TANZANIA FOREST SERVICE AGENCY

Climate resilient NTS (considerations for climate-adapted NTS selection and discussion to understand the well and commonly planted NTS and their response to changing climate) ” 26th February 2025 | Unique Hotel, Dodoma, Tanzania

Fandey HM.

Project Coordinator-TFS

Considerations for Climate-Adapted Native Tree Seed Selection in Tanzania.

Project Background

- Tanzania committed to restoring **5.2 million hectares** of degraded land by **2030** under the **Bonn Challenge**.
- The country has **1,755 native tree species (NTS)**, but their integration into restoration efforts has been slow.
- Limited knowledge and capacity are major barriers to NTS-based restoration.

ISSUES

  - **Prioritize** over-exploited and useful threatened **NTS**.
  - **Assess** constraints and capacity affecting **NTS seed/seedling** availability.
  - **Address** policy and **practical barriers** limiting NTS restoration.
- Strengthened **supply chains** for NTS seeds and seedlings to support large-scale restoration.

Considerations for Climate-Adapted Native Tree Seed Selection in Tanzania.

Project Impact

- **Environmentally and economically resilient** NTS contribute to **carbon sequestration**, **biodiversity**, and **economic activity**.

Project Outcome

- **Increased diversity** in the **NTS seed portfolio**, focusing on high-value species.
- Restoration prioritizes **NTS that is beneficial to people and biodiversity**.
- As climate patterns shift, the strategic selection of native tree seeds must integrate scientific research, local knowledge, and conservation priorities.
- By focusing on climate resilience, Tanzania can strengthen its reforestation programs and enhance ecosystem services, ensuring sustainable forest management in the face of climate change.

Considerations for Climate-Adapted Native Tree Seed Selection in Tanzania

- **Ecological Suitability** –Different regions, from coastal to highland areas, have varying soil types, rainfall patterns, and temperatures that influence tree growth and survival.
- **Ecosystem Services:** Prioritize species offering multiple benefits, such as mangroves (*Rhizophora mucronata*) for coastal protection and carbon sequestration.
- **Drought Tolerance** – With increasing drought occurrences, selecting tree species that can withstand prolonged dry periods is crucial (*Trichilia emetica, Croton dictrosthyus Brachystegia* spp, *Adansonia digitata* (baobab) and *Acacia tortilis* which thrive in arid zones.
- **Genetic Diversity**: Prioritize seeds from populations with high genetic variability to enhance adaptability to climate stressors. *Milicia excelsa* (mvule), *Pterocarpus angolensis*, and *Combretum* spp can be selected to counter increasing aridity.

Considerations for Climate-Adapted Native Tree Seed Selection in Tanzania

- **Local Provenance & Climate Matching**: Source seeds climates similar to the planting site.
- **Growth Rate and Regeneration Capacity** – Fast-growing native trees with strong natural regeneration capabilities e.g. *Faidherbia albida* and *Albizia lebbeck* regenerate well in degraded areas.
- **Carbon Sequestration Potential** Indigenous species such as *Milicia excelsa,* most of Terminalia spp.
- For a native tree species, If C is the carbon sequestered, r is the growth rate and A is the area covered

$$C=r.A$$

Considerations for Climate-Adapted Native Tree Seed Selection in Tanzania

- **Resistance to Pests and Diseases** –Selecting species known for their natural resistance, *Dalbergia melanoxylon, Khaya anthotheca*, shows robustness against emerging pests exacerbated by warmer climates.
- **Soil and Water Conservation** –Ficus sycomorus (Sycamore fig), *Syzygium cumini* and *Cordia africana* help prevent soil erosion and improve watershed conservation.
- **Soil Adaptation**: Use nitrogen-fixing species (e.g., *Faidherbia albida*) to restore degraded soils and improve agroforestry systems in drought-prone areas.

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- **Local Uses and Economic Benefits** – Sustainable utilization of native trees for timber, medicine, and fodder promotes conservation efforts e.g. *Terminalia sericea* provide valuable wood and medicinal properties while maintaining ecological balance.
- **Fire Resistance and Adaptation** –Fire-resistant species like *Burkea africana* can play a role in fire-adapted landscapes and reduce habitat destruction, *Terminalia sericea* (silver cluster-leaf) that tolerate high temperatures, critical for lowland and savanna ecosystems.
- **Phenological Flexibility**: Favor trees like *Tamarindus indica* that adjust flowering/fruiting cycles to erratic rainfall, ensuring seed viability.
- **Community Acceptance and Traditional Knowledge** –Adansonia digitata (Baobab) can effectively manage and protect native species for future generations, *Sclerocarya birrea, Vangueria infausta, Vitex mombassae V. doniana* to ensure local adoption and stewardship.

Considerations for Climate-Adapted Native Tree Seed Selection in Tanzania

Several native tree species are widely planted across Tanzania due to their ecological and economic importance.

- **Acacia spp.**: Highly drought-resistant, thrives in arid regions, and provides fodder, firewood, and soil enrichment.
- **Brachystegia spp.**: Forms part of the Miombo woodlands, supports biodiversity, and is well-adapted to varying rainfall patterns.
- **Afzelia quanzensis**: A valuable timber species with deep-rooted drought adaptation.
- **Faidherbia albida**: Known for its reverse phenology (shedding leaves in the wet season and greening in the dry season), enhancing soil fertility.
- **Milicia excelsa**: Excellent carbon sink, soil stabilizer, and timber source.
- **Adansonia digitata**: Stores water in its trunk, provides food and medicinal benefits, and withstands high temperatures.
- **Dalbergia melanoxylon**: Used for high-quality timber and resistant to pests.
- **Cordia africana**: Adapted to various climatic conditions, used for timber and soil enrichment.
- **Ficus sycomorus**: Aids in water retention and provides fruit for wildlife.
- **Terminalia sericea**: Tolerant to poor soils and useful for reforestation.
- **Burkea africana**: Fire-resistant and beneficial for biodiversity.
- **Albizia lebbeck**: A nitrogen-fixing tree improving soil fertility.
- **Combretum molle**: Resilient to drought and useful for medicinal purposes.

Considerations for Climate-Adapted Native Tree Seed Selection in Tanzania

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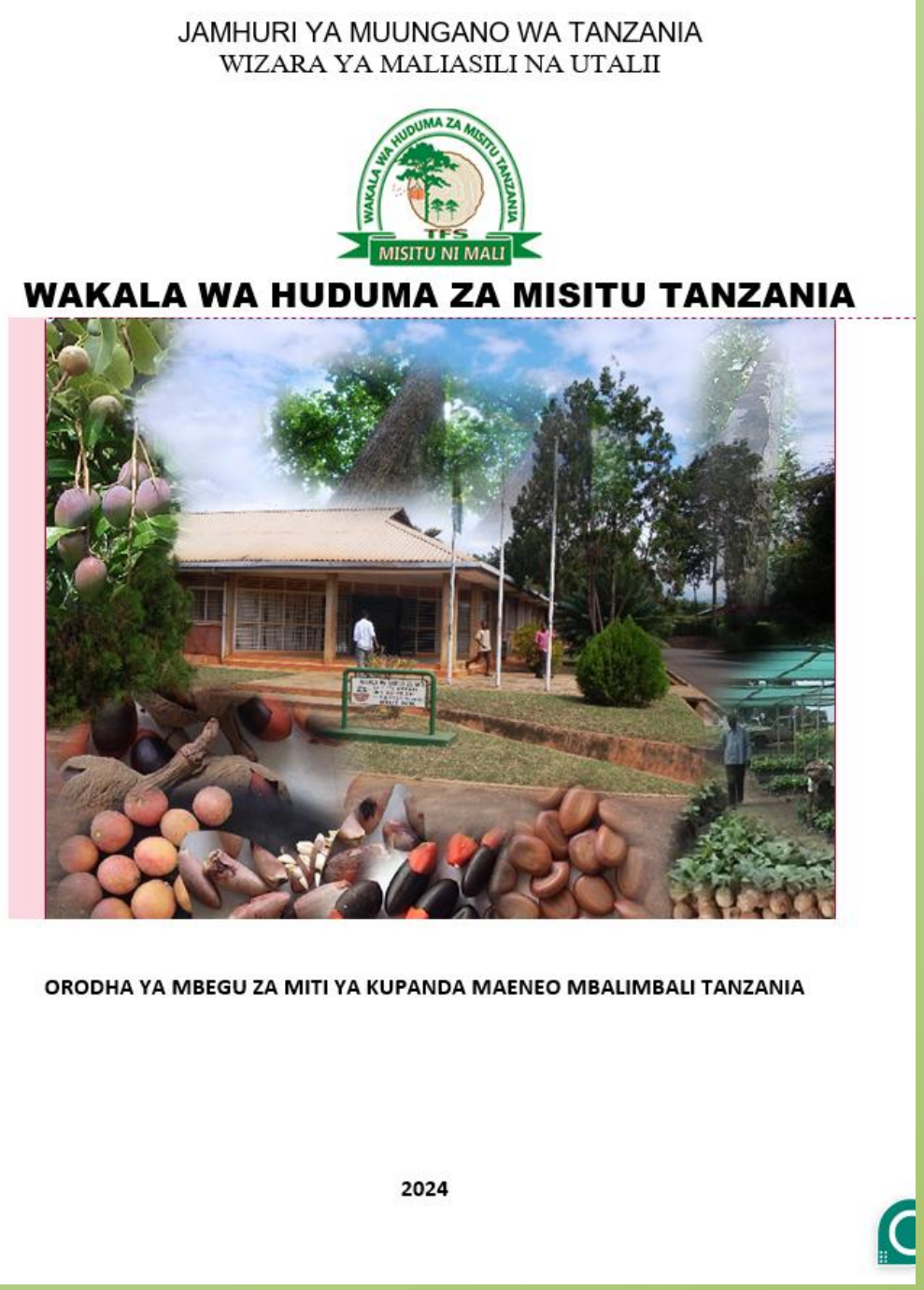
- ***Sterculia africana***: Adapted to semi-arid conditions and valuable for reforestation.
- ***Tamarindus indica***: Drought-tolerant and provides edible fruit.
- ***Khaya anthotheca***: A large tree with excellent timber quality.
- ***Markhamia lutea***: Well-adapted to both wet and dry conditions.
- ***Ximenia americana***: A hardy tree with medicinal uses.
- ***Sclerocarya birrea***: Known for its drought resistance and fruit production.
- ***Syzygium guineense***: Tolerant to various soil types and used for erosion control.
- ***Bridelia micrantha***: Fast-growing and supports soil stability.
- ***Ochna serrulata***: A small tree with decorative and ecological benefits.
- ***Zanthoxylum chalybeum***: Medicinal and adapted to semi-arid conditions.
- ***Warburgia salutaris***: Valuable for medicinal use and climate resilience.
- ***Vitex doniana***: Provides edible fruit and withstands dry conditions.
- ***Grewia bicolor***: A drought-tolerant species supporting biodiversity

Considerations for Climate-Adapted Native Tree Seed Selection in Tanzania



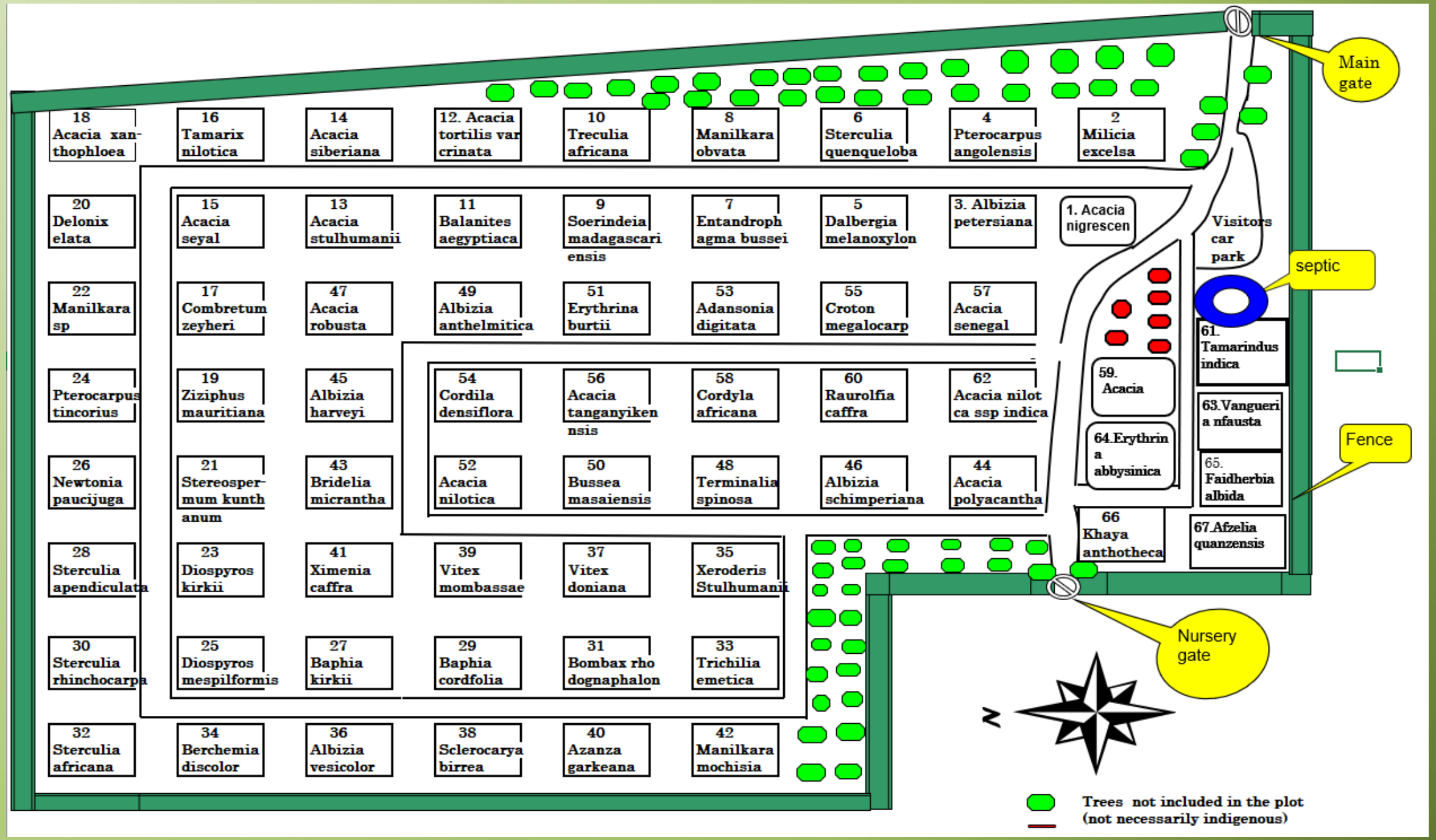
Considerations for Climate-Adapted Native Tree Seed Selection in Tanzania

Jedwali Na. 1. Mgawanyiko wa kanda za hali ya hewa za kimisitu Tanzania

Kanda za hali ya hewa za kimisitu (Forest Climatic zones)	Maelezo	Mifano
1. Maeneo ya miinuko yenye unyevunyevu (Wet montane)	Safu za milima zaidi ya mita 1,800 juu ya usawa wa bahari na mwanzo wa ukanda wa theluji, ambapo kuna mvua nyingi isiyopungua milimita 1,000 kwa mwaka. Kiwango cha chini cha joto ni 13°C. Kuna ukungu na mawingu mara kwa mara.	Lushoto mjini, Magamba, Narok, Ngorongoro, Mufindi, Tukuyu n.k
2. Maeneo ya miinuko yenye ukame (Dry montane)	Maeneo ya milima kati ya mita 1,500 na 1,800 juu ya usawa wa bahari na mwanzo wa ukanda wa theluji ambapo kwa kawaida mvua si chini ya milimita 760 kwa mwaka. zKiwango cha chini cha joto ni 15°C	Shume, Njombe, Iringa, West Kilimanjaro, Meru kaskazini, Hanang n.k
3. Maeneo ya miinuko ya wastani (Transitional montane)	Maeneo ya milima kati ya mita 1,500 juu ya usawa wa bahari na mwanzo wa ukanda wa theluji yenye hali ya hewa kati ya kanda (1) na (2).	Sungwi, Olmotonyi, Rongai, Mbulu, Mbeya, Soni, n.k.
4. Nyanda za juu zenye unyevunyevu (Moist plateau)	Maeneo kati ya mita 600 na mita 1,200 juu ya usawa wa bahari yenye mvua kati ya milimita 760 na 1,400 kwa mwaka. Kiwango cha chini cha joto ni 15°C	Geita, Mpanda, Tabora, Kigoma, Moshi n.k.
5. Nyanda za juu zenye ukame (Dry tropical)	Maeneo kati ya mita 600 na 1,200 juu ya usawa wa bahari yenye mvua chini ya milimita 760 kwa mwaka. Kiwango cha chini cha joto ni 18°C.	Dodoma, Itigi, Shinyanga, Mwanza, Tabora n.k.
6. Maeneo ya hali ya joto na unyevunyevu (Wet tropical)	Maeneo maalum katika mwambao wa pwani chini ya milima yenye mvua nyingi, na maeneo ya tambarare yaliyoko mashariki mwa baadhi ya milima. Mvua milimita 1,140 au zaidi kwa mwaka. Kiwango cha chini cha joto ni 18°C	Rau, Turiani, Matombo, Minziro, Ukerewe, Korogwe, Muheza n.k.
7. Mwambao wa pwani (Coastal belt)	Ukanda wa pwani chini ya mita 600 juu ya usawa wa bahari. Sehemu zingine huingia bara hadi kilomita 300. Mvua kwa kawaida ni milimita 760 kwa mwaka. Kiwango cha chini cha joto ni 18°C	Dar es salaam, Kibaha, Bagamoyo, Lindi, Mtwara Ifakara.

Jedwali Na.2. Orodha ya miti, matumizi na kalenda ya ukusanyaji wa mbegu

Na.	Jina la mti Kisayansi	Jina la mti Kiswahili	Matumizi ya mti	Maandalizi ya mbegu kabla ya kusia	Muda wa kulea buatani hadi kupandwa (Miezi)	Idadi ya mbegu kwa kilo 1	Wastani wa idadi ya miche kwa kilo 1	Bei ya Mbegu kwa kilo 1 (Sh)		Kalenda ya kukusanya mbegu											
								Mbegu zilizo boreshwa	Mbegu za kawaida	Januari	Februari	Machi	Aprili	Mei	Juni	Julai	Agosti	Septemba	Oktoba	Novemba	Desemba
1	*Acacia auriculiformis*	Mkesia	KN, MK, MB, NG, KV	a	6 - 8	45,000	29,250	NA	20,000												
2	*Acacia drepanolobium*	Mboliboli	KN, MP	a	4 - 6	24,500	15,925	NA	20,000												
3	*Acacia kirkii*	Mnalo	KN, MK, MP	a	4 - 6	7,000	4,550	NA	20,000												
4	*Acacia mangium*	Mkesia	KN, MK, MB, NG, KV	a	6 - 8	95,000	61,750	NA	20,000												
5	*Acacia mearnsii*	Muwati	KN, MK, NG, , KV	a	4 - 6	80,000	52,000	NA	20,000												
6	*Acacia melanoxylon*	Mtasimana	KN, MK, MP, MB, NG	a	4 - 5	77,000	50,050	NA	20,000												
7	*Acacia mellifera*	Kikwata	KN, MK, KV, DW	a	4 - 6	13,500	8,775	NA	20,000												
8	*Acacia nigrescens*	Mkambala	KN, MK, NG	a	4 - 6	15,000	9,750	NA	20,000												
9	*Acacia nilotica ssp. indica*	Mgunga	KN, MK, NG, MP, KV	a	4 - 6	6,000	3,900	NA	20,000												
10	*Acacia polyacantha*	Mgunga	KN, MB, KV, MP	a	4 - 6	10,900	7,630	NA	20,000												
11	*Acacia senegal*	Kikwata	KN, DW, KV, MP	a	4 - 6	8,000	5,600	NA	20,000												
12	*Acacia seyal*	Mgunga	KN, MK, NG	a	4 - 5	7,000	4,550	NA	20,000												
13	*Acacia sieberiana*	Mgunga	KN, NG, DW	a	4 - 6	4,000	2,600	NA	20,000												
14	*Acacia tanganyikensis*	Mgunga	KN, MK, MB, KV	a	4 - 6	6,000	3,900	NA	20,000												
15	*Acacia tortilis ssp. spirocarpa*	Mgunga	KN, , MP, KV, MM	a	4 - 5	18,000	11,700	NA	20,000												
16	*Acacia xanthophloea*	Mgunga	KN, MK, MP, KV	a	4 - 6	30,000	19,500	NA	20,000												
17	*Acrocarpus fraxinifolius*	Mtikivuli	KN, MB, NG, MP	a	5 - 6	28,000	16,800	NA	25,000												
18	*Adansonia digitata*	Mbuyu	MT, MP, DW,	c	3 - 5	1,900	1,330	NA	10,000												
19	*Adenanthera pavonina*	Mshanga	KN, MP, NG	b	4 - 5	4,000	2,800	NA	15,000												
20	*Afzelia quanzensis*	Mkongo	KN, MK, MB, KV, MM	b	3 - 5	370	315	NA	25,000												
21	*Albizia antunesiana*	Mkami	KN, NG, MB	a	5 - 6	9,000	6,750	NA													


18 Acacia xanthophloea
16 Tamarix nilotica
14 Acacia siberiana
12. Acacia tortilis var crinata
10 Treculia africana
8 Manilkara obvata
6 Sterculia quenqueloba
4 Pterocarpus angolensis
2 Milicia excelsa
Main gate
20 Delonix elata
15 Acacia seyal
13 Acacia stulhumanii
11 Balanites aegyptiaca
9 Soerindeia madagascariensis
7 Entandrophagma bussei
5 Dalbergia melanoxylon
3. Albizia petersiana
1. Acacia nigrescen
Visitors car park
septic
22 Manilkara sp
17 Combretum zeyheri
47 Acacia robusta
49 Albizia anthelmitica
51 Erythrina burtii
53 Adansonia digitata
55 Croton megalocarp
57 Acacia senegal
61. Tamarindus indica
24 Pterocarpus tincorius
19 Ziziphus mauritiana
45 Albizia harveyi
54 Cordila densiflora
56 Acacia tanganyikensis
58 Cordyla africana
60 Raurolfia caffra
62 Acacia nilotica ssp indica
59. Acacia
63.Vangueria nfausta
64.Erythrina abbysinica
Fence
26 Newtonia paucijuga
21 Stereospermum kunthanum
43 Bridelia micrantha
52 Acacia nilotica
50 Bussea masaiensis
48 Terminalia spinosa
46 Albizia schimperiana
44 Acacia polyacantha
65. Faidherbia albida
66 Khaya anthotheca
67.Afzelia quanzensis
28 Sterculia apendiculata
23 Diospyros kirkii
41 Ximenia caffra
39 Vitex mombassae
37 Vitex doniana
35 Xeroderis Stulhumanii
Nursery gate
30 Sterculia rhinchocarpa
25 Diospyros mespilformis
27 Baphia kirkii
29 Baphia cordfolia
31 Bombax rhodognaphalon
33 Trichilia emetica
N
32 Sterculia africana
34 Berchemia discolor
36 Albizia vesicolor
38 Sclerocarya birrea
40 Azanza garkeana
42 Manilkara mochisia
Trees not included in the plot
(not necessarily indigenous)