FARM FORESTRY DEVELOPMENT IN KENYA: A LOOK AT POTENTIALS AND OPPORTUNITIES FOR COMMECRCIALIZATION TREE GROWING IN WESTERN KENYA

Sponsored by Farm Forestry Programme, Kenya Forestry Research Institute

Joshua K. Cheboiwo, David Langat and Richard Siko
Kenya Forestry Research Institute, Londiani Regional Research Centre

JULY 2006

TABLE OF CONTENTS

TABLES AND FIGURES

1.0 Preview of Farm Forestry Trends

1.1 Global Perspective

Private forest is defined as all other forests outside public land owned by private individuals mostly farmers and companies whereas farm forestry is defined as the practice of growing trees on a privately owned agricultural land for household use and surplus for sale (F A O, 1989). Worldwide distribution of private forests both in absolute size and proportion to total forestlands differ significantly between continents and countries. FAO (1999) indicate that in Western Europe, private forest owners hold up to 54% of total forestlands whereas in North America its accounts for 49%. The distribution by size of individual owners in North America is skewed towards large commercial forest owners and corporations. This contrasts with Western Europe where majority of private forest owners are smallholders. For example in Germany, 42% of farm forestry holdings consist of less than 5 hectares. In Japan smallholder individuals and communities own 64% of total forestland and 60% of growing stock (JAWIC, 1995). Rigorous policy changes towards grouping of small private forestland pieces in Western Europe and Japan has succeeded in reducing small size plots but in most cases it has been below expectations due to passive resistance from landowners.

Scandinavian countries are reputed to have one of the most developed private forestry in the world. For example, in Finland 60% of the forestland is owned by small holders under the umbrella of forest owners association. Marketing cooperatives have evolved into strong institutions to serve farmers in production, processing and marketing of forest products (FFRI, 1995). The services offered include credit facilities, acquisition of own processing industries, development of integrated management plans and leverage bargains for better roundwood prices with large wood based industries. Private forests provide significant job opportunities to rural family labour in production, logging, transport and value adding processing. In Africa, South Africa has one of the most developed farm forestry in the continent, its forestland account for 1.2% of the total land area but its gross output value is 4th after maize, sugar cane and wheat. Private forests account for 70.6% of the total plantation area (FOA, 1997).

In Far East and South East Asian countries, high population and severe shortage of arable land forests have evolved into multi-storey home-gardens where timber and non-timber products are highly valued for both domestic consumption and sale (Nair et al, 1987).

In Europe, North America, Japan and Australia, policies and legislation in place have deliberately encouraged private forestry development through various fiscal policies such as generous subsidies, loans, tax exceptions and guaranteed prices (Byron, 1987). The policy and legislative instruments are sometimes specific to a country but have similarities across the countries. For example vigorous promotion of tree planting to replace farmlands, to reduce agricultural commodity surplus in European Union (EU) countries has resulted in public authorities practically assuming control and management functions of private forestlands thus leaving landowners recipient of product proceeds and title rights such as compensations.

1.2 Current Farm Forestry Status in Kenya

The Kenya Forest Policy of 1968, in addition to spelling policy issues on public forest management and training of forestry professionals, recommended acceleration of rural tree planting activities. Rural Afforestation and Extension Services Division (RAES) was started in 1971 to facilitate its implementation through training of farmers, establishment of tree nurseries countrywide and deployment of extension staff to offer technical services to rural farmers.

By 1990, through RAES and Local Afforestation Programmes (LAP), there were about 370 Local Chiefs Nurseries (LCN) out of 850 administrative locations in the country (GOK, 1989). Tree seedling outputs was over 100 million seedlings per annum by 1989 reflecting an equivalent area of between 53,000 and 84,000 hectares (Odera, 1989). This excludes farmers' backyard nurseries that were reported to be important sources of seedlings (Van Gelder and Kerkhof, 1984; Cheboiwo, 1993). Several NGO's in collaboration with government agencies and farmers have expanded tree-planting activities in the country. Private nurseries both in rural and urban areas and recently seed collection and vending have over-time flourished as an important business for farmers and commercial operators thus making the activities more market and need driven. Kenya Forestry Master Plan (KFMP, 1994) estimated that total volume of planted trees of various species by farmers equalled that public closed-canopy indigenous and plantations forests combined.

Forestry resource management on farms has evolved through several stages in Kenya for the last 80 years in terms of planting patterns, species mix, density, utilization, markets and marketing. The changes were largely shaped by various factors to include local biophysical, institutional and socioeconomic conditions through some definable common stages (Arnold, 1997). These stages evolved from common resource extraction to planting in compound, boundary and windbreaks,

inter-cropping and lately intensive mono cropping in form of woodlots for commercial purposes. These factors have also shaped some regional dominance of some species in the country, for example *Gravillea robusta* and *Cuppressus lusitanica* in Central; *Casuarina equisitifolia* in Coastal strip and *Acacia mearnsii* and *Eucalyptus sp* in Western Kenya. However, most farmers in Kenya grow mixture of tree these species in their agricultural land. These trees are grown for various purposes such as fencing, timber, posts, fodder, food, poles, fuelwood and bark. Farm forestry also provide vital environmental goods and services to the households and society such as wind breaks/shelter belts, water catchment protection, shade, soil conservation, boundaries markers and enhancement of scenery.

The spread of tree planting and conservation on farms by 1980's was significant, for example a survey by Kenya Woodfuel Development Project (KWDP) in three highly populated districts, indicate that woody biomass occupied 21.9% of land area in Kakamega, 20.0% in Kisii and 20.8% in Murang'a (KWDP, 1985). Kenya Forestry Master Plan Project (KFMP, 1994) reports that trees on farms and settlements in the high and medium potential ecological zones contain an average of 9.3 m^3/ha and is projected to grow to 27m^3/ha by 2020 without adversely affecting agricultural production. KFMP (1994) further predict expansion of annual roundwood production from farms from 11.5 m^3 in 1995 to 22.2 million m^3 by 2020 and its share of national output to increase from 65% to 80%. Farm and private forestry is projected to grow from 690,000 ha in 1994 to 830,000 hectares by 2020. This will be approximately 10% of the total prime agricultural land in the country (KFMP, 1994). Various farm forestry products (fuelwood, polewood, sawnwood, sawlogs, charcoal) consumed or marketed by households is estimated to have generated up to Ksh. 14.5 billion in the year 2000 and predicted to expand to Ksh 31.6 billion by 2020. The declining ability of public forests in recent years as the major supplier of wood products in the country has put pressure on farm forestry to fill the widening gap between demand and supply of wood products. Recent reports indicate that farm forests are producing between 300,000 and 400,000 m^3 of saw logs and between 100,000 and 150,000 m^3 of pulpwood annually (Ngibuini, 2003).

The success of farm forestry in Kenya has been due to farmer's initiatives, government and NGO's farm forestry promotion strategies through direct packages such as subsidies in provision of seedlings to farmers, promotion of private nurseries and seed vending and provision of technical and research services. The tree planting culture among farmers in Kenya and their

ownership of more than 10 million hectares favourable for tree planting in the medium and high potential makes the future of trees on farms brighter (Simmons, 1998). Though farm forestry has the potential to meet the basic household needs, however, its capacity to supply industrial roundwood and other forestry products is uncertain. It is predicted that the demand for various products such as woodfuel, construction timber, fencing poles, furniture and constituted products is to increase with population growth rate currently estimated at 2.8% per year into the future (GOK, 2001). To meet the demand for forestry products, the forestry sector in Kenya has few options either to import or to seek alternative supplies outside public forests. However, roundwood is a bulky commodity. Transport costs will tend to rapidly increase with distance from the production and processing sites. This makes import and international trade more expensive option to wood industries and other product markets given current state of infrastructure. This leave farm forestry as a potential supplier of roundwood for industrial processors and other forestry product markets along side those from public forests.

1.3 Problem Statement

Kenya has been experiencing high population growth for the last two decades which grew at the rate of 3.8% between 1969 and 1979 and by 3.4 % from 1979 to 1989 and between 1989 and 1999 it grew at the rate of 2.9%, topping 28 million people (GOK, 2001). However, population distribution in Kenya is skewed towards high and medium potential regions that account for 18% of the total land area and hosts up to 23 million people. The rural areas sustain over 78% of the population and the rest are located in urban and major trading centres spatially located in the country. The concentration of population and agricultural activities in a small proportion of the high and medium potential rural landscapes led to deforestation at early stages but scarcity of forest products and environmental values has increased planting of trees on farms thus directly competing with agricultural land uses.

Recent reports indicate that industrial roundwood output from public forests has been declining and it will become a major constraint in the industrialization of the forestry sector and other sectors dependent on wood such construction and allied sectors (GOK, 2001). This is because public forestry plantation sector that used to produce over 90% of the industrial roundwood declined from 133,000 hectares in 1990 to 97,200 hectares by 2001 and its output fell from 437,000 m^3 to 360,000m^3 in the same period (GOK, 2001). The 1999 government moratorium on harvesting in public forests has further diminished supplies to most wood based industries in the

country. To make things worse, annual plantation establishment fell from peak of 8600 ha in 1982 to meagre 300 hectares in 1999 (GOK, 2001). The fall is likely to adversely affect socioeconomic development and worsen existing pressure on productive public forestry resources. It will also accelerate exploitation of ecologically sensitive protective areas such as water catchments, steep slopes and riverine sites. Despite existing optimism on the future growth of farm forestry sector in Kenya, its role in environmental protection, supply of roundwood to fast growing wood based industries and other wood product markets has not been continuously updated. Thus data on farm forestry for use in policy decisions is inadequate and sometimes completely lacking as compared to public forestry sector (KFMP, 1994).

The problem of allocating private land among competing uses is increasingly becoming an important subject of environmental and natural resource economists (Parks et al, 1997). This is more critical in smallholder farms where security of basic material needs, mostly food and wood products within an emerging monetarization and globalization of local economies. Cash income will thus become critical in household land use decisions. Empirical studies on the role of farm forestry has increasingly become important in the recent times with accelerated decrease of public forests thus putting it in a pivotal position in future production of wood materials for both domestic needs and surplus to industry (KFMP, 1994, Simmons, 1998). Tree planting requires land space, labour and cash outlays and has to compete with other land, uses such agriculture and settlement. However, prime land is increasingly becoming smaller and dearer in Kenya thus making land use decisions more critical than before.

Secondly, few studies have attempted to capture recent developments in the farm forestry sector in Kenya in terms tree planting trends, species preferences, commercial orientation of tree planting activities and constraints facing the players in the sector. Due to lack of data on farm activities its contribution to forestry sector output has been overlooked is least understood.

The current study attempts to capture the recent developments in farm forestry western Kenya in order to enhance the existing knowledge on the subject. Recent trends towards commerclialization of tree growing in the region have gone unnoticed by many development agencies. New developments include the increased dependence on the wood based industry and small scale wood processing enterprises on roundwood from farms and hence the pressure for the sector to expand their outputs to meet the growing market niches to such as sawlogs, polewood, charcoal and firewood sectors. The current study was aimed at documenting the recent

development of the farm forestry sector towards meeting the expectations of various stakeholders. Farm forestry development is also important in that it expands the flow of environmental goods and services that are jointly produced with forestry activities.

2.3 Methods and Data Sources

The study is based on farm data collected from sample farms in Uasin Gishu, Kericho, Trans Nzoia and Nakuru districts. Reconnaissance survey and consultations respective District Forest Officers showed that the selected districts have recorded increased commercial tree planting from 2000. The farm data collection was done using structured questionnaire and informal discussions with tree growers. Divisional extension officers were trained and engaged in the survey work because of their knowledge on forestry activities in the selected divisions. The data collected from the four districts were used in a comparative study on farm forestry development dynamics and associated unique characteristics. Table 1.1 show the distribution of sample farms in the study districts.

1.4 Sample Frame

The survey covered 5 districts in Rift Valley Province and one district in Western Province. Some of the districts had been subject of farm forestry surveys 2001 and 2002 and have long history of farm forestry activities (Cheboiwo, 2003). The sample households were evenly distributed by allocation of between 80-125 households among the districts as shown in Table 1.1.

Table 1.1: The covered during the survey and households sampled.

District	Planned samples		Percentage (%)
Uasin Gishu	100	80	16.2
Nakuru	100	98	19.8
Trans Nzoia	80	77	15.6
North Nandi	100	82	16.6
Kericho	125	98	19.8
Lugari	80	60	12.1

1.5 Analytical Procedure

The data was collected from field officers and checked for consistency and other anomalies. The checked data was entered into SPPS Version 10.0 and analyzed using descriptive statistics.

2.0 Results

2.1 Tree Planting Activities

2.1.1 Distribution of sample households

Nakuru and Kericho had the highest number of respondents whose survey data was accepted. Lugari had half of the data rejected followed by Trans Nzoia. The major problems that caused rejection was inaccurate data entries that made sizes of land under various uses differ markedly from household land sizes. The data cleaning exercise reduced entries to between 60 and 98 as shown in table 2.1.

Table 2.1: The covered during the survey and households sampled.

District	N	Percentage (%)
Uasin Gishu	80	16.2
Nakuru	98	19.8
Trans Nzoia	77	15.6
North Nandi	82	16.6
Kericho	98	19.8
Lugari	60	12.1

2.1.2 The respondent's relation with household head

Those interviewed during the survey were household heads (70%), wife (12%), sons (12%) and others (6%). The majority of the interviewees were household head who are the main land use allocation decision makers and the information obtained is assumed to sufficiently reflect the true positions at household level.

Table 2.2: The respondent's relations to the household head

The interview	N	Proportion (%)
Household head	333	70.3
Wife	56	11.8
Son	56	11.8
Others	29	6.1

2.1.3 The sample distribution by land size categories

Land is one of the critical inputs to forestry development activities and its availability widens the household decision making latitude concerning tree planting. Tree growing on commercial basis may need larger tracts of land as compared to subsistence tree growing that is prevalent with smallholder farmers. To capture the information from wider land ownerships the survey was structured to distribute sample households among different land ownership classes.

The survey results in Table 2.3 indicate that smallholder and medium scale farms accounted for 59% of the sample households as compared to 41% for the large medium and large scale farms.

Table 2.3: Sample Households land size in Hectares

Land size	N	Percentage (%)
Small scale (0.4-2 ha)	181	36.6
Medium scale (2-4 ha)	109	22.0
Large- medium (4-12 ha)	118	23.8
Large scale (> 12 ha)	87	17.6

2.1.4 Socio-economic characteristics of sample households

The seriocomic status of the sample households provides some critical information on households' history and resource endowments. It also gives some indication of land distribution among the competing land uses and their preferences.

The survey results revealed that the mean age of the sampled household heads was 50 years. The sampled households on average have lived in the study area for 19 years and owned on average 13.2 hectares under which 44% was under crops and 44% grazing. The areas classified as under trees was approximately 12%.

Table 2.4: The Socio-economic characteristics of sample households

Characteristics	Minimum	Maximum	Mean	N
Age of the Farmer	18.00	85.00	50.30	495
Date of Settlement	1	75	19	488
Household land size in Ha.	0.20	600	13.2	495
Land under crops in Ha	.00	36	4.9	495
Land under grazing in Ha	.00	240	4.8	495
Land under woodlot in Ha	.00	96	1.6	495
Year started planting tree in the farm	1	85	28	495

2.1.5 The level of education of respondents

Education is one of the most important human resource development indicators as it improves the ability of the individual to access several knowledge sources available with ease. It is the assumption that more educated farmers are better placed to appreciate available innovation and make more informed investment decisions.

The survey results indicate that the sample households are fairly educated for 36% attended primary education, 38% attended secondary school and 21% tertiary education.

Table 2.5: Level of Education of Respondents

Level of education attained	Percentage (%)	N
Primary	35.9	170
Secondary	37.8	179
Tertiary	21.7	103
None	4.6	22

2.1.6 Households land uses

It has been observed that most smallholders farmers practice multiple land uses to spread risk and as well improve their self-sufficiency their basic material requirements. The multiple land use approaches are reported not only to reduce risk but as well results in greater outputs and overall incomes. However, single cropping or planting few crops promote specialization and high unit commodity outputs and hence highly advocated by agricultural and forest experts.

The study revealed that most sample households practiced mixed farming of growing agricultural crops and keeping livestock among other land uses (84%). Those that practiced single land uses were few with those growing crops only accounting for 10% and livestock keeping 7%.

Table 2.6: The household main land use

Responses	N	Percentage (%)
Crop Farming	46	9.7
Livestock Keeping	32	6.8
Mixed Farming	396	83.5

2.1.7 Commercial orientation of sample farms

For better appreciation of the potential for farmers to enter into new commercialized land based enterprises it is better to establish current commercialization levels of the priority land uses. This is based on the assumption that experience in market oriented commodity production systems makes its easier for such farmer to diversify into other commercial oriented enterprises.

The results in Table 2.7 show that most farmers were practicing semi-subsistence and subsistence farming (67%) as compared to commercial oriented farming that accounted for 23%. Similarly, it is presumed that commercial tree farming orientation is thus likely to be adopted by farmers with experiences in commercialized tree production systems.

Table 2.7: Farming orientation

Responses	N	Percentage (%)
Commercial	110	23.2
Semi-subsistence	235	49.6
Subsistence	129	27.2

2.1.8 Off-farm income opportunities

It has been observed that off-farm income opportunities enables adoption for long rotation crops such as tree planting for two reasons. Firstly, its allows them to access regular finances and thus able to invest in long term investments such as tree planting without facing financial stress as compared to those who highly depend on land for all their incomes. Secondly, it provides funds for development of long term investments that may be beyond to reach of land dependent smallholder households.

The survey revealed that the sample households that had diversified their income generation opportunities beyond farm level activities were 49% that compared well to those that relied on on-farm activities. It further indicate that farmers may be willing to diversify income opportunities within on-farm land use to incorporate more commercialization of tree planting activities as overall strategy to improve the welfare of household members.

Table 2.8: The household respondent's off-farm income generating activities

Response	N	Percentage (%)
Yes	230	48.5
No	244	51.5

3.0 Tree Planting Activities

3.1 Expansion of tree planting activities

Many farmers were overwhelming in their quest to plant more trees on their farmsin the next five years (95%). This confirms the high expectation of farmers on the potential of tree growing on their general welfare through provision of specific goods and services.

Table 3.1: The respondents plan to plant more trees in the next five years

Response	N	Percentage (%)
Yes	452	95
No	22	5

3.2 The main purpose for expanding tree planting activities

Recent studies have shown that in the past the majority of farmers have planted trees for aesthetic and other purposes not related to commercial uses. The evaluation was based on the fact that most of the planted trees on farms were rarely subjected to conventional management procedures for production of specific materials that become imperative in commercial oriented production systems.

The survey revealed that majority of the respondents indicated that their main purpose for expanding their tree planting activities was for commercial purposes (67%) and 33% cited subsistence and aesthetics (33%). The findings provide strong proof that recent tree planting activities have tilted towards commercial in orientation than before. The developments calls for urgent efforts in planning for investments to develop market outlets to expand demand markets niches for products from farms and the accompanying support infrastructure that will enable farmers/investors to realize their expectations.

Table 3.2: The respondent's main purpose of planting more trees in the next five years

Response	N	Percentage (%)
Commercial	316	66.5
Aesthetics	8	1.7
Subsistence	150	31.8

3.3 Tree planting trends between 2002 and 2005

Tree planting on farms has long history in Kenya and preference for species has some regional dominance as well for various reasons such as history, climatic and agricultural landscape. There

are reports of increased preference of Eucalyptus and *G. robusta* among smallholder farmers due to their fast growth and multiple uses as compared traditional plantation species such as *C. lusitanica, A. mearnsii* and *P. patula*. Development of intensive tree growing and commercialization is thus easier is areas where tree planting has long history and developed infrastructure is in place than otherwise.

The results of the survey shown in Table 3.3 indicate that overally tree planting reached its peak in 2001 when over 243,000 seedlings are reported to have been planted that translate to over 38,000 hectares of land assuming a spacing of 2.5m x 2.5m. *E. grandis* was ahead of other species in terms of the number planted during the review period. Similarly, From the surveys it can be deduced that *C. lusitancia Acacia mearnsii* and *Gravillea robusta* were other most preferred species by farmers. Assuming that the results reflect overall tree planting by households in the study districts the amount of seedlings planted since 2001 has decreased but still remain significant. This may be attributed to reduction on land available for tree planting within the household farm profiles that common with smallholder farms facing decreasing land sizes

Table 3.3: Tree species planted from 2002 to 2005

Species	No. planted 2001	No. planted 2002	No. planted 2003	No. planted 2004	No. planted 2005	Commercial	Subsistence	Commercial and subsistence
Cypress	53,395	36,131	36,109	44,249	36,917	95	64	158
Eucalyptus	72,845	61,464	104,746	235,622	68,844	113	68	166
Grevillea	35,952	14,015	12,787	15,659	14,917	42	128	106
Black wattle	54,535	17,483	8,776	15,603	8,495	13	53	32
Pines	7,993	7,545	3,350	4,205	3,389	20	24	24
Others	15,765	10,427	8,077	4,070	12,199	10	57	41
Others	2,774	998	2,810	419	1,456	3	32	13
Total	243,259	148,063	176,635	319,827	146,217	196	426	540

3.4 Availability of land for commercial tree planting

Expansion of tree planting on farms is subject to various factors among the critical is availability of land for tree planting activities. The success of commercialization of tree planting activities

and its expansion will largely depend on the land the households are willing to allocate to the activity.

The study revealed that most households indicated that there was land available for planting commercial trees in the future (62%) as compared to 38% who reported that they had no more land for planting activities. The findings show that given the right incentives most farmers will plant more trees and venture into commercial tree growing.

Table 2.12: The availability of land for commercial tree planting activities

Responses	**N**	**Percentage (%)**
Yes	293	61.7
No	181	38.3

3.5 The potential land sizes available for expansion of tree planting

The potential to significantly increase areas under trees on farmlands will highly depend on the size of land each household is willing to set aside for the purpose.

The survey revealed that majority of the farmers with land available for tree planting were willing to set aside between 0.4 and 2 hectares of land (48%), between 2-4 hectares (7%), between 4-6 hectares (3%) and greater than 6 hectares (4%). Those who had no more land for expanding tree planting accounted for 38% of the sample households.

Table 3.5: The potential size of household land available for tree planting

Responses	N	Percentage (%)
None	179	37.7
0.4-2 hectares	229	48.2
2-4 hectares	33	6.9
4-6 hectares	13	2.7
> 6 hectares	20	4.4

3.6 Constraints facing tree growers

The success of tree planting by farmers will highly depend on their ability to overcome several problems facing the sector. The solution to the set of problems depends on availability of information on these problems for formulation of cost-effective interventions.

The study showed seedling availability and land scarcity were the main bottlenecks facing sample households who wanted to expand their tree planting activities (70%). Livestock damages were distant third (17%) followed by termite damages (5%). Thus interventions in the

seedling availability and how to overcome livestock damages are some feasible interventions that can be undertaken by farmers in collaboration with governmental institutions. On land scarcity the only feasible solution is purchase of more land or better planning of existing landholdings or embracing agroforestry systems.

Table 3.6: Main constraints to tree planting in the sample districts

Responses	N	Percentage (%)
Livestock damage	78	16.6
Seedling costs	167	35.2
Termite damage	22	4.6
Land scarcity	167	35.2
Others	40	8.4

3.7 Extension Service Provision

The success of transformation of tree growing activities on farms into highly productive land uses enterprise will depend on effective technology transfer among other factors. Thus farmers encounter with technical staff trained on forestry issues is one of the key parameters to measure potential of effective transfer of conventional forestry technologies to farmers.

The survey results indicate that the majority of the respondents received forestry extension services (59%) but those who had not received were significantly high as well. The results show that shortage of extension services to enable farmers access range of technical support services for successful intensification and commercialization of tree growing activities is a real problem that may need urgent attention.

Table 3.7: Respondents having received extension services on forestry activities

Responses	N	Percentage (%)
Yes	277	58.5
No	197	41.5

3.8 Providers of extension services

There has been greater focus on tree planting activities as part of a wider environmental development agenda by many governmental and non governmental agencies.

The results indicate that Forest Department staff provided the bulk of the extension services to sample households (41%). Other agencies such as Department of Agriculture, NGOs among others accounted for the rest. In fact the findings indicate that provision of extension and support services in farm forestry has reached a pragmatic stage where apart from line governmental agencies many other institutions support tree growing on farms in various ways.

Table 3.8: The institutions that provided forestry extension services

Responses	N	Percentage (%)
FD	194	41
Agriculture	36	7.6
NGO	45	9.5
FD and Agriculture	21	4.4
Others	178	37.5

3.9 Respondents level of tree management

The ability of the farmers to undertake successful tree planting activities will depend on their skills and experiences in tree growing activities. The best approach to gauge the tree management skills is by observing their level of management of trees or woodlots on their farms in terms of their adherences to conventional practices.

The field enumerators ranked fairly the respondents level of tree management skills on their farms. This shows that farmers have acquired good level of tree management skills and transformation of their operation into a commercial in orientation may not be as difficult as anticipated.

Table 3.9: The adequacy of respondent's level of management of forestry

Responses	N	Percentage (%)
High	356	75
Low	118	25

3.10 Tree management operations

Tree management operations is an essential activity that is aimed at improving tree productivity and product quality that will improvement return to investment in tree enterprises. Tree management operations are routine directives under conventional forestry and it will become increasingly inevitable for farmers transforming from subsistence tree farming to commercial tree enterprises. It can thus be used a gauge on the transformation process and level of investment in tree management activities.

The study revealed that the majority of the respondents performed thinning and pruning of trees on their farms (84%). Some sample households reported to have selectively planted specific species for production of some desired tree products.

Table 3.10: The specific management operations done by the respondent

Responses	N	Percentage (%)
Thinning and pruning	397	83.6
Species selection	76	16.0

3.11 The tree planting skills rating

The overall performance of the farm forestry sector in adopting conventional forestry practices is based upon many factors that are well enumerated in the above sections. However, the status of the current tree management practices may help in the gauging of the transformation process from non professional practice to a more professional practices based on conventional forest practice.

The rating of the field surveyors on the overall tree management practices in comparison with conventional forest practices showed that 34% of the respondents were rated excellent and very good with good and fair accounting for the rest.

Table 3.11: The rating of the interviewer on the farmer's skills on tree management

Rating	N	Percentage (%)
Excellent	57	12.0
Very good	104	21.9
Good	187	39.4
Fair	126	26.5

4.0 Markets and Marketing of tree products from farms

4.1 Buyers of tree products from farms.

For trade in commodities to thrive two conditions are necessary, surplus production and deficits conditions in two or more regions must occur and hence the need for markets and marketing services. At infancy trade among households signals the evolution of the barter trade into higher forms of trade that will involve several merchants and agents of industrial enterprises thus increasing volumes and value of business. Recent studies has shown that trade in tree products have evolved into multi-channel and value chain sector that involve hundreds of marketers supported by vast infrastructure networks.

The study revealed that some trade already exists between farmers and other marketers in the selected districts. However, the bulk of the trade is between the farmers and their neighbours (62%) whereas those who dealt with merchants and industry agents accounted for 38% of the

sampled households The findings points to the increased participation of merchants and industrial agents in purchase of tree products from farms that is a very positive development because the two sectors unlike the neighbourhood trade are multi-million sector business with greater potential for growth and hence the chances of increased demand driven commercial tree growing enterprises.

Table 4.1: Main buyers of tree products from farmers in the sample districts

Respondents	N	Percentage (%)
Merchants	68	14.3
Industry	30	6.3
Neighbours	293	61.7
Merchants and industry	82	17.3

4.2 Access to market information and marketing infrastructure

The farmer's decision to invest in tree planting as a profitable enterprise is assumed to be based on some comparative information with other competing enterprises for their limited resources and set of investor's objectives. Key to decision making on land use options is the easy access to market information and marketing infrastructure status to enable well informed choice decisions depending on the farmers set of objectives assumed to be profit in orientation.

The study revealed that these key packages were not available to most of the farmers and hence less likelihoods of well informed choices as far as tree planting investments is concerned. This is because only 30% reported to have adequate market information on trade in tree products as compared to 70% who reported to have inadequate information.

Table 4.2 The respondent's access to information on potential buyers of tree products

Respondents	N	Percentage (%)
High	141	29.7
Low	332	69.9

4.3 Tree products marketing problems

Several reports have pointed that the inability of the farmers to transform their tree growing from subsistence to commercial driven enterprises has been due to myriad of marketing problems that have stoked the sector. The removal or easing of these handicaps is assumed to be the necessary conditions for improvement of trade in tree products from farms and motivation of farmers to commercialize their tree planting operations.

Table 4.3 study confirmed the observation because 54% of the respondents reported to have faced some problems in marketing of their tree products. However, significant number of the respondents reported to have not encountered any problems. The findings points to the ambivalence and lends credence of the diversity and asymmetry in market infrastructure in the region mostly explained by resource endowments and demographics factors among many other factors.

Table 4.3: Do the respondent face any in marketing tree products from the farm?

Responses	**N**	**Percentage (%)**
Yes	254	53.5
No	219	46.1

4.4 The type of marketing problems.

The types of problems that face farm forestry sector are critical in seeking solutions and hence their identification is crucial in market and marketing studies. This is because trade in tree products is influenced by several factors ranging from infrastructure, socioeconomic, policy and legal structures that may makes some problems to be easily tackled than others depending and others may be beyond local and national stakeholders control.

Table 4.4 reveal that among the market related problems facing the respondents prices was highly ranked (20%), lack of market for products (18%), government regulations (13%) and high transport costs (4%). The findings reflect some issues that are crucial in motivation of farmers to adopt commercial tree growing that may need urgent attention by forestry sector stakeholders that may include government and non government agencies.

Table 4.4: The nature of problems the respondents experience

Responses	**N**	**Percentage (%)**
Lack of market	86	18.1
High transport costs	21	4.4
Low prices	93	19.6
Government regulations	63	13.3
Others	210	44.2

4.5 The impacts of harvesting and movement permits on trade in tree products.

Harvesting and movement permits are some of the instruments that have been put in place by government agencies for purposes of environmental conservation and reduction of thefts from public forests. The restrictive procedures are based on genuine public concerns but its implementation and effect have been reported to be counter productive. The procedures are reported not only increase increases marketing costs to merchants and hence increased retail prices to consumers but as well tend to lower producer gate prices. Many natural resource analysts have termed the procedures unnecessary the main for marketing efficiency and hence hindering growth of trade in tree products.

Table 4.5 indicate that the respondents did not overwhelmingly confirm to dislike for regulatory structures but significant number of them found reported to frustrate their effort to sale tree products. Further discussion with the respondents indicate that those that reside next public forests dislike the regulations. This is because the high level of scrutiny of their permit applications by enforcing agencies because of the suspicion that they may have stolen trees from public forests. This contrasts with areas far away from public forests where most of the respondents were happy with the regulatory structures for several reasons. The suspicion on source of origin was not only less but little harassment from law enforcement was experienced by farmers. The procedure was reported to reduce theft or cutting of trees by family members without being subjected to ownership screening. This ownership screening is highly welcomed in highly populated areas where trees are highly valued and ownership within the tiny farms is usually contested by family members and bordering neighbours.

Table 4.5: The impacts if harvesting and movement permits on trade on tree products

Responses	**N**	**Percentage (%)**
Yes	222	46.7
No	252	53.1

4.6 Support services to improve profitability of tree planting enterprises

There are some key support services that farmers need to enable them improve profitability and popularity of tree planting enterprises as an alterative land use within the agricultural landscape. The forestry development agencies have to disintegrate these services into its components for more targeted interventions based on priority ranking and roles in the overall forestry sector development.

According to Table 4.6 technical support to tree growers was highly ranked. The technical support services included high yielding tree varieties, seed collection and handling and tree management skills among others. Market related services were second in ranking to include market information, pricing support, and creation of niche markets for products in that order. Another support cited was provision of low interest credits for tree growers especially those wishing to invest in large scale plantations were facing financial problems.

Table 4.6: Services for improving profitability of tree growing enterprises.

Tree planting profitable	**Rank 1**	**Rank 2**	**Rank 3**	**Rank 4**	**Rank 5**	**Mean**
Market information	87	83	61	33	10	55
Technical support	277	92	26	18	7	84
Creation of markets	33	77	96	42	11	52
Good prices for products	39	42	57	63	28	46
Low interest credits	49	24	27	30	78	42

4.7 Membership to tree producer associations

Smallholder performance in the market place has been subject of various discussions and recommendations due to the unique characteristics of the sector to include small outputs from hundreds of tiny farms, varied quantity and quality per producer, uneven harvesting schedules and high transaction costs associated with trade in the sector. The key to success in marketing commodities under such conditions is through collective actions that involve pooling of produce and resources for development marketing infrastructures.

Table 4.7 show some recommendations made by the farmers that include formation of producer associations to tackle not only marketing but technical and inputs services. The survey revealed that meager 16% of the respondents belong to producer groups or marketing associations. This reveals that magnitude of work that may be needed to bring together farmers in order to improve cost-effective production and marketing through collective actions.

Table 4.7: Has the respondents joined tree planters group or association?

	N	**Percentage (%)**
Yes	75	15.8
No	399	84

5.0 Summary and Recommendations

The survey involved 448 households where 95% of the respondents had plans to plant more trees on their farms and 66% indicated that the purpose was commercial. The species highly preferred were E. grandis, C. lusitanica, A. mearnsii, and G. robusta in that order. On land 62% of the respondents reported they land was available for tree planting with 48% reporting to have between 0.4 and 2 hectares and 14% had between 2 and 6 hectares. The major tree planting related problems facing the respondents were seedling cost 35%, land scarcity 35%, livestock damage 16% and termite damages 5%. On extension services 58% of the respondents received from Forest Department 41%, and the rest from Ministry of Agriculture and NGOs. The respondents reported to perform tree management operations such as thinning and pruning 84% and selection of species 16%.

Tree marketing issues were prominently mentioned by the respondents with 70% reporting to have insufficient information on tree product markets and marketing systems. The major buyers of tree products from farms were neighbours 62%, merchants 14%, industry 6% and both industry and merchants 17%. The market related problems cited by the respondents include lack of markets, low prices for tree products and government regulations in that order. On collective actions, 15% of the respondents were registered members of tree growing associations or groups within their areas.

The main technical support services requested by the respondents from the government and other forestry development agencies were technical support 30%, 20% lack of market information 20%, creation of markets 19%, offering good prices 16% and provision of low interest rates 15%.

From the above findings it is evident that tree planting by farmers is on the increase and there are greater opportunities of becoming an important sector within the agricultural landscape in terms of land size and income opportunities. This is because many farmers are willing to set aside significant amount of land to commercial tree planting activities. However, there is urgent need to address technical and market related problems currently facing the farmers such as supply of affordable high quality seedlings and improvement of marketing infrastructure are addressed.