Status of Seed and Seedling Supply System in Uganda

Survey Report

By

Odoi Juventine Boaz¹ and Buyinza Joel¹ and Okia Clement²,

¹National Forestry Resources Research Institute, P. O. Box 1752, Kampala, UGANDA
²World Agroforestry Centre, Uganda Country Office, P. O. Box 26416, Kampala, UGANDA

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# Table of Contents

**BACKGROUND** .................................................................................................................................................. 3

Objectives ................................................................................................................................................................. 4

**METHODS** ........................................................................................................................................................... 5

**STUDY FINDINGS AND DISCUSSION** .................................................................................................................. 6

Socio-demographic characteristics of the respondents .......................................................................................... 6

Tree species raised in Tree nurseries ...................................................................................................................... 7

Source, collection and distribution of tree seeds and seedlings ............................................................................ 7

The tree seed and seedling customer base ............................................................................................................. 9

Tree Seed and seedling quality assurance ............................................................................................................. 10

Role of government in ensuring seed and seedling quality .................................................................................. 11

Support to tree nursery operators in Uganda ......................................................................................................... 12

Bottlenecks in Uganda’s seed and seedling system .............................................................................................. 14

**RECOMMENDATIONS** ..................................................................................................................................... 16

References ................................................................................................................................................................. 17

**APPENDICES** ..................................................................................................................................................... 18

Appendix I: Guide for Key Informant Interviews ................................................................................................. 18

Appendix II: Key Informant Interview Checklist– Seeds and Seedling Systems .................................................... 19

Appendix III: Interventions in seedling production ............................................................................................... 20
BACKGROUND

Farmers’ access to affordable tree seeds and seedlings of superior quality is key in increasing forest production and food productivity globally. Growing trees on farms has become part of the smallholder’s strategy in agricultural enterprises along with annual crops. Agroforestry is implemented by millions of smallholder farmers in the tropics to meet their crucial household needs such as food, fuel, fodder, timber and medicinal products and valuable environmental services (Garrity, 2004). As part of efforts to address environmental degradation in the Mt. Elgon sub-region, both government of Uganda and Non-government organizations (NGOs) are engaging smallholder farmers in tree growing. However, due to absence of regulations for tree seed and seedling operations, there are increasing concerns about the quality of seedlings produced in private tree nurseries arising from low quality seed and sub-standard nursery practices. There has been impassionate argument over the decades on tree seed and seedling systems and how to make the smallholder farmers access high quality planting materials. There is also an information gap to provide an understanding on what institutional interventions may be possible for tree seed and seedling systems in Uganda.

Supporting the development of superior tree seed sector in Uganda can substantially contribute to improved food security and smallholder farmers’ livelihood improvement through development of the seed and seedling system. The interventions should explore variation among seed value chains with the aim of making seed programmes and policies more coherent with farmers’ practices by contributing to food security, livelihood improvement through the promotion of tree seed entrepreneurship, and biodiversity conservation and sustainable use of the forest products and services. The World Agroforestry Centre (ICRAF) in collaboration with the National Forestry Resources Research Institute (NaFORRI) has established a central tree nursery in Mbale town to produce high quality germplasm for establishment of participatory trials under the Trees for Food Security Project (T4FS) in Mt. Elgon sub-region. The nursery will also serve as a Rural Resource Centre (RRC) to offer training and provide tree planting materials to communities in an effort to scale up on-farm tree growing in the
sub-region. This study is designed towards contributing to one of the outputs of T4FS Project: Developing recommendations for improving tree seed and seedling systems in Uganda.

The study involved a questionnaire survey to assess tree seedling production in tree nurseries in Central and Eastern agro-ecological zones of Uganda. The survey covered Mbale, Manafwa and Sironko districts in the Eastern Highlands Agroecological Zone while Wakiso, Kampala and Mukono districts were covered in the Lake Victoria Crescent Agroecological Zone. This study will be followed by an inventory of seedlings in different tree nurseries for assessment of quality in terms of root-shoot ratio, rooting, hardening processes, among other factors. Viable interventions would then be drawn from the two studies and consequently conduct a workshop for developing recommendations for improving the tree seed and seedling supply system in Uganda.

Objectives
The objective of the study was to map out the tree seed and seedling supply system in Uganda in order to establish the following;

1. Role of government and NGOs in the tree seed and seedling system;
2. Quality of the germplasm as mapped out in the seed sourcing, collection/procurement and distribution and ultimately seedling production
3. Role of smallholder farmers and the private sector in the tree seed and seedling system as an indicator of sustainability
4. Bottlenecks in Uganda’s seed and seedling system and possible interventions geared towards overcoming them especially on networking and information sharing within the system and its sustainability
METHODS
Reconnaissance was carried out to come up with the list of tree nursery operators in Mbale, Manafwa, Sironko, Mukono, Kampala and Wakiso districts to establish their total numbers. From the list 35 Tree nursery operators were randomly selected from each of Mt. Elgon AEZ (considering Mbale, Sironko and Manafwa districts) and Lake Victoria Crescent AEZ (Kampala, Mukono and Wakiso districts) to come up with a total of 73 interviewees to give information on the contribution of tree seed and seedlings systems to food security in Uganda.

Fifteen key informant interviewees from each of the AEZs were purposively selected for interviews from the districts resourceful persons, including District Forest Officers (DFOs), District Environment Officers, Makerere University, Government institutions dealing in tree seeds and seedlings like National Forestry Authority (NFA) field staff, National Tree Seed Centre staff and National Forestry Resources Research Institute (NaFORRI) staff. Data was entered in Microsoft Excel and later exported to the Statistical Package for Social Scientists (SPSS) for analysis to establish the contribution of tree seed and seedlings towards food security in Uganda.
STUDY FINDINGS AND DISCUSSION

Socio-demographic characteristics of the respondents

Over 70% of the respondents were male, 47% were owners of the tree nurseries and 60% of the owners were from Lake Victoria crescent (Table 1). While 74% of the of the respondents in L. Victoria crescent owned individual tree nurseries, about 50% in Eastern highlands had family or group tree nurseries. The results show that most of the tree nursery owners rent the land where their nurseries are located and this is more prominent in Lake Victoria Crescent reported by about 50% of the respondents.

Table 1: Socio-demographic characteristics of the respondents (N=73)

<table>
<thead>
<tr>
<th>Variable (s)</th>
<th>Agro Ecological Zone</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Eastern highlands</td>
<td>Lake Victoria Crescent</td>
</tr>
<tr>
<td>Number of Respondents</td>
<td>38</td>
<td>35</td>
</tr>
<tr>
<td>Sex (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>73.7</td>
<td>77.1</td>
</tr>
<tr>
<td>Female</td>
<td>26.3</td>
<td>22.9</td>
</tr>
<tr>
<td>Age (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25 Years</td>
<td>7.9</td>
<td>17.1</td>
</tr>
<tr>
<td>25-34 Years</td>
<td>34.2</td>
<td>25.7</td>
</tr>
<tr>
<td>35-44 Years</td>
<td>18.4</td>
<td>37.1</td>
</tr>
<tr>
<td>&gt;44 Years</td>
<td>39.5</td>
<td>20.0</td>
</tr>
<tr>
<td>Status of Respondent (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner</td>
<td>34.3</td>
<td>61.7</td>
</tr>
<tr>
<td>Employee</td>
<td>34.2</td>
<td>26.5</td>
</tr>
<tr>
<td>Relation or share crop</td>
<td>5.3</td>
<td>2.9</td>
</tr>
<tr>
<td>Group chairperson/ secretary/member</td>
<td>23.7</td>
<td>2.9</td>
</tr>
<tr>
<td>Government Employee</td>
<td>2.6</td>
<td>5.9</td>
</tr>
<tr>
<td>Type of nursery (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual</td>
<td>28.9</td>
<td>74.3</td>
</tr>
<tr>
<td>Family/ group</td>
<td>52.6</td>
<td>11.5</td>
</tr>
<tr>
<td>Company</td>
<td>18.4</td>
<td>14.3</td>
</tr>
<tr>
<td>Land ownership of nursery site (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner/private land</td>
<td>39.4</td>
<td>11.4</td>
</tr>
<tr>
<td>Borrowed</td>
<td>18.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Rented</td>
<td>23.7</td>
<td>48.6</td>
</tr>
<tr>
<td>Communal land</td>
<td>0.0</td>
<td>2.9</td>
</tr>
<tr>
<td>Government land</td>
<td>18.4</td>
<td>37.1</td>
</tr>
</tbody>
</table>
Tree species raised in Tree nurseries

Tree nurseries are dominated by exotic tree species including *Eucalyptus grandis*, *Pinus caribea* and *Pinus oocapa*. Little attention has been given to indigenous tree species and most nursery operators reported that the seeds are not readily available from local seed sources (Plate 1). Other tree species raised in tree nurseries include *Markhamia lutea*, *Mangifera indica*, *Grevilea robusta*, *Measopsis eminii*, *Manhogany*, *Coffee*, *Casuarina equisitifolia*, *Prunus africana*, *Cordia africana*, *Spathodea campanulata*, *Melicia excelsa*, *Azandrachta indica*, *Albizia coriaria*, and *Artocapus heterophylus*.

Plate 1: Nursery operator in Wanale, Mbale District explaining the tree species being raised

Source, collection and distribution of tree seeds and seedlings

The main source of seed are the seed dealers and the National Seed Centre (Table 2). While the seed dealers are widely distributed and close to the communities, the National tree seed center is centralized with offices in Central Uganda. Other seed sources reported include farmers’ own farms, natural forests and plantations. There are very few existing seed orchards and mother blocks in Uganda, a major setback for Uganda’s seed sector. The sector is dominated by the private tree seed and seedling producers. A wide range of tree seeds required by private tree nursery operators are normally
collected rudimentarily from local sources for planting by the small holder farmers. However, the use of private enterprise approach may get limited due to lack of attention to the geographical scale of demand and avoid it due to the costs involve. This may become unsustainable and also cause the distribution of inferior material (Wiggins and Cromwell, 1995; Cromwell et al., 1992; Tripp, 2001).

Plate 2: The DFO Manafwa delivering seedlings from NaFORRI/ICRAF nursery in Mbale to Manafwa farmers under Trees for food security project

Table 2: Source of planting material and reasons for source

<table>
<thead>
<tr>
<th>Source of planting material (seeds and scions)</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>Natural Forest</td>
<td>21</td>
</tr>
<tr>
<td>Own Farm</td>
<td>66</td>
</tr>
<tr>
<td>Neighbor’s farm</td>
<td>75</td>
</tr>
<tr>
<td>Seed dealer or centre</td>
<td>341</td>
</tr>
<tr>
<td>Seed orchard</td>
<td>12</td>
</tr>
<tr>
<td>Plantation</td>
<td>7</td>
</tr>
<tr>
<td>Mother block</td>
<td>9</td>
</tr>
</tbody>
</table>

Reason for source

<table>
<thead>
<tr>
<th>Reason for source</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy access</td>
<td>64</td>
</tr>
<tr>
<td>Good quality source</td>
<td>49</td>
</tr>
<tr>
<td>Only available</td>
<td>25</td>
</tr>
</tbody>
</table>
The survey also revealed that the nursery operators’ source of planting material is greatly influenced by ease of access, reported by 44% of the survey respondents (Table 2). This implies that there is a likelihood that the nursery operators will chose any planting material easily accessible to them irrespective of quality. Other reasons given for the source of planting materials were because the source was the only one available and most inexpensive to the nursery operators. This is especially common among road-side tree nursery operators. A poor seed source eventually leads to poor quality seedlings that end up in fields. Only 34% of the respondents consider good quality source while selecting planting materials.

**The tree seed and seedling customer base**

Private individuals form the largest portion of tree seedling customers (60%), followed by government organizations (Figure 1). Other customers include donor projects or NGOs (including Tree Talk Uganda) and private companies. Tree Talk Uganda, for example, has since 2008, been collecting and buying tree seed from communities in quantities of up to 1000 kg each year.

![Figure 1: Major buyers of tree seedlings](image-url)
Tree talks mainly buys *Melicia excelsa, Maesopsis eminii, Cordia africana, Markhamia lutea* and Avocado seeds from local seed collectors and dealers. Buying seed from communities is another way to show that trees have value. Tree Talk has been paying UGX 10,000 per kg of mahogany seed and UGX 8,000 per kg of *Markhamia* and *Cordia africana*. Children and women that collect the seed often use the earnings for scholastic materials.

**Tree Seed and seedling quality assurance**

The survey made a comparison between the proportion of seedlings raised against those sold and the findings showed that 85% of the seedlings raised are sold by the tree nurseries, an indication of high demand for tree seedlings. What remains a key concern is the quality of the seedlings produced and supplied to tree growers. For example, the study revealed that 70% of the unsold seedlings were still in the nursery (Figure 2) and nursery owners are likely to sell them over the following planting season, thus supplying over-grown seedlings to tree planters.

*Plate 3: A Technician verifying seed quality supplied by a farmer at NaFORRI/ICRAF nursery in Mbale*
Role of government in ensuring seed and seedling quality

The government of Uganda, through the National Forestry Authority (NFA), established the National Tree Seed Centre (NTSC) in Namanve, about 12 Km along Kampala – Jinja Highway. The center has a well-built standard infrastructure to collect, process, test, store and distribute tree seeds of over 100 indigenous and exotic species. The laboratory is equipped to test seed for quality assurance using the International Seed Testing Association (ISTA) Guidelines. NaFORRI with the established function of forestry research in Uganda has established the tree seed research unit to inform and advice public and tree seed and nursery operators on the best practices in tree seed handling and seedlings production.

The NTSC manages a tree nursery to supply seedlings of priority species to meet the demand for seedling for tree planting programs. Annual seedling production has increased from 700,000 to 2,000,000 assorted seedlings between 2004 and 2014, an indication of increased tree germplasm demand. The priority species are for timber (mainly Pine, Eucalyptus, Measoppisi eminii, Terminalia superba, and Araucaria). However with increasing demand, the NTSC is giving more attention to the production of fruit trees (grafted mangoes, avocados, budded oranges, pawpaw, jackfruit, and passion fruits), which have of recent increased demand. Tree farmers are

Figure 2: What is usually done to unsold seedlings in the nursery

Donations to fellow farmers: 15.7%, Still in nursery: 70.0%, Destroyed: 14.3%
also provided with useful information and advice on species-site matching, spacing, and other relevant silvicultural practices. Field checks are also undertaken by the staff as a follow-up on the performance of the seed and seedlings and to further advise the farmers.

The NTSC also establishes and manages seed sources, promotes research on species performance and site suitability for various species. These seed sources are well-established and of good genetic and physiological quality both in natural forests and plantations. Some seed sources are in the protected areas (forest reserves, national parks and wildlife reserves), while others are on privately managed farms. The seed for timber species are mainly from selected stands and seed production areas. A number of private farmers collaborate with the NTSC to establish and manage trees on-farm for purposes of producing quality seed. NTSC normally provides technical guidance for this purpose. This makes such farmers legible to sell their seed to the NTSC.

The National Tree Seed Centre also offers training and advisory services in seed & tree nursery management and plantation forestry. This targets private seed suppliers, and nursery owners and operators, NGOs, local governments, schools, and investors in plantation forestry. However, training is at a cost, and has been organized into three modules, namely Nursery management, Seed collection and handling, and Plantation establishment.

**Support to tree nursery operators in Uganda**

In terms of building the technical capacity of nursery operators in Uganda, the supporting institutions include the National Forestry Authority (NFA), whose major role is to avail quality seed through the National Tree Seed Center (NTSC), the National Agricultural Research Organization (NARO), which supports research through the National Forestry Resources Research Institute (NaFORRI) and Nyabyeya Forest College. Other supporting institutions include Uganda Timber Growers Association (UTGA), Sawlog Production Grant Scheme (SPGS), district local governments through the department of Natural resources and a number of Non-government organizations.
including ECOTRUST, Tree Talk Uganda, Mbale Coalition Against Poverty (promoting indigenous tree species) and Share an Opportunity Africa (Plate 4). Government initiative such as FIEFOC and NAADS/Operation Wealth creation have also been reported to support tree nursery operators.

Plate 4: Seedlings being distributed by Share an Opportunity Africa community mobilizer in Busiu Sub County, Mbale district

SPGS supports nursery operators through trainings and certifying those that meet the required standards. It promotes tree plantations by awarding grants that cover half the cost of planting. In order to qualify, candidates, who come from all walks of life, must own at least 25 hectares of land. It’s a requirement designed to discourage all but the most serious planters. PGS also links the qualified candidates to certified tree nurseries close to where they want to establish tree plantations. Tree planting advocates are quick to point to ways in which plantations can benefit local communities as well as wealthy investors. SPGS, for instance, provides free planting advice and seedlings to poorer villagers who don’t have much land, as long as they can form an association of at least 20 people. So far, the organization has helped over 130 such groups to plant trees.
In terms of financial support, tree nursery operators have received minimum external support, with most of the nursery operators investing their own capital (66%) to support nursery activities. Other sources of financial support to tree nursery include NGOs, government departments and donor projects, reported by 14%, 11% and 5% of respondents respectively (Figure 3).

![Figure 3: Source of financial support to tree nursery operators](image)

**Bottlenecks in Uganda’s seed and seedling system**

The main challenges faced in reaching customers include long distance and high transport costs, high cost of follow-up on the customers and competition from other nursery operators. The nursery operators have failed to expand their customer base due to high cost of advertisement, small nursery space to allow increased production, poor location of the nurseries in areas that are not visible and accessible to customers and the high cost of production caused by expensive nursery inputs such as seed and equipments.
The nurseries that are owned and run by associations or groups have faced similar challenges as the individual nurseries. In addition, the survey results show that there is unhealthy competition out of selfishness and differing priorities among association and group members, mistrust and small capital investment into nursery operations which may compromise seedling quality.
RECOMMENDATIONS

The following recommendations were drawn from the survey;

There is need for government to put in place measures for regulating road side tree nurseries so as to ensure production of quality seedlings. There should also be provision for training of nursery operators, focusing on quality seed collection and nursery management.

Decentralization of seed supply through establishment of more seed centers closer to the communities and supporting local communities to establish genetically diverse seed sources. This is necessary since seeds are currently obtained from only one centrally located National Tree Seed Centre.

The current focus on exotic tree species is undermining on-farm tree diversity. Therefore, communities should be encouraged to engage more in local seed collection for indigenous tree species since these are easily accessible and adapted to the local environment.

The Forestry Sector Support Department (FSSD) should develop Tree Nursery Standards for Uganda to guide establishment and management of tree nurseries. These can be in form of technical manuals for seed collection and handling and seedling production.
References


Tripp R (2001) Seed provision & agricultural development: the institutions of change. Overseas Development Institute, London, UK

Wiggins S. and Cromwell E. (1995) NGOs and Seed Provision to Smallholders in Developing Countries', World Development 23(3) 413-422
APPENDICES

Appendix I: Guide for Key Informant Interviews

Objectives of the study
The objective of the KII on seed and seedling systems is to map out the tree seed and seedling supply system in the ACIAR project countries in order to establish the following:

- The role of government and NGOs in the systems
- The quality of the germplasm as mapped out in the seed sourcing, collection/procurement and distribution and ultimately seedling production
- The role of smallholder farmers and the private sector in the system as an indicator of sustainability
- Bottlenecks in the system and possibility of interventions geared towards overcoming them especially on networking and information sharing within the systems and their sustainability

I need your support in getting information from the organizations dealing with agriculture/agroforestry/forestry in the two sites whether they be government projects or non-governmental organizations (most of it may be got from their offices in Kigali anyway) that can be strengthened through specific nursery operators’ and seed dealers’ surveys. I have therefore edited the checklist as attached. Please look through it and see if you understand the flow and then get back with your comments as we finalize it. I guess I have already answered your questions below but still go through them in red below. Please note that the nursery survey and a customized instrument will follow this interview depending on the results of this interview and the baseline survey that has just been conducted.
Appendix II: Key Informant Interview Checklist – Seeds and Seedling Systems

Organization being interviewed:
Name and designation of interviewee
Date

<table>
<thead>
<tr>
<th>Administrative Boundary of mandate area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Province (s)/Regio: Mt. Elgon sub-region, Eastern Uganda</td>
</tr>
<tr>
<td>District (s) – Manafwa</td>
</tr>
<tr>
<td>Sectors (here specifically in Buta and Namabya sub-counties)</td>
</tr>
<tr>
<td>Cells (if not operating in all cells in the sector) Parish</td>
</tr>
<tr>
<td>Village (Immadugudu)</td>
</tr>
</tbody>
</table>

Questions to be asked organization:
What are your organization’s main focus areas on agroforestry
Do you deal with tree seed and/or seedlings – please explain briefly your focus in this area

Interventions in seed supply
Which species are most preferred by community?
Have you introduced new species to the community? If yes which ones
Do you supply tree seeds to farmers or nursery operators?
If yes where do you get the seeds from? (Purchase and from who, own collection and from where, seed stands, plantations, natural forests etc)
How do you ascertain the genetic, physiological and physical quality of the seeds
How do you distribute the tree seeds (directly, indirectly through other farmers or organisations or contract seed growers)
Do you know of farmers who collect and distribute/sell tree seeds?
If yes do you deal with them and how? Is it possible to share their contacts with us?
Do you encourage your farmer communities to collect seeds for themselves, establish seed orchards or other means of acquiring tree seeds?
If yes what kind of training/information/intervention do you offer to ensure quality of such seeds?
Appendix III: Interventions in seedling production

Do you support tree nurseries in your works?

If yes could you please supply us with the following information?

<table>
<thead>
<tr>
<th>Name of nursery</th>
<th>Location (cell and Sector)</th>
<th>Type of nursery (government, project, individual, group)</th>
<th>When it was started</th>
<th>Whose initiative was it?</th>
<th>What kind of support is given</th>
<th>What community needs did nursery establishment seek to achieve?</th>
<th>Tree species types in the nursery (fruit, fodder, fertilizer, timber etc)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

Do your nursery operators access sufficient tree seed to meet the demand of their customers/members?
Do you deal with vegetatively produced species in any of these nurseries
If yes what are the sources of scions/cuttings
What kind of training has been offered to nursery operators that you are aware of? By who?
What would you say are tree seed and seedling procurement and distribution challenges facing organizations promoting agroforestry in this area?
What would you say are tree seed and seedling production and distribution challenges facing farmer seed dealers and nursery operators?
What interventions do you know that have been undertaken by the government or other non-governmental organizations to address these challenges
How else do you think seed and seedling supply can be improved in this area

Could you please share with us contacts of:

- Farmer seed dealers that you know
- Private enterprises dealing with tree seeds that you know
- Other development organisations dealing with tree seed/seedlings that you know