Guidelines for native tree seeds/seedlings distribution in Tanzania

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LIST OF ACRONYMS AND ABBREVIATIONS

NTS	Native Tree Species
TTGAU	Tanzania Tree Growers Association Union
MBG	Migombani Botanical Garden ECHO East Africa
TFS	Tanzania Forest Services Agency
BGCI	Botanical Gardens Conservation International
NAFORMA	National Forest Resources Monitoring and Assessment
FREL	Forest Reference Emission Level
CSOs	Civil Society Organisations
MNRT	Ministry of Natural Resources and Tourism
MoA	Ministry of Agriculture
LGAs	Local Government Authorities
MoFP	Ministry of Finance and Planning
PO-RALG	President's Office Regional Administration and Local Government
GNTSDT	Guidelines for Native Tree Seeds/Seedlings Distribution in Tanzania
SUA	Sokoine University of Agriculture
TAFORI	Tanzania Forestry Research Institute
AFR100	The African Forest Landscape Restoration Initiative

FOREWORD

There has been increasing efforts to restore degraded land to optimise socio-economic and environmental benefits through planting and retaining of Native Tree Species (NTS) in Tanzania. Unfortunately, these efforts have not been effective partly due to limited knowledge and capacity related to NTS restoration. Experience shows that different technical tools are in place including Forest Plantation and Woodlot Establishment Technical Guidelines (2017) and Forest Technical Order (2021), which have continuously supported the efforts. Nevertheless, these tools contain most information for wide planted tree species which is constituted largely by exotic tree species. This situation has left a significant number of NTS of high value to people, economy and environment unreached, with consequence on native tree species disappearance and extinction.

Guidelines for Native Tree Seeds/Seedlings Distribution in Tanzania (GNTSDT) has come in the right time. These Guidelines have been developed with cognisance of the existing knowledge and practical gaps among practitioners, managers and members of research community. It took advantage of accumulated knowledge and field experience over the years to build knowledge base enabling proper distribution of high quality and productive NTS to different climatic and agro-ecological zones in response to increasing impacts of climate change in Tanzania. The guidelines contain sufficient information, instructions, activities and principles with detailed but simple useful tables and maps to enhance understanding and adoption among different stakeholders in the restoration value chains.

It is therefore anticipated that the developed Guidelines will be useful tool to support and accelerate degraded land and NTS restoration initiatives. More also, broadly speaking, implementation of these guidelines will facilitate achieving restoration targets of 5.2 million hectares of degraded land the Tanzania committed itself to restore under the Bonn Challenge by 2030. All stakeholders both private and public, and small, medium and large are urged to widely use these Guidelines to enhance effective distribution and successful restoration impacts of NTS.

ACKNOWLEDGEMENTS

Preparation and production of the Guidelines for Native Tree Seeds/Seedlings Distribution in Tanzania would have not been possible without the technical, logistical and financial support from several important individuals and institutions both in and outside Tanzania. Technical inputs from tree seeds and forestry experts in Tanzania at various stages were important to improve drafts of the Guidelines. The experts from the Department of Botany, University of Dar es Salaam (UDSM) led the successful preparation of the Guidelines. Experts from Sokoine University of Agriculture (SUA) and Tanzania Forestry Research Institute (TAFORI) spared their valuable time to consult relevant documents and share their vast experiences which led to the development and production of this valuable NTS management tool.

Practical knowledge and field experience were received from several institutions including Tanzania Tree Growers Association Union (TTGAU), ECHO East Africa and Migombani Botanical Garden (MBG) in Zanzibar. The commitment, professionalism and support of these institutions and individuals were instrumental.

The preparation of the Guidelines was funded by the Darwin Initiative through Botanic Gardens Conservation International project 'Diversifying Tanzania's NTS portfolio for people and biodiversity'. Additionally, Tanzania Forest Services (TFS) Agency provided technical guidance and logistical arrangements.

LIST OF TABLES AND FIGURES

DEFINITIONS AND GLOSSARY

Seed	Part of plant used for planting
Guidelines	A collection of general rule, principles or piece of technical advice. It aims to streamline particular processes according to a set routine or sound practice to reach desired objectives.
Phytogeographical regions	Landscape areas or geographical regions which are inhabited by closely related plant species and plant associations. They are five in total.
Floristic region	Large area or region characterized by the similar or closely related composition of plant species. These regions are not bound to political or administrative regions and sometimes cross beyond the administrative regions. These are denoted as T1-T8 as explained in the Flora of Tropical East Africa.
Forestry zones	This is a large area, landscape or zone with comparable forests. These are Lake Victoria, inland plateau, highland areas, Eastern Arc Mountains foothills and Coast zone.
Agroecological zone	Large areas/zones classified based on similarities in climate and soils. Tanzania has seven agroecological zones: Coastal; Arid lands; Semi-arid lands; Plateaux; Southern & Western Highlands; Northern Highlands; and Alluvial plains.
Forest climatic zones	Large areas of forests experiencing comparable or similar climate especially in terms of rainfall and temperature as well as tree species. There are seven climatic zone namely wet montane, dry montane, transitional montane, moist plateau, dry plateau, wet tropical and coastal belt.
Native Tree Species	Indigenous tree species found in a certain area; the naturally occurring species in the specified area.
Botanical Gardens Conservation International	An international Non-Government Organisation (NGO) working to secure plant diversity for the well-being of people and the planet.
Tanzania Forest Services Agency	A semi-autonomous government executive agency established to develop and manage forest and bee resources sustainably.

CHAPTER ONE

INTRODUCTION

1.1 Background information

Tanzania is a tropical country widely known as mega rich biodiversity hotspot. It has high number of rare, endemic, unique, flagship and threatened plant species of local, regional and international importance. Although the exact number is not known it is estimated that there are between 10,000 to 12,000 plant species distributed in forests and other land uses including farms, wetlands, agroforestry systems and open urban green spaces. The last National Forest Resources Monitoring and Assessment (NAFORMA) revealed that the country hosts 48.1 million hectares of forested land, which is 55% of the entire land surface area. It has been estimated that the forested land is currently equivalent to the Forest Reference Emission Level (FREL) of 43,673,924 tCO2e/year. Of the total forested land (i.e. 48.1 million hectares), woodland constitute 91% equivalent to 44 million hectares while other vegetation types including bamboo and mangrove forests constitute the remaining amount i.e. 4.1 million hectares. No doubt that Tanzania has estimated 77.2 billion trees and 32.2% of them are in production forests and wildlife-protected areas. Out of those trees, a total of 1,755 are Native Tree Species (NTS), 410 are threatened, 308 are endemics, and 247 are timber species of which 30 are threatened with extinction.

Despite having endowed with rich biodiversity in protected and non-protected areas human activities in form of uncontrolled clearing forests for agriculture, livestock grazing, illegal charcoal harvesting and other developmental needs have exacerbated deforestation and land degradation. According to the last national FREL report, deforestation has increased from 412,000 hectares per year between 1990 and 2005 to recent 469,420 hectares per year. Unfortunately, combined restoration efforts by various players in the country e.g. Civil Society Organisations (CSOs) both local and international, government and well-wishers' individuals are apparently far less than the deforestation and degradation trends. This trend needs to be reversed sooner than later to ensure that forests and environmental resources dependent communities (or socio-ecological systems) are safe guarded.

Tanzania is a signatory to many conventions and treaties focusing on biodiversity conservation. One of those is The Bonn challenge in which 61 countries from all over the world agreed in 2018 to restore 350 million hectares of degraded and deforested landscapes by 2030. Tanzania being one of those countries has committed itself to restore a total of 5.2 million hectares. Unfortunately, even with the pledge to restore that amount of land i.e. 5.2 million hectares, overall progress in restoration has overall not

been impressive particularly with regards to the use of Native Tree Species (NTS). This is due to several reasons including inadequate silvicultural knowledge and incentives for planting NTS, insufficient information on which tree species to plant where (species – site matching) and apparently no NTS seed zone maps which could facilitate smooth distribution of tree seeds and seedlings among different climatic and agroecological zones. These constraints have resulted in native tree seeds and seedlings either being unavailable, or too expensive to buy and propagate in the country consequently hampering the dire need restoration efforts. Present Guidelines have come in the right time to provide systematic technical instructions that facilitate NTS distribution for successful restoration in line to the African Forest Landscape Restoration Initiative AFR100.

CHAPTER TWO

SITUATION ANALYSIS

2.1 Floristic regions

Tanzania occupies a total of 95 million hectares of which forests cover a total area of 48.1 million hectares. Forests have long been recognized for provisioning of important ecosystem goods and services. Thus, they contribute up to 3.5% of gross domestic product, over 20% to subsistence economy and employ over 3 million people in Tanzania. Tanzania is among the mega biodiversity country known to host between 10,000 and 12,000 plant species including species of ecological, cultural and socio-economic importance. Recent statistics put the cover of forests for Tanzania mainland to 48.1 million hectares equivalent to the Forest Reference Emission Level of 43,673,924 tCO2e/year. Forests provide a wide range of ecosystem services including climate amelioration, domestic and industrial water, soil conservation, variety of foods, biofuels in form of firewood and charcoal, and other timber and non-timber forest products including medicines, as well as cultural, spiritual and recreational values. Forests have received increasing attention in recent times as they contribute to the global carbon cycle through absorbing and releasing carbon dioxide, one of the major greenhouse gases with substantial contribution to global warming. Due to large coverage, permanence and presence of legal and institutional arrangements, natural forests are critical for sustainable national efforts to mitigate and adapt to the negative impacts of climate change and variability. Trees make the large part of the forests and in Tanzania trees are estimated to be 1750 species.

Tanzania is endowed with different floristic regions (T1 – T8) with different tree species (Fig. 1). A tree species may be recorded to appear in some floristic regions however, this does not necessarily mean that the species does not occur elsewhere in Tanzania. In due course the Guidelines will be revised to show other areas of distribution. Note that floristic regions go beyond administrative/political regions of Tanzania and identification of regions-species matching facilitates effective restoration of tree species.

Tree species diversification involves use of several compatible species on the landscape to increase stability against environmental and economic perturbations. The objective of technical instructions on tree seeds species diversification is to serve as an insurance against insect pests, pathogens and climatic fluctuations especially as the climate keeps on changing. Additionally, this may result in increased market security through species

and product diversification. It is recommended that stakeholders should use whenever possible native tree species in large scale plantations and on restoration projects.

Planting materials can be seeds or vegetative propagules (cuttings, single cell/organ used in tissue culture). The objective of technical instructions on tree seeds and vegetative propagules is to ensure genetically improved seeds and vegetative propagules are used for the establishment of productive and quality plantations and woodlots. Planting materials must be sourced from seed orchards. For the native tree species which have no seed orchards, the seeds must be obtained from seed stands.

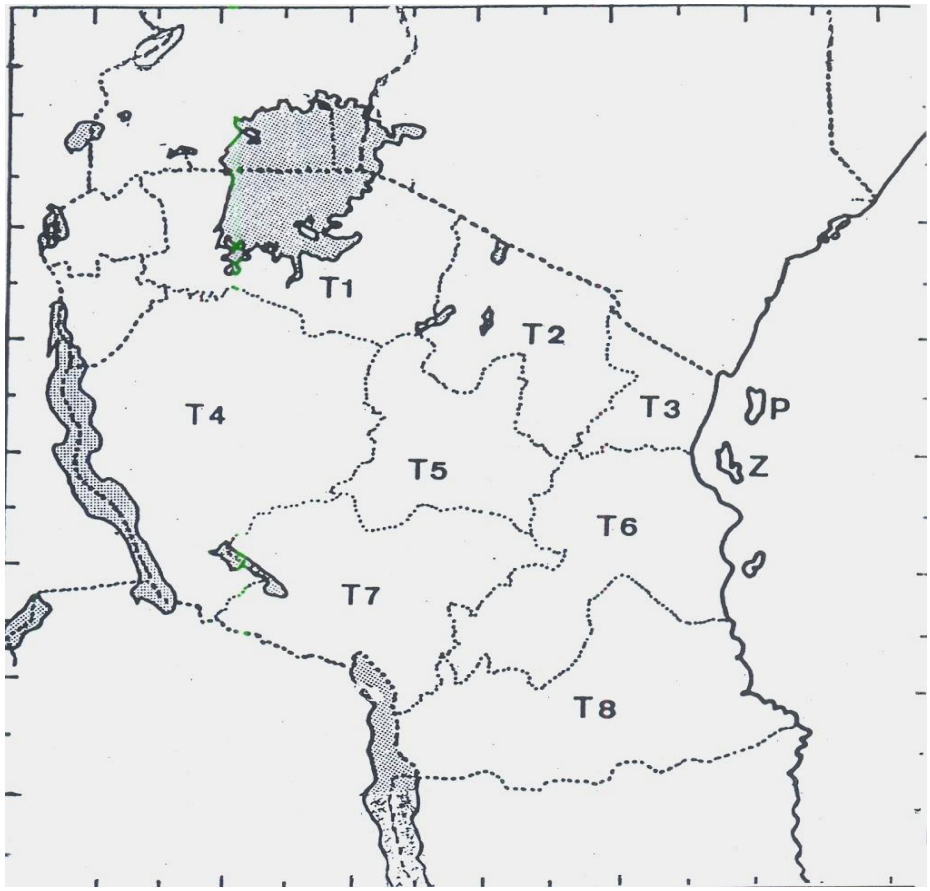

Figure 1. Map of Tanzania showing floristic regions. Mwanza, Kagera, Mara, Shinyanga (T_1); Kilimanjaro, Arusha and Manyara (T_2); Tanga (T_3); Tabora, Kigoma and Rukwa/Katavi (T_4); Dodoma and Singida (T_5); Morogoro, Pwani and Dar es Salaam (T_6); Iringa, Njombe and Mbeya (T_7); Ruvuma, Mtwara and Lindi (T_8); Unguja (Z); Pemba (P).

2.2 Agroecological zones

Tanzania has seven (7) agroecological zones (Table 1) which support a wide variety of native and non-native tree species. These zones are made up of unique climate, soils and vegetation types. The zones provide a thorough framework that captures the various

environmental and climatic conditions which facilitate forestry development that suits the needs of each zone.

Table 1: Tanzania agroecological zones

Zone	Sub zone	Soil and topography	Altitude	Temperature range (min-max with months)	Rainfall
1. COAST	North: Tanga (except Lushoto), Coast and Dar es Salaam South: Eastern Lindi and Mtwara (except Makonde Plateau	Infertile sands on gently rolling uplands Alluvial soils in Rufiji Sand and infertile soils Fertile clays on uplands and river flood plains	Under 300 m	Min: 23–25°C (Jul–Aug); Max: 30–32°C (Feb–Mar)	North: Bimodal, 750-1200 mm South: Unimodal, 800-1200 mm
2.ARID LANDS	North: Serengeti, Ngorogoro Parks, Part of Masailand Masai Steppe, Tarangire Park, Mkomazi Reserve, Pangani and Eastern Dodoma	North: Volcanic ash and sediments. Soils variable in texture and very susceptible to water erosion South: Rolling plains of low fertility. Susceptible to water erosion. Pangani river flood plain with saline, alkaline soil	North: 1300-1800 m South 500-1500 m	Min: 12–16°C (Jun–Jul); Max: 30–34°C (Feb–Mar)	North: Unimodal, unreliable, 500-600mm South: Unimodal and Unreliable, 400-600 mm
3. SEMI-ARID LANDS	Central Dodoma, Singida, Northern Iringa, some of Arusha, Shinyanga Southern: Morogoro (except Kiliombero and Wami Basins and Uluguru Mts). Also Lindi and Southwest Mtwara	Central: Undulating plains with rocky hills and low scarps. Well drained soils with low fertility. Alluvial hardpan and saline soils in Eastern Rift Valley and lake Eyasi. Black cracking soils in Shinyanga. Southern: Flat or undulating	Central: 1000-1500 m Southeast ern 200-600 m	Min: 16–18°C (Jul); Max: 30–33°C (Oct–Nov)	Central: unimodal and unreliable: 500-800mm Southeastern: Unimodal 600-800 mm

		plains with rocky hills, moderate fertile loams and clays in South (Morogoro), infertile sand soils in center			
4. PLATEAUX	Western: Tabora, Rukwa (North and Center), Mbeya North: Kigoma, Part of Mara Southern: Ruvuma and Southern Morogoro	Western: Wide sandy plains and Rift Valley scarps Flooded swamps of Malagarasi and Ugalla rivers have clay soil with high fertility Southern: upland plains with rock hills. Clay	800-1500 m	Min: 15–18°C (Jul); Max: 31–33°C (Sep–Oct)	Western: unimodal, 800-1000 mm Southern: unimodal, very reliable, 900-1300mm
5. SOUTHERN AND WESTERN HIGHLANDS	Southern: A broad ridge of from N. Morogoro to N. Lake Nyasa, covering part of Iringa, Mbeya Southwestern: Ufipa plateau in Sumbawanga Western: Along the shore of Lake Tanganyika in Kigoma and Kagera	Southern: Undulating plains to dissected hills and mountains. Moderately fertile clay soils with volcanic soils in Mbeya Southwestern: Undulating plateau above Rift Valleys and sand soils of low fertility Western: North-south ridges separated by swampy valleys, loam and clay soils of low fertility in hills, with alluvium and ponded clays in the valleys	Southern: 1200-1500m Southwestern: 1400-2300m Western: 100-1800 m	Min: 8–12°C (Jun–Jul); Max: 24–28°C (Oct–Nov)	Southern: unimodal, reliable, local rain shadows, 800-1400mm Southern: unimodal, reliable, 800-1000mm Western: bimodal, 1000-2000mm
6. NORTHERN HIGHLANDS	Northern: foot of Mt Kilimanjaro and Mt. Meru. Eastern Rift Valley to Eyasi	Northern: Volcanic uplands, volcanic soils from lavas and ash. Deep	Northern: 1000-2500 m Granitic Mts: 1000-2000 m	Min: 10–14°C (Jun–Jul); Max: 26–30°C (Feb–Mar)	Northern: Bimodal, varies widely 1000-2000mm Granitic mts. Bimodal and

	Granite Mts Uluguru in Morogoro, Pare Mts in Kilimanjaro and Usambara Mts in Tanga, Tarime highlands in Mara	fertile loams. Soils in dry areas prone to water erosion. Granite steep Mountain side to highland plateaux. Soils are deep, arable and moderately fertile on upper slopes, shallow and stony on steep slopes			very reliable 1000-2000m
7. ALLUVIAL PLAINS	K- Kilomberao (Morogoro) R- Rufuji (Coast) U- Usangu (Mbeya) W- Wami (Morogoro)	K-Cental clay plain with alluvial fans east and west R- Wide mangrove swamp delta, alluvial soils, sandy upstream, loamy down steam in floodplain U-Seasonally Flooded clay soils in North, alluvial fans in South W- Moderately alkaline black soils in East, alluvial fans with well drained black loam in West		Min: 18–22°C (Jun–Jul); Max: 30–34°C (Jan–Mar)	K- Unimodal, very reliable, 900-1300mm R-Unimodal, often inadequate 800-1200mm U-Unimodal, 500-800mm W-Unimodal, 600-1800mm

CHAPTER THREE

TECHNICAL DIRECTIVES

3.0 DIRECTIVES IN THE GUIDELINES

3.1 Preamble

The Ministry of Natural Resources and Tourism (MNRT) has the legal responsibility of providing the directives on sustainable use of natural resources which include the conservation and protection of Native Tree Seeds (NTS). This is done in collaboration with the other sectoral ministries including those which are responsible for agriculture, environment, livestock and local authorities in making formal arrangements to encourage the conservation of honeybees in order to intensify production of bee products and pollination of agricultural crops.

The Guideline for native Seeds/Seedling Distribution in Tanzania ensures effective movement of native tree seeds while at the same time maintains integrity of ecosystems and landscapes. It touches technical directives on seed sourcing, growing and management according to the seed zone and agro-ecological maps. This guideline incorporates the views and opinions of the wide stakeholders in tree-seeds value chains and other users shall adhere to these directives. Good seeds are those that have undergone research, have been examined and certified for quality. The characteristics of good seeds include their ability to germinate, their purity, their stability and their freedom from diseases.

An example of matching floristic zones with native tree species for planting is presented on Table 3. There is also a list of commonly used sources for tree seeds often used by TFS (Table 4). These recommendations are by no means definite, as besides the overlapping and variation in the zones, trials may show that some species have a far greater adaptability than at present thought, whereas some may prove to be total failures wherever planted.

3.2 The Directives

3.2.1 Field collection of native tree seeds/seedlings

Native tree seeds/seedlings like other tree seeds/seedlings need careful preparations and collection at field. It is therefore important that the preparation of native tree seeds/seedlings mimic what happens in nature:

i) A seed source must consist of trees of acceptable age, quality and development that adaptation and other criteria for selection can be clearly judged.
ii) A seed source must consist of well-distributed and sufficiently numerous trees on a given area making possible adequate inter- pollination to avoid increased risk of future inbreeding.
iii) Selected stands must be free from attack by damaging organisms and show resistance to adverse conditions of climate and site.
iv) Seeds must be collected from seed orchards, and where there is no such, seeds be sourced from seed stands.
v) Gather from healthy, superior, good looking matured local trees to preserve local genetic base.
vi) Trees in selected stands must show particularly good phenotypical features, e.g. for production of sawlogs and poles straightness and circularity of stem, favourable branching habit and small size of branches.
vii) The proportion of forked trees and those showing spiral grain should be low.
viii) Seeds must be collected at full maturity i.e. when fruits change colour or begin to drop naturally.
ix) Avoid collecting more than 10–20% from a single tree and along the borderline of the selected stand/orchard.
x) Seedling for planting must attain height of 20-35 cm and root collar diameter of 3-4 mm.
xi) Label everything right away in the field (e.g. species name, location, site description, climate, stand establishment, composition, genetic data and testing if possible).

3.2.2 Transport of native tree seeds/seedlings

Seeds/seedlings must be handled with care as not doing so will lead to poor quality. Thus:

i) Pods, cones, capsules and freshly fruits containing seeds be carried in hessian sacks, boxes or any other safe containers.
ii) Seeds must be transported immediately to processing sites to avoid desiccation.
iii) Seedlings be transported soonest possible to planting site to avoid heating.
iv) Observe care during packing and transport to avoid damage of seedlings.
v) Keep roots moist and protected from sun/wind, using covered, well-ventilated transport.
vi) Once at the site, remove the seedlings from the vehicle and store them under shade.

3.2.3 Processing of native tree seeds/seedlings

Processing of native tree seeds depends on the fruit type:

i) Dry fruits (e.g. pods, cones and capsules) can be air-dried in shade.
ii) Shake or gently crush to release seeds.
iii) Winnow or sieve to remove debris and remain with seeds.
iv) For fleshy fruits (berries and drupes) soak in water, rub or mash to remove pulp and rinse thoroughly as pulp can inhibit germination.

3.2.4 Packaging and storage of native tree seeds/seedlings

It is important that seeds are packaged and stored well to avoid losing viability:

i) Orthodox seeds which are most species must be dried to 5±2% moisture content, cooled and put in airtight containers.
ii) Recalcitrant seeds must be kept under special conditions e.g. moisture content of ≥ 40% or sown immediately.
iii) Seedlings be maintained under the shed and be provided with moisture at least once per week.
iv) Labelling be correctly done with information including on species, locality and date of packaging and storage.
v) It is important that seeds are stored in safe place at all times.

3.2.5 Management of native tree seeds/seedlings

i) Use high quality viable seeds/seedlings at all times.
ii) Manage seed dormancy and pre-germination tests.
iii) Protect seedlings from extreme heat, heavy rain, pests and diseases.
iv) Gradually hardening off seedlings by performing root pruning, reducing shade intensity and watering regimes before transplanting into the field.
v) Match species to site to maximize growth and productivity as indicated in Table 2 and 3.
vi) Label correctly with information on species, locality and date of packaging.

Table 2: Native tree seeds/seedlings distribution in different floristic regions of Tanzania

S/N	Scientific/botanical name	Common name (English or Swahili)	IUCN Red List Status	Recommended areas for seed sourcing and seedling planting according to floristic regions
1	*Adansonia digitata*	Baobab, Upside-down tree, Mbuyu	Least Concern	T3, T4, T5, T6 and T7
2	*Afrocarpus usambarensis (Podocapus usambarensis)*	Podo, East African yellow wood, Mpodo	Endangered	T2, T3, T5 and T7
3	*Afzelia quanzensis*	Pod Mahogany, Mkongo	Least Concern	T3, T4, T5, T6, T7 and T8
4	*Albizia gummifera*	Peacock flower, Mkenge, Mshai	Least Concern	T1, T2 and T3
5	*Albizia schimperiana*	Long-podded albizia, Mkenge	Least Concern	T1, T2 and T7
6	*Allanblackia ulugurensis*	Mkanye Msambu	Vulnerable	T6
7	*Aloe ballyi*	Aloe, Kisapa	Endangered	T3, T4, T5 and T7
8	*Avicennia marina*	Grey/ white mangrove, Mchu	Least Concern	T3, T6 and T8
9	*Baphia kirkii*	Mkuruti	Vulnerable	T6
10	*Bobgunnia madagascariensis (Swartzia madagascariensis)*	Snake bean, Fule, Mukowo	Least Concern	T6
11	*Brachystegia spiciformis*	Zebra wood, Myombo	Least Concern	T5, T6, T7 and T8
12	*Bridelia micrantha*	African blackwood, Mwiza	Least Concern	T1, T2, T3 and T6
13	*Bussea eggelingii*		Endangered	T8
14	*Cephalosphaera usambarensis*	Camphorwood, Mtambara	Least Concern	T3
15	*Coffea kimbozensis*	Kimboza coffee, Kofi kimboza	Critically Endangered	T6
16	*Cola kimbozensis*	Kimboza cola	Critically Endangered	T6
17	*Cola lukei*		Critically Endangered	T6
18	*Cola quentinii*		Critically Endangered	T6
19	*Cola usambarensis*		Critically Endangered	T3

20	*Cordia africana*	East African cordia, Mkobokobo, Mringaringa	Least Concern	T1, T2 and T3
21	*Cordia monoica*	Sandpaper tree, Msasa	Least Concern	T3
22	*Cordyla densiflora*	Mkwata	Vulnerable	T2 and T5
23	*Croton macrostachyus*	Broad-leaved Croton, Mfurufuru	Least Concern	T1, T2 and T3
24	*Croton megalocarpus*	Fever-berry croton, Msenefu	Least Concern	T1, T2, and T3
25	*Cynometra longipedicellata*		Critically Endangered	T3
26	*Cynometra ulugurensis*		Critically Endangered	T6
27	*Dalbergia acariaeantha*	Mpingo	Endangered	T7
28	*Dalbergia melanoxylon*	African blackwood, Mpingo	Least Concern	T3, T4, T5, T6, T7 and T8
29	*Deinbollia borbonica*	Soap berry, Mkunguma	Least Concern	T3, T6
30	*Diospyros kirkii*	Large-leaved jackal-berry, Mnumbulu	Least Concern	T4, T5, T6 and T7
31	*Dypsis pembana*	Pemba palm, Mpopomwitu	Vulnerable	Z and P
32	*Encephalartos sclavoi*	Sclavo's Cycad	Critically Endangered	T3 and T6
33	*Entandrophragma bussei*	Wooden banana, Muondo	Least Concern	T4, T5 and T6
34	*Entandrophragma excelsum*	African Mahogany, Mkukusu	Least Concern	T2, and T3
35	*Erythrina abyssinica*	Abyssinian coral tree, Mjafari	Least Concern	T2, T3, T4, T5 and T6
36	*Erythrina sacleuxii*		Least Concern	T5 and T6
37	*Euclea natalensis*	Natal Guarii	Least Concern	T2 and T6
38	*Euphorbia neospinescens*	Not found	Critically Endangered	
39	*Euphorbia tirucalli*	Pencil tree, Mnyara	Least Concern	T5 and T6
40	*Faidherbia albida*	Apple-ring acacia, Mgunga	Least Concern	T3, T5, T6 and T7
41	*Ficus bubu*	Bubu fig, Kifumbao	Least Concern	T3
42	*Ficus sansibarica*	Zanzibar fig	Least Concern	Z and T3
43	*Ficus sycomorus*	Sycamore fig, Mkuyu	Least Concern	T1, T2, T3, T4, T5, T6, T7 and T8
44	*Ficus thonningii*	Strangler fig, Mlandege	Least Concern	T1, T2, T3, T4, T5, T6, T7 and T8
45	*Gigasiphon macrosiphon*	Gigasiphon, Mnyanza	Endangered	T8

46	*Guibourtia schliebenii*	Glossy copalwood, Mfenesi	Vulnerable	T6
47	*Huberantha verdcourtii (Polyathia verdcourtii)*		Endangered	T7?
48	*Hymenaea verrucosa*	Gum copal tree, Mtandarusi	Least Concern	T6 and T8
49	*Isoberlinia scheffleri*	Mbarika	Vulnerable	T3
50	*Julbernardia magnistipulata*	African blackwood, Mukuwa	Vulnerable	T3
51	*Juniperus procera*	East African cedar, Mwangati	Least Concern	T2 and T3
52	*Karomia gigas*	Giant Chinese-Hats	Critically Endangered	T8
53	*Khaya anthotheca*	East African mahogany, Mkangazi	Vulnerable	T3, T4, T5, T6 and T7
54	*Kigelia africana*	Sausage Tree, Mwegea	Least Concern	T2, T3, T4, T5, T6 and T7
55	*Kuloa usambarensis*	Kuloa	Least Concern	T3
56	*Lijndenia brenanii*		Critically Endangered	T3
57	*Lingelsheimia sylvestris*		Critically Endangered	T6
58	*Majidea zanguebarica*	Black Pearl Tree, Mgambo	Least Concern	T6
59	*Markhamia lutea*	Mtarawanda	Least Concern	T3, T4, T5, T6 and T7
60	*Milicia excelsa*	African teak. Mvule	Least Concern	T2, T3, T4, T5, T6 and T7
61	*Mkilua fragrans*	MkiluaMwitu, Kilua	Vulnerable	T3
62	*Monotes lutambensis*		Endangered	T4 and T5
63	*Nauclea nyasica (Burttdavya nyasica)*	Nyasika	Least Concern	T8
64	*Newtonia buchananii*	Newtonia, Mnyasa	Least Concern	T1, T2 and T3
65	*Osyris lanceolata*	African sandalwood, Kizulu	Least Concern	T1, T2, T3, T5 and T6
66	*Pandanus rabaiensis*	Screw pine, Msanaka	Least Concern	T6
67	*Parinari curatellifolia*	Mbolaplum, Hissing tree, mbura	Least Concern	T4 and T6
68	*Parkia filicoidea*	African locust bean, Mnienze, Mkunde	Least Concern	T5
69	*Pericopsis angolensis*	East African afrormosia, Mbanga	Least Concern	T4
70	*Premna schliebenii*	Muhorro, African Greywood	Vulnerable	T8

71	*Prioria msoo (Oxystigma msoo)*	Msoo	Vulnerable	T3
72	*Prunus africana*	African cherry, Kiburabura	Vulnerable	T3 and T6
73	*Pterocarpus angolensis*	Muninga, Mninga	Least Concern	T3, T4, T5, T6 and T8
74	*Rauvolfia caffra*	Quinine tree, Msesewe	Least Concern	T2 and T3
75	*Rhizophora mucronata*	Loop-root mangrove, Mkoko	Least Concern	T3, T6 and T8
76	*Rhodognaphalon schumannianum*	Wild kapok, Mkaranga mti	Least Concern	T3 and T6
77	*Sclerocarya birrea*	Marula tree, Mng'ong'o	Least Concern	T3, T4, T5, T6, T7 and T8
78	*Senegalia Senegal (Acacia senegal)*	Gum Arabic tree, Kikwata	Least Concern	T4, T5, T6, T7 and T8
79	*Sorindeia madagascariensis*	Madagascar Butter tree, Mkunguma	Least Concern	T3, T6 and T7
80	*Sterculia africana*	African star-chestnut, Mgoza	Least Concern	T3, T5, T6 and T7
81	*Syzygium guineense*	Waterberry, Mzambarau	Least Concern	T3 and T6
82	*Tamarindus indica*	Tamarind, Mkwaju	Least Concern	T4, T5, T6, T7 and T8
83	*Terminalia brownii*	Red Pod Terminalia, Mbarao	Least Concern	T2
84	*Trichilia emetica*	Natal mahogany, Mti Maji	Least Concern	T3, T5, T6 and T7
85	*Uapaca kirkiana*	Sugar Plum, Mkusu	Least Concern	T4, T6 and T7
86	*Vangueria infausta*	Wild medlar, Mviru	Least Concern	T3, T4, T5, T6 and T7
87	*Vangueria pallidiflora*	African Medlar, Mviru	Vulnerable	P
88	*Vitex doniana*	African oak, Mfudu	Least Concern	T3, T4 and T7
89	*Vitex mombassae*	Smelly Berry Vitex, Mfudu	Least Concern	T3, T6 and T7
90	*Vitex zanzibarensis*	chaste tree	Vulnerable	T6 and Z
91	*Warburgia elongata*	East African greenheart, Ol – sokonoi	Critically Endangered	T6
92	*Warburgia stuhlmannii*	East African greenheart, Mkarambaki, Mkaa, Ol – sokonoi	Vulnerable	T1, T2 and T3
93	*Warburgia ugandensis*	East African greenheart, Mshingirwa	Least Concern	T3, T4 and T6
94	*Xylocarpus granatum*	Cannonball Mangrove, Mkomafi	Least Concern	T3 T6 and T8
95	*Zanthoxylum chalybeum (Fagara chalybeum)*	Muuku	Least Concern	T3, T4, T5, T6, T7 and T8
96	*Zanthoxylum deremense*	Muvuu	Vulnerable	T3 and T6

97	*Zanthoxylum holtzianum*	Coral knobwood, Mjafari	Vulnerable	T6
98	*Zenkerella perplexa*		Critically Endangered	
99	*Ziziphus \mucronata*	Buffalo thorn, Mnyangwe	Least Concern	T4, T5, T6 and T7
100	*Ziziphus robertsoniana*	Robertson's jujube, Mchanga	Endangered	T4, T5, T6 and T7

Table 3. General seed sources used by TFS

Science name	District	Area (ha)	Latitude	Longitude	Altitude (m)
Acacia mearnsii	Kidabaga	15	8°06'S	35'54'E	1870
Acacia mearnsii	Lushoto	10	4°45'44.26"S	38°17'1.48"E	1340
Acacia melanoxylon	Lushoto	7	4°41'33.66"S	38°12'15.23"	1800
Acacia polyacantha	Iringa Rural	10	7°47'20.96"S	35°43'14.17"	1563
Acacia senegal	Kilolo	>20	-7.616878	36.3	713
Acacia senegal	Kilolo	Scattered	7°37'0.76"S	36°17'46.19"	683
Acacia senegal	Kilosa	20	7°28'S	36°32"	600
Acacia seyal	Gairo	10	6° 8'6.58"S	36°48'59.29"	1270
Acacia siberiana	Iringa Rural	2	-7.786977	35.72	1563
Acacia tortilis var crinita	Iringa Rural	6	7°30'S	37°45'E	560
Acacia xanthophloea	Same	0.1	4°39'43.06"S	38°4'34.02"E	475
Acrocarpus fraxinifolius	Lushoto	Scattered	4°5'S	38°21'E	1160
Acrocarpus fraxinifolius	Rombo	1	2°55'.58.22"S	37°27'46.50"	2091
Adansonia digitata	Dodoma Rural	>10	5'º55'S	35°08'E	540
Adansonia digitata	Dodoma Rural	>50	6°02'S	34°49'E	940
Adansonia digitata	Iringa Rural	40	7°30'S	37°45E	520
Adenium obseum	Kilosa	5	7°30'S	37°31E	450
Afzelia quanzensis	Dodoma Rural	30	6°56'S	35°18'E	800
Afzelia quanzensis	Dodoma Rural	40	5°56'41.31"S	35°18'18.60"	980
Afzelia quanzensis	Nzega	50	-4.413212	33.23	1249
Albizia gummifera	Lushoto	100	4°46'S	38°20'E	1600
Albizia lebbeck	Korogwe	0.2	4°53'S	38°17'E	430
Albizia lebbeck	Mvomero	10	6°23'S	37°25'E	926
Albizia schimperiana	Lushoto	20	4°51.356"S	38°21.605"E	1117
Albizia versicolor	Mbeya rural	3	8°50'S	34°10'E	1400
Azadirachta indica	Korogwe	50	4°54'S	38°13'E	430
Azadirachta indica	Moro. Urban	Scattered	06°50'S	37°39'E	570
Balanites aegyptiaca	Dodoma Rural	1	6°15'S	35°35'E	980
Baphia masaiensis	Kondoa	10	-5.333307	35.87	1183
Bauhinia petersiana	Njombe	Scattered	8°39'S	34°28'E	1300
Bombax rhodognaphalon	Moro. Urban	Scattered	06°50'S	37°39'E	570
Brachystegia spiciformis	Dodoma Rural	Scattered	6°09'S	35°35'E	980
Breodelia salisina	Kilombero	Scattered	7°42'S	36'45'E	450
Burkea africana	Kilosa	Scattered	7°45'S	37'00'E	100
Bussea massaiensis	Dodoma Rural	6	6°12'S	35°35'E	980
Caesalpinia pulcherima	Moro. Urban	<1	6°45'40"S	37'39'28"E	538
Calistemon speciosus	Iringa Rural	0.5	7°49'S	35'40'E	1548
Cassipourea gummiflua	Iringa Rural	15	8°06'S	35°55'E	1850

Cassipourea malosana	Iringa Rural	Scattered	8°06'S	35°55'E	1890
Cassuarina junghuhiana	Lushoto	0.5	4°47'S	38°17'E	1400
Cassuarina junghuhiana	Lushoto	1	4°41'S	38°22'E	1440
Casuarina cunninghamiana	Lushoto	1	4°37'9.89"S	38°18.033"E	1784
Cedrela odorata	Morogoro Rural	3	-7.01718	37.81	336
Cedrela odorata	Same	10	4°11'S	37°49'E	760
Cephalosphaera usambarensis	Muheza	10	4°58'9.54"S	9E+06	938
Cinamomum camphora	Lushoto	2	4°45'S	38°17'E	1700
Croton megalocarpus	Lushoto	Scattered	4°53'7.68"S	38°20.724"E	1249
Dalbergia melanoxylon	Mvomero	500	6°48'S	37'38'E	470
Delonix regia	Korogwe	Scattered	4°53'S	38°17'E	430
Dovyalis caffra	Lushoto	Scattered	4°46'S	38°22'E	1600
Eckebergia capensis	Iringa Rural	10	8°06'S	35°55'E	1890
Erythrina abyssinica	Lushoto	>50 ha	4°42'S	38B25'E	1500
Eucalyptus ficifolia	Lushoto	Scattered	4°47'S	38°17'E	1400
Eucalyptus grandis	Iringa Rural	1.3	8°08'S	35°25'E	1720
Eucalyptus grandis	Mufindi	1	8°26'S	35°12'E	1900
Eucalyptus maculata	Iringa Rural	in rows	8°01'S	35°28'	1820
Eucalyptus maidenii	Arumeru West	50	3°15.788"S	36°39.832"E	1888
Eucalyptus maidenii	Iringa Rural	10	-7.809558	35.67	1556
Eucalyptus robusta	Iringa Rural	0.5	7°35'S	30°07'E	1380
Eucalyptus saligna	Lushoto	1	4°47'S	38°17'E	1400
Faidherbia albida	Mbalizi	30	8°50'S	35°50'E	900
Faidherbia albida	Mvomero	100	7°25'11.41"S	37°40'51.90"	200
Faidherbia albida	Njombe	10	8°53'S	34°35'E	1320
Faidherbia albida	Same	10	4°20'S	38°00'E	860
Grevillea robusta	Arumeru West	>20	3°15'42.18"S	36°39'57.20"	1240
Haegenia abysinica	Iringa Rural	5	8°30'S	35°21'E	1900
Haegenia abysinica	Rungwe	50	-8.078752	35.89	2053
Hakea saligna	Iringa Rural	in rows	8°05'S	35°25'E	1660
Hakea saligna	Mufindi	Scattered	8°20'S	35°19'E	1800
Jacaranda mimosifolia	Iringa Rural	2	7'58'S	35'31'E	1680
Jacaranda mimosifolia	Iringa Rural	4	7'54'S	35'47'E	1580
Jacaranda mimosifolia	Iringa Rural	5	7°66'S	35°41'E	1500
Jacaranda mimosifolia	Lushoto	Scattered	4°51'S	38°23'E	1150
Jacaranda mimosifolia	Rombo	0.3	2°57'435"S	37°3.793"E	1834
Khaya anthotheca	Morogoro Rural	1	-7.021142	37.81	302
Khaya anthotheca	Muheza	0.4	4°53.402"S	38°17.170"E	443
Leucaena diversifolia	Lushoto	2.5	4°47'S	38°17'E	1300
Leucaena diversifolia	Mbeya rural	4	8°58'S	33°21'E	1440

Leucaena diversifolia	Mbeya rural	70	8°52'S	33°18'E	1240
Leucaena leucocephala	Lushoto	Scattered	4°47'S	38°17'E	1200
Leucaena leucocephala	Mbeya rural	70	8°53'S	33°14'E	1240
Makhamia lutea	Lushoto	Scattered	4°35'26.60"S	38°21'3.13"E	1350
Melia azedarach	Iringa Rural	2	7°48'43"S	35'39'47"E	1550
Milicia excelsa	Moshi Urban	Scattered	3°22.503"S	37°21.467"E	808
Newtonia buchananii	Lushoto	10	4°47'S	38°17'E	1190
Newtonia buchananii	Muheza	Scattered	05°07'S	38°37'E	1000
Ocotea usambarensis	Lushoto	20	4°44'9.71"S	38°16'34.52"	1500
Ocotea usambarensis	Same	0.6	4°21'S	38°00'E	1600
Parkinsonia aculeata	Dodoma Urban	Avenue	6°10'S	35°45'E	1050
Peltophorum pterocarpum	Chamwino	0.2	6° 7'45.57"S	36° 0'57.51"E	1032
Prunus africana	Rombo	10	2°55'56.48"S	37°26'55.48"	2116
Rauvolvia caffra	Kidabaga	1	-7.789672	35.72	1564
Rauvolvia caffra	Lushoto	1	4°46'S	38°16'E	1160
Samanea saman	Muheza	Scattered	5°08'S	38°41'E	430
Schinus molle	Dodoma Rural	Scattered	6'10'S	35'45'E	1050
Sclerocarya birrea	Mvomero	>500	6°40'S	37°39'E	560
Senna siamea	Iringa Rural	4	7°38'4.39"S	36°15'51.44"	666
Senna siamea	Korogwe	100	4°53'S	38°17'E	430
Senna singuena	Dodoma Rural	6	6°15'S	35°35'E	570
Senna spectabilis	Arumeru East	100	3°18'44.87"S	36°52'10.49"	1200
Senna spectabilis	Lushoto	Scattered	4°51'3.94"S	38°20.656'E	1164
Sesbania sesban	Mtera	10	7°04'S	35°58'E	683
Sorindeia madagascariensis	Moro. Urban	Scattered	7°46'41.18S	37'39'29"E	510
Spathodea campanulata	Muheza	Scattered	05°09'S	38°39'E	1000
Sterculia quinqueloba	Mbalali	28	8°39'S	34°22'E	1090
Stychnous inocua	Mufindi	15	8°25'S	34°45'E	1240
Syzygium cuminii	Iringa Rural	Avenue plants	7°47'S	35°40'E	1540
Syzygium guineense	Iringa Rural	Along Ruaha river	8°05'S	35°25'E	1680
Tamarindus indica	Iringa Rural	1.5	7°30'S	37°45'E	588
Tephrosia vogellii	Mbeya rural	Scattered	8°55'S	33°27'E	1740
Terminalia catappa	Moro. Urban	Scattered	6°50'	37°39'E	400
Terminalia spinosa	Bagamoyo	10	06°45'S	38°16'E	183
Terminalia superba	Korogwe	0.4	4°53.303"S	38°17.170"E	443
Tipuana tipu	Lushoto	along the road	4°51"0.20"E	38°21'23.45"	1267
Toona ciliata	Songea rural	0.4	-10.671395	35.61	1113
Uapaca kirkiana	Iringa Rural	20	8°05'S	35°25'E	1680
Uapaca kirkiana	Sumbawanga	100	07°45'S	31°35'E	1800
Vangueria infausta	Lushoto	Scattered	4°47'S	38°17'E	1190

Vangueria madagascariensis	Singida rural	Scattered	5'45'S	35'15'E	1250
Vitex keniensis	Lushoto	2.4	4° 44.264"S	38° 16.550"E	1784
Warburgia salutaris	Iringa Rural	Scattered	7°29'S	36°08'E	1420
Xeroderris stuhlmani	Dodoma Rural	20	6°15'S	35°35'E	980
Acacia tanganyikensis	Dodoma Rural	15	6°15'3.55"S	35°35'9.90"E	980
Cassuarina cunninghamiana	Mufindi	0.5	8°18'S	35'17'E	1880

General seed stands used by TFS

Science name	District	Area (ha)	Latitude	Longitude	Altitude (m)
Acacia crasicarpa	Kahama	2	4° 0'29.28"S	32°14'2.56"E	1215
Acacia melanoxylon	Rombo	11.1	2°55.791"S	37'°26.937"E	2099
Acacia melifera	Kilosa	50	7°30'S	37°30'E	598
Acacia xanthophloea	Babati	2	-4.23564	35.74819	1385
Acacia xanthophloea	Katesh	4	-4.23564	35.74819	1385
Allanblackia stuhlmanii	Muheza	6	5°09'S	38°42'E	1000
Antiaris toxicaria	Ifakara	>30	7°47'17.03"S	36°54'14.86"E	337
Beilschmidia kweo	Muheza	6	5°09'S	38°42'E	1000
Bianceae decapitala	Lushoto	Scattered	4°52'46.58"S	38°20'26.59"E	1046
Brachylaena huillens	Handeni	100	5°29'S	38°3'E	610
Cephalosphaera usambarensis	Muheza	0.1	5°08'S	38°41'E	1000
Cupressus lusitanica	Lushoto	2	4°46.747"S	38°18.989"E	1766
Cupressus lusitanica	Lushoto	10	4°41'51.53"S	38°13'7.64"E	1948
Cupressus sempervirensis	Lushoto	on line	4°47'S	38°17'E	1190
Delonix elata	Kongwa	10	6°15'S	36°30'E	570
Entandrophragma bussei	Dodoma Rural	20	-6.1413	35.92011	1098
Enterobium cyclocarpum	Shinyanga Rural	1	3°52'15.28"S	33°11'46.28"E	1159
Enterobium cyclocarpum	Shinyanga Rural	10 ha	3'67'S	33 43'0"E	1135
Erythrina abyssinica	Hanang	60	-4.51891	35.32187	1623
Erythrina abyssinica	Mufindi	10	8°30'S	35°02'E	1780
Eucalyptus robusta	Mufindi	1	8°30'S	35°18'E	1880
Eucalyptus tereticornis	Chamwino	3	6° 2'6.08"S	36° 1'59.95"E	1017
Eucalyptus tereticornis	Kaskazini A	4	-5.92302	39.30795	50
Faidherbia albida	Rujewa	5	8°39'S	34°19'E	1050
Gmelina arborea	Lindi Rural	10	10°10'0.16"S	39°19'45.80"E	293
Gmelina arborea	Moro. Urban	Avenue plants	6°50'S	37°39'E	50
Gmelina arborea	Songea rural	on line	10°35'4.81"S	35°45'18.77"E	1054
Juniperus procera	Lushoto	1	4°44'40.46"S	38°17'7.49"E	1700
Khaya anthotheca	Moro. Urban	0.1	6°50'S	37°39'E	570

Khaya anthotheca	Moshi Urban	2	3°21.749"S	37°21.502"E	798
Khaya anthotheca	Rombo	0.3	3°10'52.81"S	37°37'6.04"E	1347
Khaya multifoliolata	Kigoma rural	13	5° 0'32.22"S	29°46'47.98"E	781
Khaya senegalensis	Moro. Urban	Avenue plants	6°51'6.23"S	37°39'31.44"E	552
Khaya senegalensis	Muheza	15	5°09'S	38°41'E	1000
Macaranga kilimandscharica	Iringa Rural	10	8°01'S	35°55'E	1970
Maesopsis eminii	Muheza	0.24	5°6'8.49"S	38°38'40.93"E	525
Maesopsis eminii	Muheza	10	05°09'S	38°42'E	1000
Mammea usambarensis	Same	0.6	4°20'S	38°00'E	1600
Markhamia lutea	Lushoto	Scattered	4°47'S	38°22'E	1425
Melia volkensii	Same	Scattered	4°3'S	37'43'E	760
Milicia excelsa	Korogwe	0.8	4°53.297"S	38°17.297"E	448
Milicia excelsa	Lindi Rural	Scattered in Natural forest	10° 9'58.97"S	39°19'45.95"E	312
Newtonia buchananii	Moshi Urban	Scattered	3°22.230"S	37°22.506"E	786
Olea capensis	Arumeru East	50	3°18.762"S	36°52.023"	1432
Olea capensis	Lushoto	0.3	4°47'S	38°17'E	1400
Osyris lansiolata	Kondoa	21	-4.47458	35.75214	1639
Osyris lansiolata	Kondoa	>20	-4.74154	35.91955	1655
Parinari curatelifolia	Dabaga	>5ha	8° 6'53.95"S	35°56'57.62"E	1794
Pinus caribaea	Bukoba Rural	9.5 ha	1.35'20"S	31°30'13"E	1135
Pinus caribaea	Lindi Rural	20	10° 7'12.02"S	39°14'6.04"E	787
Pinus caribaea	Sengerema	10	2°25'2.11"S	32°15'0"E	1158
Pinus caribaea	Ukerewe	6	1°35'20"S	31°30'13"E	1238
Pinus oocarpa	Mufindi	10.8	8°40'S	35°21'E	1190
Pinus radiata	Rombo	12	2°55.785"S	37°26.975"E	2091
Podocarpus usambarensis	Lushoto	4	4° 44'5.72"S	38° 16.873"E	1723
Prunus africana	Iringa Rural	10	8°06'S	35°55'E	1870
Prunus africana	Lushoto	1	4°44'4.342"S	38°16'46'42"E	1707
Pterocarpus tinctorius	Nzega	50	4°25'39.59"S	33°23'33.04"E	1248
Syzygium cuminii	Lushoto	0.5	4°51'S	38°28'E	1150
Syzygium cuminii	Moro. Urban	Avenue plants	6°50'S	37°39'E	580
Syzygium guineense	Iringa Rural	Scattered	-7.78945	35.71415	1558
Syzygium guineense	Lushoto	100	4°46'S	38°16'E	1290
Tamarindus indica	Dodoma Rural	50	5°56'S	35°18'E	800
Tectona grandis	Muheza	53.7	6°7.587"S	37°40.383"E	280
Tectona grandis	Mvomero	15	6° 5'10.34"S	37°41'58.21"E	377
Terminalia ivorensis	Muheza	3.1	5°07.949"S	38°41.036"E	210
Terminalia sambesiaca	Iringa Rural	5	7°38'48.44"S	36°14'59.70"E	704
Terminalia sericea	Iringa Rural	15	8°33'S	34°54'E	1524

Terminalia superba	Muheza	2	5° 7'6.59"S	38°41'36.85"E	280
Treculia africana	Kilombero	2	7'54'S	36'55'E	450
Waburgia ugandensis	Lushoto	Scattered	4°39'8.78"S	38°14'41.47"E	1845
Acacia mangium	Kaskazini A	4	-5.92302	39.30795	50

General seed collection zone used by TFS

Science name	District	Area (m)	Latitude	Longitude	Altitude (m)
Acacia melifera	Iringa Rural	20	7°31'S	35°8'E	760
Acacia siberiana	Moro. Rural	>2	6°50'32.62"S	37°49'54.42"	570
Acacia tortilis var. spirocarpa	Dodoma Rural	100	6°09'S	35°45'E	1370
Acacia tortilis var. spirocarpa	Mvomero	50	6°25'S	37°23'E	580
Acacia tortilis var. spirocarpa	Shinyanga Rural	10 ha	3. 67'S	33°43'0"E	1135
Afzelia quanzensis	Handeni	>100	-5.442741°	37.511430°	630
Afzelia quanzensis	Shinyanga Rural	2 ha	3 39'50"S	33 25'16"E	1135
Albizia antonesiana	Mufindi	13	8°23'S	34°46'E	1240
Albizia harveyi	Mbalali	4	8°22'S	34°42'E	1050
Azanza garkeana	Mufindi	15	8°25'S	35°45'E	1245
Brachystegia bussei	Mufindi	20	8°23'S	35°45'E	1280
Breodelia salisina	Rungwe	25	9°00'S	34°00'E	1100
Burkea africana	Mufindi	Scattered	8°25'S	34°45'E	1240
Cassia grandis	Morogoro Urban	Scattered	6°50'S	37'39'E	580
Cedrela odorata	Morogoro Rural	5	6°49'53.53"S	37°49'0.28"E	300
Cordia africana	Lushoto	100	4°51'S	38°21'E	1150
Cordia sebastina	Moro. Urban	Scattered	6°47'44.09"S	37°38'44.70"	512
Croton macrostachys	Arumeru East	6	3°17.060"S	36'39.746"E	1716
Dalbergia melanoxylon	Bagamoyo	50	6°36'S	38°09'E	350
Delonix regia	Moro. Urban	on line	6°50'S	37°39'E	570
Delonix regia	Shinyanga Rural	1 ha	2 40'51"S	33 25'37"E	1135
Dodonea viscosa	Iringa Rural	5	7°53'S	35°48'E	1640
Dodonea viscosa	Iringa Rural	10	8°03'S	35°30'E	1820
Dovyalis caffra	Iringa Rural	Scattered	7°46'S	35°41'E	1460
Dovyalis caffra	Iringa Rural	Scattered	8°05'S	35°25'E	1700
Entandrophragma bussei	Idodi	>40	35°12'11.65"	7°46'34.88"S	712
Entandrophragma bussei	Iringa Rural	4	7°30'S	37°45'E	540

Entandrophragma bussei	Nzega	50	4°25'39.59"S	33°23'33.04"	1240
Erybotya japonica	Rungwe	5	9°15'S	34°20'E	1616
Gardenia ternifolia	Mufindi	Scattered	8°23'S	34°46'E	1240
Gmelina arborea	Shinyanga Rural	1 ha	3. 67'S	33 43'0"E	1135
Grevillea robusta	Rombo	1000	3°11'S	37°35'E	1350
Hakea saligna	Mufindi	Scattered	8°30'S	36°45'E	2500
Jacaranda mimosifolia	Moro. Urban	3	6'44'S	37'47'E	457
Leucaena leucocephala	Moro. Urban	10	6°48'S	37°38'E	570
Makhamia obtusifolia	Korogwe	100	4°57'S	38°11'E	510
Melia azedarach	Iringa Rural	3	7°43'26"S	33'38'23"E	1480
Melia azedarach	Iringa Rural	15	7°36'S	35°48'E	1250
Parkinsonia aculeata	Iringa Rural	Scattered	7°33'24,76"S	36°23'8.35"E	598
Peltophorum pterocarpum	Moro. Urban	Scattered	6°49'8.64"S	37°39'47.56"	570
Pericopsis angolensis	Nzega	50	4°25'S	33'23'E	1240
Pithecelobium dulce	Kilosa	50	6°49'S	3°7°00'E	510
Podocarpus usambarensis	Lushoto	2	4°47.054"S	38°17.632"E	1459
Polyalthia longifolia	Moro. Urban	Scattered	06°50'S	37°39'E	570
Pterocarpus angolensis	Iringa Rural	15	-7.71289	35.72559	1414
Pterocarpus angolensis	Mufindi	7	8°25'S	34°48'E	1210
Sclerocarya birrea	Mufindi	13	8°23'S	34°46'E	1240
Senna siamea	Mbalali	15	8°39'S	34°22'E	1067
Spathodea campanulata	Moro. Urban	Scattered	6°50'S	37°39'E	570
Strychnous cocculoides	Mufindi	20	8°23'S	34°46'E	1240
Swartzia madagascariensis	Mufindi	Scattered	8°25'S	34°48'E	1240
Tamarindus indica	Korogwe	Scattered	4°57'S	38°11'E	470
Tecoma stans	Moro. Urban	0.1	06°50'S	37°39'E	570
Terminalia brownii	Moshi Rural	50	3°24'S	37°28'E	800
Terminalia mantaly	Kigoma Urban	Scattered	04°54'S	29°24'E	824
Trichilia emetica	Dodoma Rural	Scattered	06°10'S	35°45'E	1050
Vitex doniana	Iringa Rural	40	7'43'S	35'37'E	1480
Vitex mombassae	Iringa Rural	30	7°29'S	36°08'E	1420
Vitex mombassae	Iringa Rural	80	8°05'S	35°25'E	1720

Vitex payos	Iringa Rural	30	7°29'S	36°08'E	1390
Waburgia ugandensis	Misenyi	50	1°06'21"S	31'30"58"E	1156
Ziziphus abyssinica	Iringa Rural	6	7°45'S	35°40'E	1450
Ziziphus mucronata	Mvomero	Scattered	06°25'S	37°27'E	579
Acacia nilotica subsp indica	Shinyanga Rural	Avenue plants	3°32'26.26"S	33°24'23.36"	1220

General provenance seed stands used by TFS

Science name	District	Area (ha)	Latitude	Longitude	Altitude (m)
Acrocarpus fraxinifolius	Lushoto	0.2	4°42.429"S	38°23.574"E	1566
Azadirachta indica	Moro. Urban	6.8	6°40'S	37°39'E	560
Casuarina equisetifolia	Moro. Urban	0.2	6°50'S	39°39'E	580
Corymbia citriodora	Moro urban	5	6°40'47.80"S	37°37'48.26"E	564
Eucalyptus camaldulensis	Iringa Rural	2	7°41'S	36°02'E	1400
Eucalyptus camaldulensis	Iringa Rural	14	7°34'45.29"S	35°48'10.38"E	1384
Eucalyptus cloeziana	Lushoto	2	4°43.528"S	38°23.611'E	1603
Eucalyptus grandis	Lushoto	0.5	4°43.558"S	38°23.602"	1616
Eucalyptus peliita	Morogoro Rural	spot	6°48.561	37°49.767"E	436
Eucalyptus saligna	Arumeru East	>20	3° 18.629"S	36° 52.168'E	1403
Eucalyptus saligna	Rombo	100	2°53.93"S	37°21'53.4'E	1886
Eucalyptus tereticornis	Handeni	14	5°12'S	38°28'E	250
Gliricidia sepium	Morogoro Rural	5	6°49'52.34"S	37°48'54.18"E	427
Gmelina arborea	Moro. Urban	3	6°41'0.42"S	37°37'56.02"E	571
Grevillea robusta	Morogoro Rural	2.3	6°49'57.15"S	37°49'7.95"E	425
Juniperus procera	Rombo	2	2°55'50.88"S	37°27'57.11"E	2008
Macaranga kilimanjarika	Moshi Urban	2	3°22'13.80"S	37°21'30.36"E	786
Milicia excelsa	Morogoro Rural	5	6°49'53.53"S	37°49'0.28"E	426
Pawlownia hybrida	Lushoto	0.5	4°43.558"S	38°23.602"E	1616
Pinus maximinoii	Arumeru West	8	-3.276197°	36.687704°	1997

Pinus oocarpa	Bukoba Rural	3	1°23'19.53"S	31°47'56.80"E	1208
Pinus patula	Iringa Rural	5	8°30'37.248"S	35°12'6.402"E	1862
Pinus patula	Lushoto	24	4°45.343"S	38°20.226"E	1615
Pinus patula	Rombo	30	2°58.143"S	37°29.300"E	2148
Pinus patula	Siha	15	2°59'57.9"S	37°07'15.8"E	2014
Pinus tecunumanii	Misenyi	5	-1.218209°	31.272528°	1176
Prunus africana	Lushoto	0.5	4°43.558"S	38°23.602"E	1616
Pterocarpus angolensis	Iringa Rural	1.5	7°34'45.00"S	35°48'9.26"E	1370
Tectona grandis	Moshi Urban	2	3°22'30.88"S	37°21'26.72"E	798
Tectona grandis	Muheza	30	5°13'S	38°39'E	280

General seed orchards used by TFS

Science name	District	Area (m)	Latitude	Longitude	Altitude (m)
Eucalyptus cloeziana	Mufindi	4	8°22'19.53"S	35°14'33.62"E	1890
Eucalyptus grandis	Arumeru East	5	3°18'39.59"S	36°50'36.07	1593
Eucalyptus grandis	Mufindi	5	8°22'29.22"S	35°14'14.31"E	1892
Eucalyptus grandis	Songea rural	5	9°42'23.17"S	35°31'19.11"E	1317
Eucalyptus maidenii	Iringa Urban	5	7°48'37.36"S	35°40'18.84"E	1544
Eucalyptus saligna	Ihefu	5	8°22'33.16"S	35°14'20.99"E	1889
Eucalyptus saligna	Mufindi	5	8°28'32.41"S	35°19'23.71"E	2009
Eucalyptus saligna	Songea rural	3	9º40'21.49"S	35º26'56.04"E	1297
Eucalyptus saligna	Songea rural	5.3	9°40"21.50"S	35'26'56.04"E	1297
Eucalyptus tereticornis	Moro. Urban	7	6°40'40.09"S	37°37'51.79"E	559
Eucalyptus urophylla	Mufindi	5	8°22'26.78"S	35°14'10.27"E	1893
Eucalyptus urophylla	Songea rural	3	-9.706437"S	35.521975E	1321
Gmelina arborea	Nyasa	2.75	-11.252740°	34.886073°	670
Pinus caribaea	Buchosa	1.5	-2.303037°	32.254779°	1182
Pinus caribaea	Songea rural	3	9º44'04"S	35º34'32"E	1078
Pinus kesiya	Mufindi	2	8°43'S	35°19'E	1217
Pinus kesiya	Mufindi	10	8°38'11.17"S	35°23'38.57"E	1284

Pinus maximinoii	Mbinga	3	10º53'09.38"S	35º03'54.98"E	1394
Pinus maximinoii	Mufindi	15	8°28'20.60"S	35°19'47.13"E	1948
Pinus maximinoii	Rungwe	1.5	9° 0'57.47"S	33°40'48.76"E	2202
Pinus oocarpa	Mbinga	5	10°53'7.48"S	35° 3'56.83"E	1412
Pinus patula	Arumeru West	3.1	3°14'55.29	36°40'5.64'E	2131
Pinus patula	Arumeru West	6	3°14'56.90	36°40'0.17'E	2086
Pinus patula	Lushoto	0.2	4°19'7.23"S	38°19.042'E	1762
Pinus patula	Rombo	3.5	2°57'20.95"S	37°29'51.09"E	1960
Pinus radiata	Meru East	2	. 3°16'2.74"S	36°39'42.09"E	1300
Pinus radiata	Rombo	1.5	2°57'28.84"S	37°29'44.84"E	1990
Pinus tecunumanii	Buchosa	2	-2.303290°	32.254483°	1182
Pinus tecunumanii	Bukoba Rural	1.5	-1.375285°	31.800730°	1225
Pinus tecunumanii	Mbinga	3	10º53'09.38"S	35º03'54.98"E	1394
Pinus tecunumanii	Mufindi	15	8°28'15.64"S	35°19'40.10"E	1951
Pinus tecunumanii	Songea rural	2	9º40'21.50"S	26'56.64"E	1297
Tectona grandis	Moro. Rural	10	6°48'5'61	37°49.767"E	436
Tectona grandis	Mvomero	13	6° 5'12.80"S	37 °42'2.95"E	460

CHAPTER FOUR

COSTINGS

4.1 Factors to consider in price determination

As a growing economic venture in native tree seeds subsector, production, processing and management have cost implications and raise concern for price setting consideration. It triggers increased costs which result to increased earnings of managers and costs to producers. Provision of seed/seedling production and distribution services using native tree species will at some point include cost component as per provisions in the service provision contract. In establishing cost to be charged for seed/seedling services there are several factors which need to be considered. In setting price for NTS or seedlings one should consider:

i. Tree seeds procurement costs including seed source establishment cost, field costs during collection, processing in laboratory, registration and inspection;
ii. Transport costs; securing of transit pass, transportation charges, loading and unloading of seeds/seedlings, labour charges;
iii. Management costs on seed/seedling site; inspection, water supply and security costs;
iv. Time of stay; number of days which seeds/seedlings will be subjected on the service;
v. Number of tree seeds/seedlings and species required for the service;
vi. The beneficiary of other seeds/seedlings benefits (e.g. green manure, fodder to animals) that will be obtained;
vii. Total operation costs of the manager in tree/seedling production; and
viii. Any other costs that may arise during collection, supply and management.

CHAPTER FIVE

MONITORING AND EVALUATION

5.1 Monitoring and Evaluation

This section provides the mechanism for monitoring and evaluation of implementation of the Guidelines for native tree seeds/seedlings distribution in Tanzania. The Guideline will be implemented by wide multi-sectoral stakeholders including those mentioned in this Guideline. It is one among the tools for implementation of the National Forest Policy 1998. The sectorial ministries, local government authorities and government agencies will monitor the implementation and progress of the Guideline in their daily activities. The Ministry of Natural Resources and Tourism (MNRT) shall coordinate continuous and systematic data collection, analysis, interpreting and reporting in collaboration with relevant ministries (Ministry of Agriculture – MoA), departments, agencies and Local Government Authorities (LGAs) during implementation of the Guidelines. This will further provide information to the Ministry responsible for Natural Resources and Tourism and stakeholders on ongoing implementations, for the purpose of assessing the extent of progress and achievements made. The Ministry of Finance and Planning (MoFP) will play a role of allocate budgets for NTS development and support innovation, technology promotion and transfer.

TFS will be responsible for overall coordination of NTS development in Tanzania. These includes coordination of development of supply chain network, clean planting materials, promote NTS sustainable harvesting and management. Research and academic institutions will be responsible for appraisal of management and harvesting guidelines, site-specific management plan, tissue culture protocol and tissue culture unit demonstration, participate in development of storage standards and certification mechanism and research on tree seed/seedling resources, value-chains, eco-system services and restoration.

Civil Society Organisations (CSOs) will have the role to support and encourage tree growers to combine NTS and seedlings to diversify green resources and integrate NTS in woodlots/plantations and restoration sites with exotic tree species. They will also converge development efforts for scaling up and scaling out of interventions related to adoption of NTS and native seedlings.

The Ministry responsible for Natural Resources and Tourism will conduct evaluation periodically after every five (5) years in a participatory manner for assessment and evaluation of the effectiveness, efficiency, impact and sustainability on implementation of

this Guideline. Performance evaluation will be a periodic assessment on achievement of guideline objective. These evaluations will assess progress towards attainment of the broad national beekeeping sectoral objectives. Lessons learnt will be used to improve the guideline and shared to the stakeholders. The existing frameworks within MNRT, MoA and PO-RALG will be used to monitor the implementation of this guideline.

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