya Power and Lighting Company (KPLC) and Telecommunications Company of Kenya (Telkom). Telkom has an annual requirement of between 33,000 and 40,000 pieces for its transmission activities and this with estimated value of between Ksh 396 million and 480 million. Similarly, KPLC annual demand for transmission poles is estimated at 45,000 pieces valued at Ksh 540 million in 2006. Municipalities and other urban centers represent vast untapped markets for small diameter treated fencing poles that can serve farms, residential and avenue fencing. In addition, there are emerging markets in neigbouring countries such as: Uganda, Tanzania, Sudan, Eritrea and Ethiopia.

2.3.0 Pulpwood Markets

National demand for paper and paper products is estimated at 130,000 metric tonnes per year with a projected annual growth of 4% with local production from the four mills standing at 93,000 metric tonnes (KFMP, 1994). Pan Paper_Mills (PPM) annual pulpwood demand is about 500,000m^3 and currently faces a shortage about 150,000 m^3 mostly Eucalyptus roundwood for blending with secondary fibres and currently buys 10% of its roundwood requirements from farms (Diro, 2003). PPM due to transport and logging costs prefers to source its roundwood within a radius of 150km from its factory at Webuye and has initiated an out grower scheme within the zone spanning 11 districts in western Kenya. By September, 2006 PPM with the help of 7 field assistant based in selected districts had recruited 2500 tree growers mostly in Lugari, Bungoma, Uasin Gishu, Trans Nzoia, Kakamega and Nandi districts(Diro, 2006). Based on the current

farm gate and factory gate prices of Ksh 750 and 1500 per ton the pulpwood market is worth between Ksh 110 million and Ksh 225 million.

2.4.0 Sawlog Markets

The demand for sawlogs is estimated at over 200,000m^3 with farm gate price of Ksh 1500/ m^3 translating into a value of Ksh 300 million. However, Most of the 36 saw mills in western Kenya that were dependent on sawlogs from publics forests closed after the ban on harvesting was imposed in 1999 and the few in operation rely on sawlogs from farms. Table 5 show few sampled saw mills with installed capacity of 80,650m^3 per year. The ban provided an opportunity for farmers to enter into this lucrative multi-million shillings sawnwood sector. Farmers sell sawlogs to saw mills, merchants and neighbours that convert them into sawnwood using versatile power and bench saw machines to supply local and national market outlets (Cheboiwo, 2005). In 1999 the sampled sawmills received an average supply of 20% from farmers (Table 5).

Table 5: Selected saw mills and their Roundwood intake before 1999.

Name	District	Location	Capacity m^3yr	Share of farm supplies (%)
Rai Ply	Uasin Gishu	Eldoret	54,000	5
Sajama	Uasin Gishu	Eldoret	8,000	15
Alkanoor	Uasin Gishu	Eldoret	4,500	8
Wareng	Uasin Gishu	Eldoret	9,500	50
Savanna	Uasin Gishu	Kaptagat	1,800	10
Kaimosi	Vihiga	Kaimosi	1,650	40
Rapogi	Vihiga	Rapogi	1,200	20
Total			80,650	20

The most preferred sawlog species are Cypress, Pines, Eucalyptus Podo, Cedar, Rosewood and various indigenous hardwoods species. Scarcity of indigenous hardwood has made Eucalyptus a species of choice for furniture production, coffins and even construction beams. This is due to its relative abundance, high density and red

colouration that give good wood finish. Though smallholder farmers may not establish large woodlots due the size of their farms but line and boundary plantings and in scattered patterns on farm lands can accommodate a sizeable number of trees that can be sold as sawlogs or transformed into sawnwood. Thus integration of sawlog crops into the farming landscape will not only ameliorate environmental condition for higher agricultural productivity but have the potential to generate incomes to smallholder farmers.

2.5.0 Construction Polewood

Construction polewood are used in various construction activities such as construction of temporary structures, scaffolding in high rise buildings and fencing works. Kisumu is the largest regional market for construction polewood in Western Kenya(Cheboiwo, 2003). Many other towns in the region stock small amounts of polewood as many users purchase their supplies directly from farmers. Table 6 shows the major polewood outlets in Kisumu mostly Kondele and Nyalenda with a monthly intake estimated at 42,000 pieces. The estimated annual turnover for the construction polewood in Kisumu is worth over Ksh 25 million. Most of the polewood traded in Kisumu are sourced from intensively managed Eucalyptus woodlots in Vihiga District.

Table 6: Monthly polewood stocks and sales Kondele and Nyalenda Markets in Kisumu

Market	Number of merchants	Monthly stock in pieces	Estimate stock value in Kshs	Market share (%)	Annual turnover Ksh
Kondele	9*	25,200	1,400,000	60	16,800,000
Nyalenda	2	12,600	567,000	30	6,804,000
Others		4,200	189,000	10	2,268,000
Total					**25,872,000**

*3 of the merchants were commission agents for two major merchants in the market.

2.6.0 Roundwood Industries and Farm Forestry

2.6.1 Species Preferred for Industrial Firewood

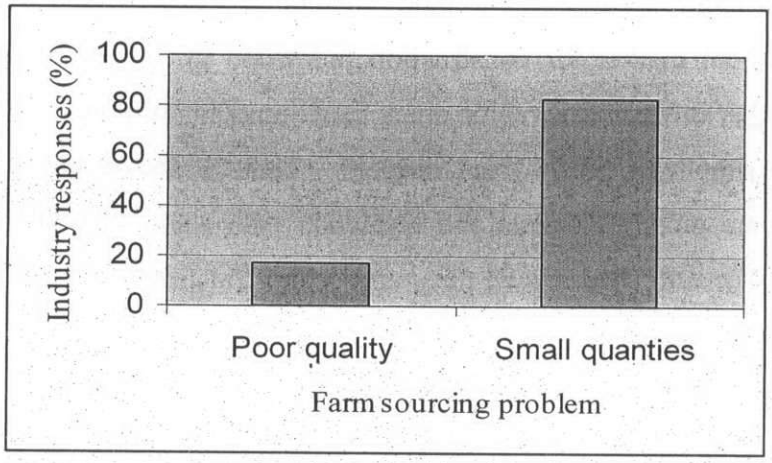
Among the many species grown on farms, 83% of the sampled industries preferred Eucalyptus whereas 17% preferred pines. The preference for Eucalyptus is due its high calorific and abundance on farms. Pine firewood has increasingly become very popular for domestic use and food production enterprises in the suburban estates in major towns

due to its good burning qualities. However, its low abundance on farms means increased transaction costs because it has to be transported over long distances to urban outlets.

2.6.2 Farm sourced Firewood Supply Problems

Most of the sampled industries cited assembling of sparsely distributed tree materials as one of the most critical handicaps facing firms which rely on firewood from farms. The survey revealed that most of the farm produced firewood were juvenile wood and crooked because most farmers do not undertake silvicultural operations according to conventional forestry practice (Fig.1).

Figure 1: Problems encountered when sourcing materials from farms



2.6.3 Farm produced firewood price setting procedures

Many of the sampled industries set their own prices (62%) and supply conditions that are usually displayed on factory notice boards for easy access by suppliers. Few firms reported to bargain with farmers and other suppliers depending on the demands/supply conditions and quality of the firewood deliveries (38%). Most farmers complained of low prices being offered for firewood supplies by industry and many preferred to sell their roundwood as sawlogs or polewood that fetch high prices. The low prices offered by the firms is disincentive to tree growing and price setting is based on own industries costs and farmers' costs of production and transactions are not considered.

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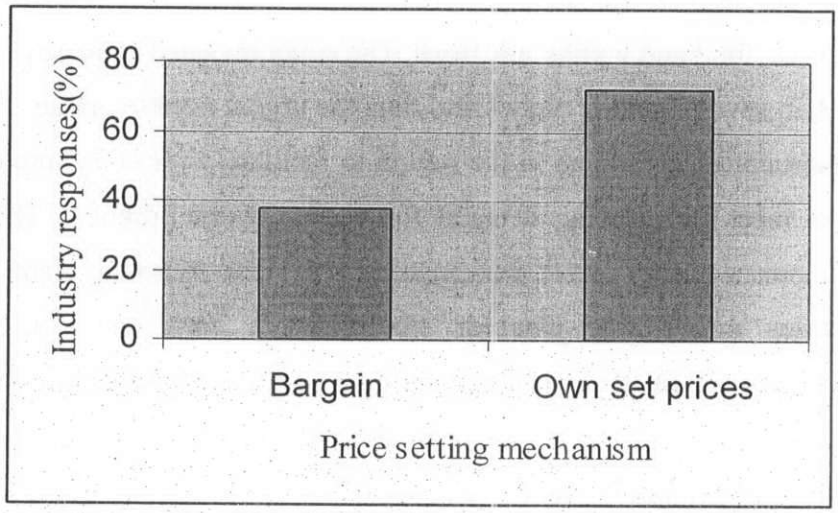
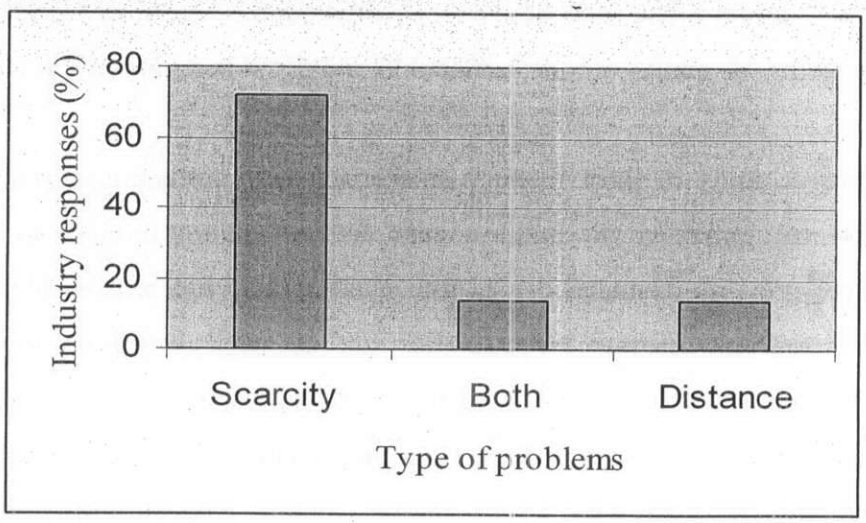
Figure 2: Price setting process by buying firms



2.6.4 Industrial Firewood Supply Problems

Most industries cited scarcity in firewood supplies (72%) as shown in Fig.3 and the long distances covered to collect firewood supplies that increase their operational costs (14%).

Figure 3: Industrial firewood supply related problems



3.0 Conclusions and Recommendations

There are large market opportunities for tree growers in western Kenya in terms of value and volume demand. The product markets range from standing trees for sawlog and pulpwood to semi-processed and processed sawnwood, firewood, and charcoal. The major industries that farmers can supply include power transmission polewood treatment plants, tea factories, food and textile industries. The study revealed some severe shortages of tree products in several market niches and thus the urgent need to create awareness on the market opportunities to farmers in the region to facilitate their entry into commercial tree growing to meet the growing demand for various wood products. The combined demand from biomass energy sector, transmission polewood treatment plants and timber making industries makes tree planting enterprises a very promising investment opportunities in the region. According to industry sources the demand for softwood sawnwood and transmission poles in the local and regional export markets is expected to rise with the latter gaining prominence.

However, except for charcoal and construction polewood smallholder tree growers' participation in major market niches is still disproportionately low due to several unique characteristics associated with smallholder tree growers such dispersed production systems, poor information on market niches within their localities, poor management practices to meet market niche specifications and low confidence from wood consuming enterprises in terms of quality of and sustainable supply to keep enterprises operational year round.

Some comparative study of farm forestry enterprises with competing agricultural land uses is highly recommended to build a case for convincing farmers to enter into commercial tree growing. Demand driven tree planting activities will enable farmers to diversify their on-farm income opportunities and as well contribute to enhancing environmental goods and services within agricultural landscapes. There is urgent need to provide adequate market related information and technical skills to improve their technical competitiveness in the various market niches. The starting point will be

formulation of favourable policies that will address the unique characteristics of smallholder tree growers. These may include promotion of collective actions among the smallholder tree growers through the formation of tree growers associations and market linkage frameworks that will enhance their tree production skills and marketing power.

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