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Challenges Affecting and Actions to Enhance Wood Production in Greater Mubende District, Central Uganda

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Abstract:- Limited consideration of small and medium tree planters by most researchers in academic and programme based research has remained a great limitation to promoting Farm Forestry in most developing countries over the years. Despite the contribution from small scale tree farmers in reducing wood products supply gap, major scientific research attention has always been directed to large scale tree farmers resulting into limited scientific information on how small and medium scale tree farmers contribute towards wood supply in Uganda and beyond. This study aimed at diagnosing the contribution of Farm Forestry Systems in the face of the forecasted wood supply gap in Uganda. Specifically, the study sought to:Investigate challenges affecting and actions to enhance wood production in the study area. A descriptive research design employing a cross-sectional field survey with qualitative and quantitative data collection approaches were adopted. Descriptive design was used to facilitate describing the state of affairs as they actually existed. During data collection, interviews were conducted with 63 Tree and 64 Non-tree farmers. Tree inventory and field observations, Geo-spatial analysis and review of literature were conducted. Descriptive statistics, Cross tabulation, Independent samples Man Whitney test, and Correspondence Analysis were used in the data analysis. Tree farmers were dominantly challenged with limited access to technical training in tree management and they indicated that formation of farmer groups and access to affordable credit facilities could enhance their involvement in wood production. Tree farmers should be organized into collective action groups to enable them jointly; seek financial support from different government initiatives, lobby for technical extension services such as training from local government officials like the office of the DFO and also access contractual markets. The study also points out the need for establishing demonstration farms to allow for peer learning and proper involvement of tree farmers in innovations aimed at developing local solutions to local challenges.

Keywords:- *Farm Forestry, Farm forestry systems, small scale tree farmer, Wood supply, Woodlot and Boundary systems.*

I. INTRODUCTION

The estimates and projections for the demand and supply of wood products in Uganda have largely been based on large scale tree plantations (Tugumisirize, 2017), with limited consideration of small and medium scale establishments that also make a contribution to the wood sector.However, Small-tree holders are becoming increasingly important producers of timber and poles as reported in India, Vietnam, Philippines &Tanzania (Bertomeu &Gimenez, 2006). Similarly, small-scale tree planting in the country has been promoted by several government and non-government initiatives over time. The government of Uganda, through National Forestry Authority(NFA) community support and other tree planting projects such as the Farm Income Enhancement and Forestry Conservation (FIEFOC) project, has distributed tree seedlings to small and medium scale land holders (FIEFOC, 2017)**.** Vi Agroforestry has since the year 1983 supported small scale farmers to adopt Agroforestry systems (Vi Agroforestry, 2015), while Ecotrust has concentrated on promoting growing of indigenous trees for carbon markets (Ecotrust, 2015). In addition, there are several individual efforts which have resulted in several scattered woodlots,

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boundary planting and tree rows as these may close the wood supply gap in Uganda.

As noted by Kiyingi (2016), Farm Forestry has been adopted by small scale farmers so as to improve agricultural production and increase on farm income. The wood from these Farm Forestry Systems (FFS) contribute to the wood sector in the country as reported by UTGA (2014). This report indicated that most of the wood sold and consumed in the peri-urban areas is harvested from the FFSs. Despite this acknowledged contribution, there is limited formal documentation of the contribution of these systems to the Ugandan wood sector (MWE, 2018).This renders the estimation and/or projection of the country's wood supply gap inconsistent with the potential reality. It is on this basis therefore that a diagnosis for the FFS is desired to unveil the potential contribution of these systems to the wood sector in Uganda.

II. STUDY AREA AND METHODS

A. *Description of the Study Area*

a) Location and size

The study was carried out in Mubende district located in the Central region of Uganda. It borders Mityana district in the East, Kyegegwa and Kibaale in the West, Kiboga and Kyankwanzi in the North, Sembabule and Gomba in the South. The district has 14 sub counties and it is located at latitude 0^{o} 35' 21" N, longitude 31^{0} 21' 36" E with a total area of 4,646 km^2, 160kms West of Kampala. The study was conducted in Madudu and Kalwana sub counties (Figure1) which were purposively selected basing on their involvement in tree planting activities with a strong practice of smallholder on-farm treeplanting (MDLG, 2018) hence making them suitable for the study.

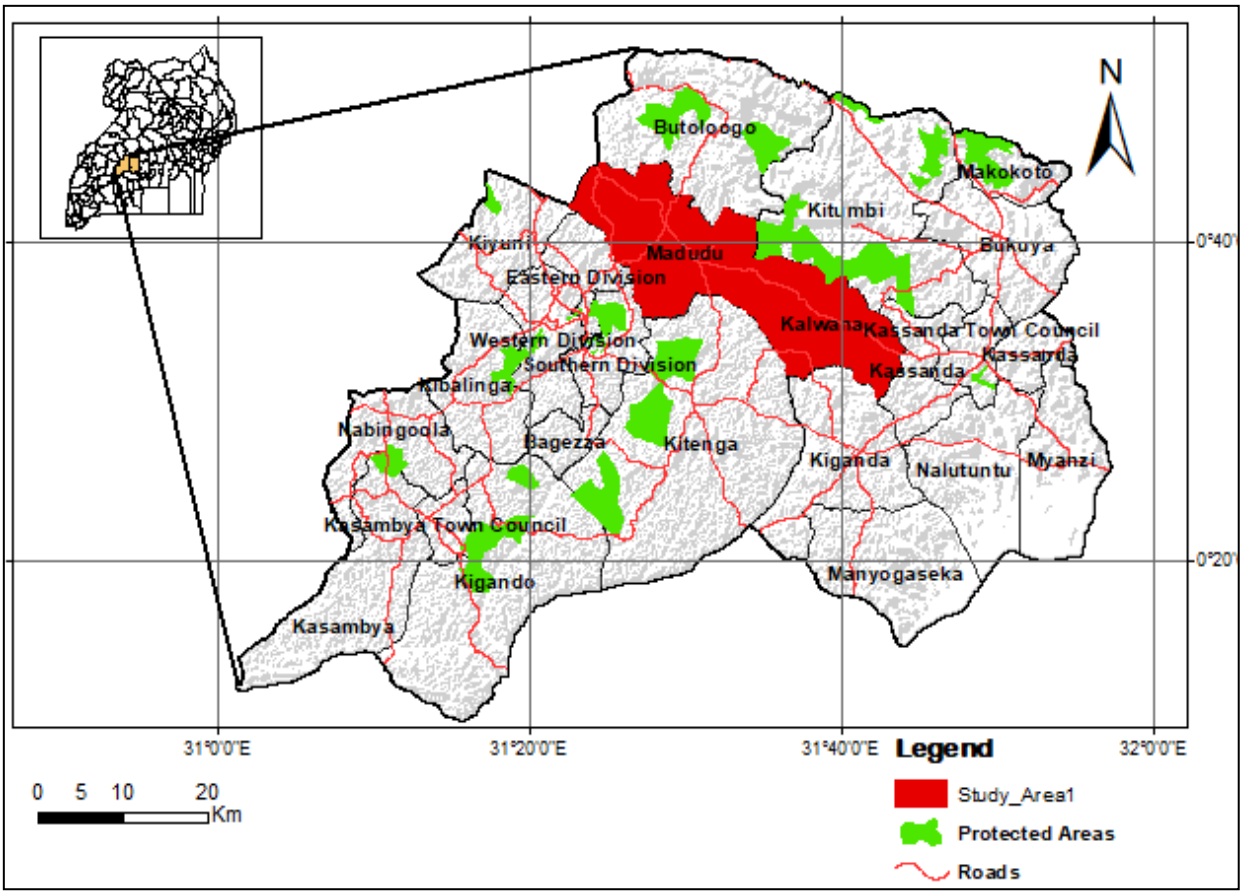

Fig. 1: Map of study area

b) Biophysical Conditions

Mubende is mainly covered by Lowland surfaces and Upland surfaces are evident to the Northern border East of Butoloogo and Bukuya. Tors and Inselbergs are found on the Western part of Nabingoola Sub County. Generally, it's a plateau with hilly ridges known as Mubende Hills(MDLG, 2011). The topography/altitude is 106-154m above sea level. Drainage is facilitated by Lakes; Wamala, Kitumbi, Katonga, Nkusi, Kuzizi and Mayanja-Kato, and Rivers; Nabakazi, Kisojo and Katabalanga in Kasambya, Kitenga and Kiganda. The high altitude ensures favorable climate with medium temperature ranging from 17^{0}C to 29^{0}C with moderate rainfall and temperature(MDLG, 2011). The rainfall pattern is bi-modal with two seasons from March to May and September to November and the annual rainfall varying between 560 mm to 1,272 mm. Across the study area, the soil structure is mostly characterized by sandy clay, sandy-clay-loam or clay loam which appeared most and they are yellow-reddish in color(Max, 2018)

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c) Land Use and Land Cover
The district has a total area of 758km^{2}land under wetlands. The permanent wetlands cover 171.7km^2 while the seasonal wetlands cover 586.4km^2 and of these the papyrus swamps cover approximately 159.5km (MDLG, 2011).In terms of vegetation**,** 23% of the total land area (1,239 km^2) is Forests and Woodlots while the rest is under crop production, wetlands and livestock. Natural high forests are found mainly in Busujju county, woodlands cover the largest part of the district especially in the counties of Buwekula and Kassanda(MDLG, 2013). There are 22 Gazetted central forest reserves (CFR) covering a total land area of 32,404Ha and one local forest reserve of 85Ha(Mubende District, 2004).Mubende district was selected for this study because it has approximately 87,137Ha of private forests planted by mainly smallholder tree farmers in scattered woodlots ranging from 1-10ha (Mubende District, 2004). The smallholders mainly plant Eucalyptus species with pine whose seed sources include Australia, Brazil and South Africa while other species are planted at a smaller scale.

d) Socio-economic Characteristics
The population is 706,256; 49% females, 51% males(UBOS, 2016) and 83.5% rural whose ethnicity includes the Bantu: Baganda; 36.1% followed by Banyoro 14%, Banyankole 11.4%, Bakiga 10.7%, Bafumbira 9.9%, Banyarwanda 6.8%, Bakhonzo 3.1%, Batoro 2.5%, Basoga 0.7% & others 4.6%(MDLG, 2013). In terms of accessibility there is a road network of 4,308 kms of which 260 kms are trunk roads, 1048 kms are feeder roads and the remaining 3000 km are community roads (MTIC, 2018).Financial Services include registered SACCOs and commercial banks spread across the district while the economic activities include; agriculture, fishing, mining, tourism, lumbering, grain processing, fruit production and chalk making (MTIC,2018).Agriculture is by far the main economic activity in the district. Over 70% of the populations depend on subsistence farming as the main source of livelihood where they also grow trees on farm and rear some animals. The rest of the population depends on employment income, trading, and cottage industries. Maize so far is the major crop produced in the district both as food crop and cash crop, followed by Banana food, cassava, beans, sweet potatoes, banana bear, G/nuts, Irish potatoes and sweet bananas(MDLG, 2011).

Land in Mubende is mainly Mailo and under the Mailo tenure, most of the farmers own the land on the arrangement of Kibanja, with only a few of private mailo holders recorded (Oboikol, 2014)while most farmers own land ranging from >1 and < 4 acres.

B. METHODS

a) The Study design
The research followed a descriptive research design employing a cross-sectional field survey; it adopted qualitative and quantitative data collection and analysis approaches. The descriptive design was used because it enabled the researcher to describe/explain the state of affairs as they actually existed or in the form in which they were found.

b) Sampling procedure and Size
Mubende and Kassanda districts were purposively selected, the two districts were predominantly comprised of rural communities with a population estimated to be 413,553 and 275,266 for Mubende and Kassanda respectively according to the National Population Housing Census 2014 (UBOS, 2018).The cross-sectional household survey was conducted in the Sub-counties of Madudu and Kalwana which were selected basing on their involvement in tree planting activities with a strong practice of smallholder tree plantations and Farm Forestry with planting and retention of a variety of multipurpose trees on farms (Mubende District Local Government (MDLG), 2018). Across the 90 villages within the two sub counties, 19 villages were randomly selected from which 127 respondents were selected. However, basing on Krejcie and Morgan (1970), the targeted population for the tree and non-tree farmers was 190. Of the total respondents, 63 tree farmers were purposively selected on the criterion of owning at least 20 trees on their farms while the 64 non-tree farmers were also purposively selected on a principle of being within close proximity (<1 Km) with the selected tree farmers.

Subcounty	**Madudu**	**Kalwana**
Parishes	Dalamba Naluwondwa Kansambya	Kikandwa Kasaazi Mayirikiti
Villages	n= 9 (Purposive selection)	N= 10 (Purposive selection)
Tree growers	n=24 (random selection)	n=39 (random selection)
Non-tree growers	n=16 (Purposive selection)	n=48 (Purposive selection)

Table 1: Sampling Procedure and Size of Tree and non- Tree Farmers (n=127)

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c) Data Collection Procedure and Tools

a. Review of related Literature

Relevant literatureswere reviewed from sources including; Scholarly published articles, Government of Uganda published documents, books, Institutional reports and newsletters like SPGS publications. Mainly literatures of not more than ten years were reviewed but also relevant old literatures were considered to clarify the claims.Scholarly published articles, Government of Uganda published documents, books,Institutional reports and newsletters were used in reviewing related literature because through providing a wealth of knowledge, they promoted the researcher's active reading, provoked deep thinking and provided evidence and clarity for the researcher's claims.These were also aimed at deepening the researcher's understanding of the subject under study and also assess the collective evidence on diagnosis of the Farm Forestry Systems. They were also relevant in helping the researcher enrich on the literature review section of the dissertation.

b. Individual Household Interviews

Interviews were conducted with 63 tree farmers and 64 non-tree farmers using a semi-structured questionnaire (AppendixI&II). The interview emphasized the aspects aimed atinvestigating the main challenges and actions to enhance engagement in wood production from their FFSs.(Semi-structured questionnaires were used in Individual Household Interviews because they allowed Informants the freedom to express their views in their own terms, provided reliable comparable qualitative data, provided opportunity for learning and helped the researcher to become acquainted with community members.

d) Data Analysis

a. Assessing the Challenges and actionsin Farm Forestry Systems

To assess the challenges limiting FFS and investigate the actions to enhance wood production from FFS, descriptive statistics like percentages and cross tabulation was used to clearly demonstrate the particular challenges faced across the studied Farm Forestry Systems(Kallio, 2013). This was done through considering the most dominant responses to be key messages from each category.

III. RESULTS AND DISCUSSION

A. Key Challenges and Actions to enhance engagement in Farm Forestry

a) Challenges encountered in tree growing

The tree farmers reported several challenges they encountered in tree farming, including; pests and diseases, financial constraints, lack of markets, lack of technical support, limited land (small land sizes), long rotation period and environmental hazards (Table 2).

Challenges	Boundary		Woodlot		Scattered	
	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)
Pests and diseases	22	14	54	5	5	
Financial constraints	12	12	58	6	6	6
Limited markets/low prices	3				25	
Lack of technical support	38	8	54			
Limited land	31	9	50	5	5	
Long rotation period	23		69		8	
Environmental hazards	27	27	40	6		

Table 2: Challenges encountered in the various FFS by sex of respondents

An investigation of the challenges encountered under the different FFS revealed that respondents with woodlots encountered the most challenges, while those with scattered trees reported the least. In the boundary system, males were mainly challenged by lack of technical support which included; limited trainings in tree management while the females were mainly limited by environmental hazards such as storm and fire.Under the woodlot FFS, men mostly reported long rotation period followed by financial constraints, technical support and pests and diseases while the women equally reported financial constraints (limiting them to buy seedlings and tools/equipment) and environmental hazards.

Generally, Pests, diseases, financial capital, limited markets, lack of technical support, limited land, long rotation period and environment hazards were the challenges reported by farmers in tree growing. Termites were attributed to the destruction of other vegetation on which they could feed so they resorted to the planted trees. The findings were indistinguishable from those of Nyeko *et al*., (2005) where termites were reported to be destructive in Ugandan wood farms However, chemicals were needed in order to control pests and diseases mainly termites that destroy the trees. Declaring lack of financial capital to purchase inputs such as good quality seedlings, pesticides, irrigation equipment and hire of labour by farmers was linked to low prices of the agricultural and tree products where they could get money to boost the tree planting activities. SPGS, (2014)'s research in Uganda yielded close results highlighting inadequate extension services and research. Others mentioned small pieces of land coupled

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with land wrangles which associated with Mailo land whose titles are expensive to obtain in order to assume full ownership especially for those who had stayed in the area for a short period. Onguso et al., (2012) submitted close results after a research in Kenya exploring mainly how land size challenges tree farmers.

Farmers argued that there were imbalances in distributing farm activities such as males getting involved in digging the holes, preparing the planting sites and fire breaks and selling, whereas females helped with getting seedlings to the planting sites, watering the seedlings, applying manure and sweeping leaves around the planted trees, pruning and weeding. This kind of patriarchy dominance down surges female involvement in Tree farming. Studies done by Kate (2015) in Malawi pointed identical findings claiming that gender is a major barrier where male sex is more dominant in tree planting than the female sex since most males individually buy and own land and therefore the main decision makers. Some respondents stated being discouraged by friends, environmental hazards like fires, drought and strong winds but this was linked to high levels of ignorance, conservatism and unwillingness to change from their traditional attitudes, lack of training in commercial Farm Forestry Farming and actions to enhance wood production from Farm Forestry Systems earlier discussed. Similar findings were reported by Otsieno *et al*., (2014) in Kenya and Ouya (2016) in Ethiopia emphasizing the need for training in tree growing for the success of increased wood supply.

b) Actions needed to enhance engagement in Farm Forestry

Various measures were reported by the tree farmers that could enhance engagement in tree planting in the study area. These included use of chemicals like Tricel to kill the deadly termites that destroy trees, acquisition of loans, trainings in tree management, forming tree farmer groups, access to quality seedlings, subsidized tools and equipment and planting wind breaks (Table 3).

Challenges	Actions	% distribution of actions
Pests and diseases (n=18)	Use of chemicals like Tricel	66.6
	Trainings in tree management	22.3
	Forming tree farmer groups	11.1
Financial constraints (n=15)	Acquisition of loans	67.7
	Forming tree farmer groups	20.0
	Subsidized tools and equipment	13.7
Limited markets/low prices (n=6)	Forming tree farmer groups	83.4
	Trainings in tree management	16.7
Lack of technical support (15)	Trainings in tree management	86.7
	Forming tree farmer groups	13.3
Limited land (21)	Acquisition of loans	81.0
	Forming tree farmer groups	9.5
	Trainings in tree management	9.5
Long rotation period (n=18)	Access to quality seedlings	55.5
	Trainings in tree management	27.8
	Forming tree farmer groups	16.7
Environmental hazards (n=15)	Planting wind breaks	46.7
	Trainings in tree management	26.7
	Access to quality seedlings	13.3
	Forming tree farmer groups	13.3

Table 3: Challenges and actions to enhance engagement in Farm Forestry

Trainings in tree management and forming tree farmer groups were the mostly reported measures across the Farm Forestry Systems for addressing majority of the challenges to enhance engagement in tree planting. However, chemicals were needed in order to control pests and diseases mainly termites, loans purposely for buying more land for tree farming as well as buying quality seedlings, subsidized tools and equipment. There was a need for quality seedlings in order to achieve quick returns from trees and wind breaks to control environmental hazards like storm.

Consequently, the main actions desired among the tree farmers included: Chemicals (Pesticides and insecticides), loans, trainings in tree management, better quality seedlings, tools and equipment, forming tree farmer groups and planting wind breaks. Farmers expressed the need for chemicals such that they could control the deadly termites and other pests and diseases that destroy the trees. Conversely, Nyeko, Olubayo &Agricultural Research and Extension Network (2005) recommend embracing traditional local knowledge to control pests and diseases. According to them, tree farmers could be taught to use trenching, red pepper, dregs of local brew, used engine oil, sealing vents, fire, paraffin, wood ash, mud fish intestine, dead snake, hot water, cow dung, *Bidens pilosa* and human urine to curb the problem of termites. Furthermore, disease management should be through acquisition of proper site species matching, timely weeding and destroying anthills. Males mainly reported the need for loans as this was attributed to the necessity of buying more land for tree planting, buying tools and equipment, machinery like tractors, pruning knives and paying laborers. The reports for the need for loans were tallying with the findings of Appiah and Pappinen (2010) and Danjuma et al.,(2014).

On the other hand, trainings especially in tree management activities such as gap filling, weeding, pruning, thinning and spacing was reported among men who planted woodlots and boundary trees on farm. Females did not express the need for such as this was attributed to spending much of their time at home doing house work activities and so they have limited time compared to men. Wilnhammer (2009) proposes that consistent training in tree management of owners and forest work force could enhance wood supply for either timber or poles . Wilnhammer (2009) further proposes more programmatic solutions linked to land consolidation programmes, voluntary land swapping, stimulating voluntary formation of forest owner groupings, and establishment of service centres aiming at advising the forest owner which were not highlighted by the farmers who participated in this study. On addition, Tree farmer group formation plays an enabling role for small holder farmers to get easy access to extension services especially on silviculture, marketing of trees and accessing quality subsidized seedlings through their links and strong relationship with New Forest Company, District local government and other organizations (Fischer & Qaim, 2012). Males involved in boundary and woodlot tree planting cited better quality seedlings asserting that the trees they plant take long to reach harvesting age, are easily attacked by pests and diseases yet farmers require quick returns to fulfill their basic needs. In Nigeria, Danjuma *et al*.,(2014) highlighted similar findings.

Similarly, Planting windbreaks was attributed to the need to control environmental hazards particularly storm that destroys large volumes of trees when it occurs, reduce potential damage to homes, outbuildings, cropland, and livestock. it can add shade, esthetic appeal to your property, and serve as a haven for wildlife, insulation from noise and unpleasant smells emanating from neighboring properties. Similar results were presented by FAO (1989) in in Italy. Across the Farm Forestry Systems, tools and equipment were reported to be very expensive and rare such as pruning knives, tractors and Lorries. However, they argued the government and non-government organizations to provide them to farmers for free or at subsidized rates. Forming tree farmer groups was reported across the systems especially by males who participated in woodlot and scattered tree planting given that it could help them to obtain better markets for the tree products and also acquire new skills of managing trees. These findings conform to what SPGS (2014) noted that through grower's field meetings, tree farmers interact and learn from one another.

IV. CONCLUSIONS AND RECOMMENDATIONS

A. *Conclusions*

The challenges encountered in tree farming, included; pests and diseases, financial constraints, lack of markets, lack of technical support, limited land (small land sizes), long rotation period and environmental hazards.

Use of chemicals, acquisition of loans, trainings, access of quality seedlings, subsidized tools and equipment as well as forming tree farmer groups could be used to overcome the challenges.

B. *Recommendations*

Based on the study findings, the following recommendations have been put forward:

There is need to organize tree farmers into collective action groups to enable them jointly; seek financial support from different government initiatives and lobby for technical extension services related to tree growing and management.

There is need for establishing demonstration farms to allow for peer learning and proper involvement of tree farmers in innovations aimed at developing local solutions to local challenges.

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