SEED PROPAGATION PROTOCOL

This form collates the information about the best method for seed propagation and growing up of the target species.

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Logo/s of the affiliated organisation(s):

This propagation protocol is subject to change and updates when new information on the propagation of the species becomes available. If there any comments or changes you would like to make, please send the information to africa@bgci.org

GENERAL INFORMATION					
Taxon name	*Scientific name of the propagated species*	*Tamarindus indica*	**Name/s of propagator/**	*Name(s) of the person or people that carried out the propagation*	
Family	*Plant family of the propagated species*	Fabaceae	**Organisation**	*Organisation(s) where the propagation was carried out*	
Origin of seeds	*Site(s) and country where seeds were collected*	Common Rural and coastal areas (Tanga, Zanzibar in dry savanna region (Dodoma, Singida, Tabora and Simiyu)	**Site and country**	*Site(s) and country where the propagation took place*	Tanga, Zanzibar, Simiyu, Dodoma and Singida-Tanzania

SEED DESCRIPTION & PROCESSING		
Description of the seeds and the processing of the seeds before seed sowing.		
Time of year for seed collection	*List month/s of the year when seed collection is best*	**July – October**
Fruit/seed transport	*Describe how fruit/seeds have been stored during transport from the field to the nursery*	• Pods transported in woven sacks, baskets, or ventilated crates. • Keep dry and protected from rain. • Avoid crushing pods to prevent seed damage.

		• Since seeds are orthodox, transport is less sensitive than recalcitrant species.
Processing of fruits/seeds	*Describe how the fruits/seeds are processed in situ or in the nursery (seed extraction methods, seed cleaning, handling of fruits/seeds...)*	**For small quantity** • Ripe pods are picked from the tree and dried in the sun • The pods are indehiscent, and are broken in the sun • The seeds are embedded in pulp, which is scraped off which a knife and the seeds are washed in water **for bulk quantities** • Fruits are soaked in water in a plastic container for about six hours • Then are mixed with gravel (one part gravel to two parts fruits by weight) and large quantities of water in a concrete mixer • Water, pulp, skin, and empty seeds are poured off to leave filled seeds and gravel • Gravel is removed by sieving • The seeds are dried in the sun for two days About 5kg of fruits produce 1 kg of clean seeds
Method to assess seed viability	*Describe method used to estimate seed viability (e.g. floating test, cut test, tetrazolium test, X-ray test)*	1. **Cut test:** • Cut seeds longitudinally. • Viable seeds have firm, white/cream embryos. • Empty or darkened seeds are non-viable. 2. **Floating test:** • Place seeds in clean water. • Viable seeds often sink; empty seeds float. *(Note: Less reliable due to winged structure.)* 3. **Tetrazolium red test (more accurate):** • Seeds soaked and treated with tetrazolium red solution. • Living tissues stain red.
% Estimated seed viability	*(Number of viable seeds) x 100 / (Total number of seed for which viability was estimated)*	Fresh seeds: 80–95% viability.
Type of seed	*Choose one of these options: Orthodox, Intermediate, Recalcitrant or Unknown*	Orthodox
Seed size	*Include a measuring unit (e.g. mm, cm…)*	• Length: 1 cm • Width: 0.5 cm
Number of seeds per gram	*Count a reasonable number of seeds and weigh them. Then, divide the number of seeds by their weight (e.g. 100 seeds / 5 g = 20 seeds/g)*	Approximately 2600 seeds per kilogram

Seed storage	*If seeds have been stored before germination, mention storage facilities (seed bank, fridge, freezer), and describe conditions (humidity, temperature), type of container, and storage time length.*	Can be stored for **2–5 years** under proper conditions. Storage conditions: • Temperature: 25°C (refrigerator or seed bank) • Relative humidity**:** Below 50% • Airtight containers (glass jars or sealed plastic containers).

\+ ***Add photographs of the fruit and seeds. Make sure to include a detailed description of the photo, such as the growth stage, date, activity or process.***

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GERMINATION			
Description of procedures, materials for seed germination and the germination success.			
Procedures	**Seed treatment**	*Describe treatment applied to the seed before sowing (e.g. mechanical scarification, chemical scarification, soaking, stratification, smoke treatment…). If applied, include the duration of the treatment.*	Seeds have a hard seed coat (physical dormancy). Recommended treatments: • Mechanical scarification: Lightly nick seed coat opposite hilum. or • Hot water treatment**:** Pour hot water (80–90°C) over seeds and soak for 12–24 hours as water cools
	Seed sowing media	*Media composition: include percentages/ratio for the different components*	Recommended mixture: Tree Seed Production Station-Morogoro • Top Black Forest soil – 63% (5) • Well decomposed Manure – 25% (2) • Rice husk – 12% (1) **Ratio is 5:2:1** Well-drained and sterilized if possible.
	Container	*Describe size and material of the container in which seeds are sown*	• Direct sowing in polythene tubes (12–15 cm diameter, 20–25 cm height) is recommended (due to fast root growth). • Can also use seed trays for pre-germination.
	Seed spacing	*Describe the recommended spacing between the seeds when sown. Include a measuring unit (e.g. mm, cm…)*	• If in seedbed: 5 cm apart. • If direct in tubes: 1 seed per tube.
	Seed depth	*Describe how deep the seeds are sown. Include a measuring unit (e.g. mm, cm…)*	• Sow at 2–3 cm depth. • Cover lightly with soil.

	Watering technique	*Describe watering tool, technique and frequency during sowing and germination*	• Watering can with fine rose. • Once daily. Avoid excessive watering (risk of rotting).
	Germination facilities	*Describe the facilities where the germination of seeds took place (e.g. close case, outdoor shaded area, heated bench, covered/bagged container...)*	• Outdoor nursery under 50% shade net • Raised beds or well-drained ground.
	Environmental conditions	*Describe the environmental conditions where germination took place (temperature, humidity, and photoperiod)*	• Temperature: 20–30°C • Moderate humidity • Natural daylight (~12 hours) • Good drainage and aeration.
Success	**Time of year for seed germination**	*List month/s of the year when seed germination is best*	1. **Northern & Eastern Zone** • October – December • March – May 2. **Central Zone** • November – April • May – October 3. **Southern & Western Zone** November – April
	Duration until germination	*Average number of days/months/years until seeds germinated*	• With scarification: 4–5 weeks. • Without treatment: 7–9 weeks.
	% Germination success	*(Number of seeds germinated) x 100 / (Total number of seeds sowed)*	Germination is good and uniform, attaining 50% after four weeks and 90% after five weeks from sowing
Materials		*List the materials needed for seed germination to help with the planning of this activity. E.g. trays, sieves, dibbers, labels, ruler…*	• Seed trays • Sand and forest soil • Compost • Hot water container • Watering can • Labels and marker • Ruler • Shade net

\+ ***Add photographs of the germination process. Make sure to include a detailed description of the photo, such as the growth stage, date, activity or process.***

SEED PROPAGATION PROTOCOL

FIRST POTTING			
Description of procedures and materials for the cultivation of the plants and the success of the growing of the plants.			
Procedures	**Growing Media**	*Media composition: include percentages/ratio for the different components*	Recommended mixture: Tree Seed Production Station-Morogoro • Top Black Forest soil – 63% (5) • Well decomposed Manure – 25% (2) • Rice husk – 12% (1) **Ratio is 5:2:1**
	Container	*Describe size and material of the container in which plants are potted*	Black polyethylene bags of height 8–10 cm and diameter 101.4 mm or 4”
	Fertiliser	*If used, include: type (organic or inorganic); nutrient composition and its ratio; and application (added to soil, dissolved on water, foliar application)*	• Organic compost mixed in media. • Optional: NPK (e.g., 20:10:10) applied lightly after 4 weeks. Application: Dissolved in water and applied to soil. NB: Being a legume, it fixes nitrogen (low N fertilizer required).
	Watering technique	*Describe watering tool, technique and frequency while growing the plants*	• Water once daily during dry periods. • Reduce watering during rainy season. • Avoid waterlogging.
	Plant growing facilities	*Describe the facilities where the plant growing took place (e.g. glasshouse, outdoors, shaded area...)*	• Outdoor nursery under partial shade initially. • Full sun after 6–8 weeks (hardening stage).
	Environmental conditions	*Describe the environmental conditions where the plant growing took place (temperature, humidity, light levels)*	• Temperature: 20–32°C • Moderate humidity • Increasing sunlight during growth • Good airflow.
Success	**Number of days until first potting**	*Average number of days since the start of seeds sowing until first potting*	• If started in seedbed**:** 28–42 days after germination**.** • If direct sown in tubes: no pricking required.
	Duration until established plants	*Average number of days/month/years for which the plant growth was monitored until the establishment of plants*	4–6 months in nursery before field planting.

	% Plants established	*(Number of plants established) x 100 / (Total number of plants potted)*	Typically 75–90% survival after potting and hardening.
	Health observations	*Record any signs of pest or disease, nutrient deficiency, damage… and the stage when they were observed (e.g. during germination, growing of seedlings, growing of plants.…)*	• Damping-off in poorly drained media (germination stage). • Occasional leaf-eating caterpillars (seedling stage). • Root deformities if containers too small. • Nitrogen deficiency rare due to legume nature
Materials		*List material needed for potting to help with the planning of this activity. E.g. pots, dibbers, labels…*	• Polythene tubes • Potting soil mix • Dibber • Labels • Watering can • Shade net

+ ***Add photographs of the pricking out, potting, and the growing of plants. Make sure to include a detailed description of the photo, such as the growth stage, date, activity or process.***