Standards for Forest Nursery Accreditation

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Babarmahal, Kathmandu
&
Enhancing Livelihoods and Food Security through Forest Management (EnLiFT) in Nepal

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1. Introduction

The production of seedlings in forest nurseries started with the initiation of plantation research since early 1960s in Nepal. Nursery related studies and researches were carried out by Silviculture Research Project under the Forest Survey and Research Office and Forestry Research Project I and II from 1981 to 1996. Seedling production is one of the key steps for expanding tree planting activities across the country. The nursery production and plantation activities have to be properly planned and implemented. The way seedlings are produced in a nursery contributes to their survival rate after planting and their subsequent growth performance (Quayle et al 2001; Lamsal et al 2020). There are mainly three types of nurseries in Nepal viz. government (DFO and Local government), private and community nursery. Forest nurseries produce millions of seedlings yearly for plantation activities in Nepal.

Good quality seedlings cannot be produced without proper care and tending. Nursery plants need to be protected from extremes of environmental conditions until they are strong enough to endure them. To ensure high quality of seedlings and to provide more opportunities (income, technology transfer), local people should be encouraged to establish small-scale commercial nurseries. Appropriate standard of the selected high value tree species seedlings needs to be accredited and certified so that there won't be any problem in marketing. Most plants used for afforestation in Nepal are produced in polypots made of polythene or polyethylene and are widely used for raising seedlings. Transparent polythene pots of size 3 inch * 7 inches were widely used in forest nurseries and are now gradually replacing by thicker black polypots of various sizes. Generally, black polypots are useful at higher altitudes where seedlings need a longer period (longer than twelve months) in nursery.

Forest nurseries in Nepal differ in various aspects such as area or size, infrastructure and facilities, production capacity, and types of planting/nursery stock. These aspects have affected both production capacities and quality of the seedlings. However, forest nurseries are not classified systematically in Nepal. It is essential to classify the forest nurseries according to set crietria to get the quality plantlets for plantation. Similarly, forest seedlings are produced by both forest-based nurseries and other nurseries, it is essential to categorize between the forest-based nurseries and other horto-flower nurseries to produce quality forest seedlings for quality plantation and subsequent better growth performance and high yield.

In Nepal, forest nurseries and other nurseries produced large number of seedlings of forest tree species every year for plantations, however, the quality of nursery stock has always been a major issue. In general, poor-quality seedlings have been produced, such seedlings could not adapt to the difficult and harsh plantation sites. As a consequence, the survival of seedlings has been poor in many plantations. Lacking standards for the types of nursery stock has compelled the use of poor-quality seedlings for plantation in Nepal. The standards set for nursery stock will obligate

and guide nursery owner to produce quality planting materials for successful plantations. Production of high quality seedlings is critical to establishment of healthy trees in the field (Pandit et al., 2020). Slow development and death of tree seedlings is common to many rural development programs, which has led to many farmers losing interest in tree planting out of frustration. This loss of interest results in further deforestation and loss of valuable biodiversity which further degrades landscapes and deteriorates livelihood opportunities for people (Munjuga et al 2013; Linyunga et al 2015). Therefore, improvements in seedling quality will improve the rate of tree seedling establishment in the field and positively impact both the environment and rural livelihoods (Pandit, et al.2020). . In view of this reality, this nursery standard book is prepared.

2. Objectives

Th general objective is to develop standards for the accreditation of forest nurseries in Nepal.
The specific objectives of the study are to:

- Develop standards for forest nursery accreditation,
- Develop criteria and rating scale for the evaluation of the nursery accreditation standards,
- Develop forest nursery accredation protocol and processes.

3. Methodology

3.1 Desk review and analysis

Related policies, guidelines, strategies, manuals, brochures, and reports were reviewed to get ensight of forest nurseries and nursery stocks.

3.2 Consultations and sharing workshops

A checklist was prepared for consultations with key informants or experts. Nursery-related experts from the Ministry of Forests and Environment, Department of Forests and Soil Conservation, Department of Plant Resources, Nepal Agricultural Research Council, and Division Forest Offices were consulted. The checklist was discussed with Province Forest Research and Training Centres. Similarly, sharing workshops were conducted to collect common consensus on accreditation criteria points. Also we shared the nursery accreditation criteria with participants of Nursery management and Certification training held in EnLiFT project's site in April 2022.

3.3 Nursery visit and observation

Twenty-three nurseries (government, private, and community) were visited thorughout the country. The checklist/questionnaire was prepared to collect the data from these nurseries to identify the prevailing practices/status of forest nurseries nursery. Criteria for nursery standards were assessed and verified in a DFO and private nurseries located at Banepa through a team of FRTC and EnLiFT2 staff and volunteers.

4. Source of germplasm and record keeping

4.1 Seed source

The source of germplasm and collection methods greatly affects the seedling quality. Germplasm used in private and public nurseries in Nepal comes from sources including seed trees, seed stands, and seed production areas and seed orchards. For instance: Tree Improvement Program (TIP) in Nepal is playing the role of conservation of genetic resources by providing seeds of various tree species. The Forest Research and Training Center (FRTC) and Tree Improvement Silvicultural Component (TISC) are jointly mandated to supply seed required for plantation activities in the country. TISC carries out identification, registration and management of natural seed stands of important tree species, and establishment of breeding seed orchards from where seed or any planting material is obtained. The breeding seed orchards have been established in different parts of the country (Pandit et al 2020). The best quality seed is always a good investment. Good seed typically costs less than 1% of the total cost of forest plantation establishment (Quayle 2001; Munjuga et al 2013). The characteristics of good quality seed of 146 species are described in a book of Gautam et al. (2018). Poor seed quality will result in:

- Low germination percentage
- Poor emergence
- Poor survival
- Poor adaptability to the site
- Susceptibility to disease and pests
- Poor growth
- Low productivity

4.2 Seeds, seed collection time and record keeping

4.2.1 Seeds

Seed trees are individual trees from which a seed or a wildling is collected. This is regarded as the most common source of germplasm in most part of Nepal. Seed trees may be in natural forest or plantations and must have superior physical characteristics including straight and single stem, few branches, mature to produce an ample quantity of seeds and belong to the dominant or co-dominant trees in the site (Gregorio et al 2010).

4.2.2 Seed collection

Seed collection time varies across different species in a year. Some will take long time to ripen, and others will ripen almost over-night. Some shed their seed quickly, while others will retain the seed on the tree for months or even years. Careful observation and record keeping is therefore the key to successful seed collection. The flowering, fruiting and seed shed habits of the various species in a particular area need to be determined and recorded so that seed collection can be efficiently programmed and opportunities will not be missed. It is essential to ensure that seed is ripe before collecting. Seed collection time of 37 most commonly grown tree species in EnLiFT2 area is presented in Table 1 and seed source, planting time, germination and survival record form in Annex 1.

Table 1: Seed collection time, seed types, viability, pre-sowing treatment and germination period (adopted from Gautam et al. 2018)

Species	Seed collection time	Seed types	Viability	Pre-sowing treatment	Germination period
1. *Actinidia chinensis (kiwi)*	Oct-Dec	Orthodox	1 month	Washing & …	1 month
2. *Alnus nepalensis (Utis)*	Nov-Dec	Orthodox	>1 year	No need	2-3 week
3. *Artocarpus lakoocha (baddar)*	June-July	Recalcitrant	1 week	Washing	10 days
4. *Bassia butyraceae (chiuri)*	May-June	Recalcitrant	1 week	Washing & ….	1 week
5. *Bauhinia purpurea (tanki)*	April-May	Orthodox	1 year	24 hr cold w	9-30 days
6. *Callistemon citrinus (kalkiphool)*	Aug-Mar	Orthodox	1 year	No need	2-7 week
7. *Choerospondias auxilaris (lapsi)*	Nov-Mar	Orthodox	1 year	24 hr cold w	3-4 week
8. *Cinnamomum camphora (kapur)*	Aug-Nov	Orthodox	6 month	24 hr cold w	35-55 days
9. *Cinnamomum tamala (tejpat)*	May-June	Recalcitrant	1 week	Removing flesh	15-20 days
10. *Coffee Arabica (coffee)*	Sept-Jan	Recalcitrant	1 month	Washing	1 month
11. *Citrus aurantifolia (lime)*	Aug-Sept	Recalcitrant	1 month	Washing	1-2 month
12. *Delonix regia (golmohar)*	Mar-Apr	Orthodox	>2 year	24 hr cold w	1-4 week
13. *Edgeworthia gardeneri (argeli)*	Dec-Jan	Cutting	-	-	-
14. *Elaecarpus sphaericus (beadtree)*	Nov-Dec	Orthodox	6 month	Breaking & hot water	1-9 month
15. *Emblica officinalis (amala)*	Oct-Dec	Orthodox	1 year	72 hr cold w	9-30 days
16. *Ficus auriculata (nimaro)*	Aug-Sept	Orthodox	1 year	No need	4-5 week
17. *Ficus benzamina (sami)*	Apr-June	Orthodox	2 year	No need	4-9 week
18. *Ficus semicordata (raikhanayo)*	July-Sept	Orthodox	6 month	No need	1-6 week
19. *Flemingia congesta (bhatamase)*	Oct-Jan	Orthodox	2 year	Hot water	10-15 days
20. *Juglans regia (Okhar)*	Nov -Dec	Recalcitrant	2 year	48 hr cold w	10-60 days
21. *Leucaena diversifolia (ipil ipil)*	Nov-Jan	Orthodox	5 year	Hot water	10-20 days
22. *Malus domestica (apple)*	Dec-Jan	Orthodox	6 month	No need	1-3 months
23. *Mangifera indica (mango)*	July-Aug	Recalcitrant	7 days	Washing	1-2 week
24. *Melia azedarach (bakaino)*	Nov-Dec	Orthodox	1 year	24 hr cold w	15-45 days
25. *Michelia champaca (chap)*	Aug-Sept	Recalcitrant	15 days	Washing with w	10-45 days
26. *Moringa oleifera (saijan)*	Feb-Mar	Orthodox	6 month	24 hr cold w	20-30 days
27. *Morus alba (kimbu)*	Dec-Jan	Cutting	-	-	-
28. *Pinus species (pine)*	Nov-Dec	Orthodox	3 year	48 hr cold w	2-4 week
29. *Prunica granatum (anar)*	Sept-Oct	Orthodox	6 month	24 hr cold w	1-2 months
30. *Persea americana (avocado)*	Aug-Sept	Recalcitrant	1 week	Washing & cold	10 days
31. *Prunus cerasoides (painyu)*	March-Apr	Orthodox	2-3 year	No need	15-20 day
32. *Pyrus communis (pear)*	Dec-Jan	Cutting	-	-	-
33. *Paulownia tomentosa*	May-June	Orthodox	1 year	Cocopit	1-2 months
34. *Saurauia nepalensis (gogan)*	Mar-Apr	Orthodox	4 month	No need	3 week
35. *Tephrosea spp (mendula)*	Dec-Feb	Orthodox	2 year	24 hr cold w	7-10 days
36. *Texus baccata (loathsalla)*	Nov-Dec	Recalcitrant	6 month	Store in cold	45-80 days
37. *Zanthoxylum armatum (timur)*	Nov-Dec	Orthodox	2 year	Washing with W	1-6 month

5. Standards and their Criteria for Accreditating Forest Nurseries

Prior to defining any standard and its criteria for nursery accreditation, it is important to define about what a forest nursery.

Forest nursery: A forest nursery is a place where seedlings specially of forest tree species are raised either from seed or from any other part of the plant for eventually planting out. A nursery is said to be a forest nursery if: **at least 60% of the total number** of different species raised in the nursery must be tree and/or shrubs and/or fuelwood and/or foddef and/or NTFPs species such as *Terminalia belerica, Terminalia chebula, Azadirachta indica, Phyllanthus emblica, Sapindus mukorossi, Elaeocarpus sphaericus* etc. and/or ornamental tree species such as *Jacaranda mimosifolia*, *Lagerstroemia* sp. The remaining 40% of the production can be fruit, flower or other species including medicinal and/or aromatic plants in the nursery.

High-Tech Nursery: The next step is to decide whether you are going to establish a simple locally operated nursery or a high tech nursery. The level and types of technologies (simple-seedlings are grown in natural environment; medium-plastic and green net used and high- iron structure and sprinkle water used) differ between nursery types and investment capacities. Therefore a **High-tech forest nursery** is the combination of poly green house and agrinet house where the following four standards including temperature control, humidity control, light intensity control and misting facility or micro-irrigation are fulfilled.

Defining standards, and indicators and criteria

A set of six standards are developed as a basis for accreditating forest nurseries as below:

1. Standards for seed collection and record keeping
2. Standards for human resource requirements
3. Standards for basic nursery set up and facilities
4. Standards for land area requirements and production capacity
5. Standards for general seedling physical quality
6. Standards for specific seedling stock quality

A total of 17 indicators have been developed for the assessment of the quality of the forest nursery seedlings. In the first 15 indicators, rating points are assigned from 0 to max 3 and the last two indicators (16^{th} and 17^{th}) have the max rating point 2.5 each. Altogether, there are 50 points of which a nursery should obtain a minimum of 20 points to pass the examination (for certification). The final results is graded as from 20-30 points is grade- C, 31 -40 points is grade-B, and more than 40 points is grade-A.

5.1 Standards for seed collection and record keeping

1. Information about the species, seed source, date of collection, amount, planting, germination and survival % is known and recorded in a format given in Annex 1.

Description	Points
No information about seed collection source	0
Have information about seed source, amount collected/ purchase and date of collection	1
Have information on date of planting & germination %	2
Have records on survival % including above	3

5.2. Standards for human resource requirement

Standards for human resource requirement is judged on the basis of individual skills/knowledge and experience on nursery operation and quality seedling production. Here four basic criteria are developed for evaluation of human resource involved in the nursery operation and management.

2. Nursery manager and/ or supervisor should have at least basic Diploma in forestry training to BSc or master in forestry level qualification and have one to two years of experience in nursery work supervision.

Description	Points
Neither obtained academic degree nor any nursery related training	0
Not have academic degree but participated a month nursery training & one year experience	1
Completed ISc/Deploma in Forestry with nursery training & one year experience	2
Completed BSc level or more training course from recognized institute & > 2 years of experience	3

3. The nursery operator should have participated at least one nursery related training and should have working experience of at least three years for producing high quality seedlings

Description	Points
Not received any nursery related training	1
Have participated one nursery related training and one year experience	2
Have participated one nursery related training and working experience of two years.	2.5
Have participated at least one nursery related training events and should have experience of at least three years	3

5.3. Standards for a basic nursery set up facilities and outlook

4. Infrastructure: nursery should have access to road/transport & market with enough space for tools/equipment storage, and facilities for electricity and fencing (Annex 2)

Description	Points
Nursery has area required for poly bag nursery but not for other facilities	1
Have access to water source, road and transport facilities	2
Have enough water supply, and space for equipments and tool storage (Annex 2)	2.5
Have realiable water supply, equipments, eleecricity, fencing and market facilities	3

5. Facilities- There should be **the p**resence of necessary nursery facilities such as seed bed, seedling bed and or hardening beds with soil sterilization and seiving facilities for quality seedling production

Description	Points
Not having separate seed, seedlings and hardening beds	0
Have three types of basic beds (seed bed, transplant bed and hardening bed)	1
Have a soil, sand and compost sieving facility	2
Have all above facilities + soil sterilization facility	3

6. Seedling container: nursery uses different sizes of polybags and hyko (elevated) trays for root training

Description	Points
Nursery uses makeshift materials (can, juice packs and plastic cups)	1
Nursery uses polybags	2
Nursery uses different sizes of polybags based on requirements (duration, seedling size)	2.5
Nursery uses hyko trays or equivalent containers with root trainers	3

7. Potting mixture: nursery uses forest top soils with drainage enhancers in the mixture

Description	Points
Pure clay soil	1
Clay soil with drainage enhancers (sand, coko pit, rice husk, saw dust) and fertilizer	2
Top forest soil with high organic matter	2.5
Top soil with drainage enhancers	3

8. General outlook of the nursery in terms of grading (according to the size of the polybags, age and type of the species) and cleaniness (weeding & hoeing) seems to be appropriate, attractive and appealing.

Description	Points
Nursery lacks appropriate grading and have poor sanitation	1
Nursery seedlings are graded based on species, age and sizes of poly pots	2
Have appropriate nursery seedling grading and good sanitation facilities	2.5
In addition to above nursery signboard is placed on a place that can be noticed easily from the outside	3

5.4. Standards for land area requirement and production capacity

9. **Land area requirement** for 4"x7" size 10000 polybags' seedlings should have at least 881 M^2 of land **(Annex 2)**

Description	Points
Nursery lacks minimum standard for space requirement	0
Sufficient area for 4"x7" size 10,000 bags+ mortality % 25 = 112 M^2	1
Space for tracks and pathways 112.5x2.25 = 281M^2 (in addition to above)	2
Space for shed, water tank/ reservoir, mother plant area, compost pit and toilet = 377 M^2 x 2 = 754 M^2 + above 281M^2 = 1035 M^2 = Approx 2 ropani	3

10. Capacity to supply planting stocks

Description	Points
Nursery can produce at least 1000 seedlings per production season	1
Nursery can produce at least 5000 seedlings per production season	2
Nursery can produce at least 7500 seedlings per production season	2.5
Nursery can produce at least 10000 seedlings per production season	3

5.5. Standards for general quality seedling stocks

11. Sturdiness: seedlings should have robust stem

Description	Points
All samples have sturdiness quotient value is of more than 10	1
10-16 samples have sturdiness quotient value is more than 6 but < 10	2
5-9 samples have sturdiness quotient value is more than 6 but < 10	2.5
< 5 samples have sturdiness quotient value is more than 6 but < 10	3

Note: Sturdiness quotient: *It refers to the ratio of the height of the seedling in cm to the root collar diameter in mm and expresses the vigour and robustness of the seedling. A small quotient indicates a sturdy and stouter plant with a higher expected chance of survival, especially on windy or dry sites (Jaenicke, 1999). A high ratio indicates a relatively spindly (thin) seedling (Haase, 2007). The ideal value for a seedling to be considered sturdy is less than six (Jaenicke, 1999 cited by Takoutsing et al., 2013). In*

the prevailing context of planting materials production in Nepal's forest nurseries, the sturdiness quotient of up to 10 or less is suggested for selecting nursery stock for planting.

12. Health: Seedlings should be free from pest & diseases, no mechanical or physical injuries and no stem rottening

Description	Points
All samples (16) are affected by pests and diseases, and but no mechanical injuries	1
10-15 samples are affected by pests and diseases, and no mechanical injuries	2
5-9 samples are affected by pests and diseases, and no mechanical or physical injuries	2.5
<5 samples are affected by pest and diseases, and or no mechanical or physical injuries	3

***Note**: Any plant or seedling is said to be healthy when it is free from pests and diseases, and at the same time, it should not have any mechanical injuries and physical damage.*

13. Colour of foliage: The colour of leaves and foliage should be dark green/ green deep colour and no dark, pale-green foliage

Description	Points
Almost all samples (>15) have pale green color foliage and leaves	1
10-15 samples (9) have pale green color foliage and leaves	2
5-9 samples (6) have pale green color foliage and leaves	2.5
< 5 samples have pale green color foliage and leaves	3

***Note**: Colour of foliage or leaves of seedlings is a general indicator of seedling quality and can vary by species and time of the season. Yellow, brown, or pale-green foliage indicates lower vigour than dark green foliage (haase, 2007).*

14. Stem form: Good quality seedlings should have straight stem

Description	Points
All samples (>15) have two or more stem leaders and bent shoots	0
10-15 samples have two or more stem leaders and bent shoots	1
5-9 samples have two or more stem leaders and bent shoots	2
<5 samples have have two or more stem leaders and bent shoots	3

***Note:** Any seedlings selected for planting in the field should have straight stem and a single stem leader*

15. Root form: Quality seedlings should have well-developed root system and no evidences of root deformations

Description	Points
All samples have j-pot bound and curled roots and primary roots growing out from the container and penetrating into the ground	1
10-15 samples have j-pot bound and crled roots and primary roots growing out from the container and penetrating into the ground	2
5-9 samples have j-pot bound and curled roots and primary roots growing out from the container and penetrating into the ground	2.5

<5 samples have j-pot bound and curled root and primary roots growing out of container and penetrating into the ground	3

***Note**: The root system of plants can be assessed easily in bare-root seedlings and plants for stump production. A deformed root obstructs the uptake of water and nutrients from the soil and a bent or looped primary root does not provide a strong base for the anchorage of the growing plant (Harrison et al., 2008 cited by Takoutsing et al., 2013).*

5.6. Standards for specific types of nursery stocks (Annex 3)

16. Container raised single year seedlings of 4"x7" should have a min ht of 25 cm & root collar diameter 2.5 mm.

Description	Points
All samples fall under the minimum standard of at least 4"x7" pot size, 25 cm ht., and root collar diameter 2.5 mm	0
Only 1-5 samples meet the minimum standard of least 4"x7" pot size, 25 cm ht., and root collar diameter 2.5 mm	1
5-9 samples meet the minimum standard of least 4"x7" pot size, 25 cm ht., and root collar diameter 2.5 mm	2
> 10 samples meet the minimum standard of least 4"x7" pot size, 25 cm ht., and root collar diameter 2.5 mm	2.5

17. Container raised or a large ball rooted multi- year seedlings of 5"x10" or 14" polipot size should have a min ht of 50 cm to 1 m & root collar diameter 5 mm.

Description	Points
All samples fall below the min pot size of 5", ht 50 -100 cm and root collar diameter >5 mm	0
Only 1-5 samples have min pot size of 5", ht 50 -100 cm and root collar diameter >5 mm	1
5-9 samples have have min pot size of 5", ht 50 -100 cm and root collar diameter >5 mm	2
>10 samples have min pot size of 5", ht 50 -100 cm and root collar diameter >5 mm	2.5

6. Nursery Accreditation

6.1 Rationale for Accreditation

In Nepal, there are many types of nurseries that do not have adequate quality assurance procedures. Species are being mislabeled and incorrect seed sources are being sold. There are evidences that some nurseries have entered the market without assurance of the quality seedlings. On the other hand, why should anyone buy seedlings from an established nursery instead of a new nursery that is selling a less expensive seedling? Nursery accreditation would be one way for a reputable nursery trying to follow correct practices to distinguish themselves from those that do not have the quality standards. Accreditation may also assist in supporting claims a nursery wishes to make concerning its products. For example, a nursery may produce seedlings in elevated pots and grown in a hardening bed before planting, which do not require root

pruning, and the roots of which are not curled. Accreditation is one method that can be used to certify that the seedlings produced with inoculation (rhizobia, micorriza, azetobactors etc) have the ability to be established properly in the new sites. Another nursery may wish to certify that their products are developed and grown for use within a particular state or region while another may wish to certify for superior timber production.

6.2 Benefits of accredited/ or certified nursery seedlings

- It is the basis to raise overall industrial quality and capacity of their organization
- Seed source is known and guaranteed when we have accreditation;
- It would help to support established programs to continue good practices (keeping them in business) and serve to educate newly organized nursery businesses.
- Accreditation would encourage tighter management. If we know someone is going to observe our nursery, then we would be careful in our operation;
- Accreditation should also help achieve recognition within our own organizations that we produce quality seedlings. This, in turn, can reasonably justify training for personnel as well as having good facilities.
- Accreditation can help focus on priorities; what gets counted gets done.
- The records required by an accreditation process will prepare a nursery to address challenges observed in the nursery work. Every nursery manager has to face customer complaints from time to time. A completely documented program from seed source identity to sowing through pack and ship will put the manager in a position to answer objectively any questions raised from outside the nursery concerning seedling quality.
- It helps to maintain availability of High quality seed of different tree species to the farmers through certification.
- It helps to achieve the objective of plantation
- It provides information about the place of origin and the quality of mother plant
- It helps to know the vigor of the growth, sturdiness and the degree of suitability to that site of plantation.
- It plays important role in risk minimization

6.3 Who would participate in the accreditation program?

Any individual nursery operator, local government unit, academic institute, government ncluding DFOs, nongovernment organization, cooperative, corporation/ company, small and cottage industry, Forest User Groups (CFUG, LFUG) and others with existing forest nursery can apply for nursery accreditation. In case of any forest nursery operator who is managing a forest nursery at least for the last 6 months prior to application may also apply for accreditation.

The accreditation of the nursery would be strictly voluntary and open to any nursery or seed plant wishing to participate. No one would be prevented from selling seedlings from an unaccredited nursery or seeds from an unaccredited seed plant, but the support or certifying agencies would certainly recommend the costumers to buy seedlings from accreditated nursery.

6.4 Accreditation body

The accreditation body is the organization that reviews the criteria and standards; and then conducts the evaluation and, finally, issues the accreditation certificate (Karrfalt, 2005). One possible accrediting body in Nepal for forest nursery accreditation could be composed of five members/ representatives of the following organizations at the local level. The last 4th and 5th members will only be invited by the DFO in case there is need for any further information on the applicant nursery.

1. Divisional Forest Officer or officer designated by DFO- Chair
2. Sub-division Assistant Forest Officer/ designated by AFO- Member secretary
3. District soil and water conservation Office- member
4. Local government-related representative equivalent to officer- member
5. District Agriculture Knowledge Center - member

This committee will be named as **Quality Nursery Verification Committee (QNVC)** that uses the above criteria and standards (section 5) for accreditation. This committee would provide voluntary conformity assessment and accreditation services to the participant nurseries for those who applied for accreditation. This committee is an independent committee, and strives to provide services in accordance with accepted nursery practices and internationally recognized nursery guidelines. All services are provided on a cost-recovery basis with fees as nearly equal as possible to the actual cost of providing the service.

6.5 Accreditation process and issuance of accreditation certificate

1. The nursery owner can apply with required materials as listed in box 1 to the DFO for their accreditation.

Box 1: Application requirements

a) The applicant should have the proof of the reliable seed or planting materials sources.
b) Certificate of attendance to trainings, workshops or lectures on Nursery Development and Management conducted by Forest Research and Training Center (FRTC) or Division Forest Offices (DFOs) or other agencies recognized for providing high quality training activities;
c) The nursery operator is applying the prescribed standard practices dipcted in **Section 5** above for nursery operation;
d) Recommendation from local government
e) Certificate of registration from the respective agencies
f) Recent Tax Clearance certificate

2. Application fee is proposed for NPR 1500 and renewal charge is NPR 1000.

3. DFO in consultation with the QNVC members may form the small team (two to three members). In case of DFO nursery, the Regional Director will form the nursery accreditation team for inspections and verification.
4. The designated Team reviews the submitted documents and conducts field verification and assessment according to the prescribed rating scale of the applicant nursery to be accredited and submits the report to QNVC.
5. The applicant nursery needs to secure an average of at least 20 points out of 50[1] to be qualified for accreditation (Section 5).
6. The QNVC approves or disapproves the application based on the rating scales for accreditation and promptly informs the applicant.
7. The duration of accreditation will be for 1 year and renewable for another year
8. Regular monitoring of accredited nursery shall be conducted either by the committee members or assigned technical personnel of DFO. The report will be the basis for continuous operation, suspension or cancellation of the accreditation permit.
9. Official shields, stamps, logos, or other marks may then be used on certified nursery certificates, correspondence, advertising, and promotional material to signify that the nursery has been accredited for the claims it makes for its products.
10. DFO will issue a license to the applicant. (Note: Any nursery business within the district must pay annual nursery licensing fees and be subject to DFO inspections. The costs of licensing and any other authority-mandated certifications must be included in the operational costs of the applicant nursery).

[1] There are 17 indicators and each of the first 15 indicators will have the chance of securing a maximum of 3 points and the last two have 2.5 points each (altogether 50 points)

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Annex 1: Seed source, date and germination and survival records

Species	Date of collection	Amount in kg	Source of germplasm	Planting date	Germination %	Survival %	Remarks

Annex 2: Calculation for space requirement for 10000 seedlings

Step 1: Measure the size of the pots or bags to be placed in the nursery.

Step 2: Measure the area taken up by the pots or bags. For example in a standard shed (6mx10m = 60 M^2) for transplant beds, a minimum of 10,000 poly bags of a 4"x7" size can be placed.

Step 3: Calculate the area assuming 50 % seedlings (5000) are smaller size and 50% are larger size (5000) = Area required for smaller size poly pots = 30 M^2+ area for larger size poly pots = 60 M^2 = 90 M^2

Step 4: Add 25 percent to the number of seedlings or poly pots (i.e., to allow for unexpected loss such as poor germination or death) = (90 + 25% = 112.5 M^2).

Step 5: Multiply by 2.5 for the space between beds, seedlings, walk ways and paths = 112.5x2.5 = 281 M^2

Step 6: Estimate the size of storage house (6x4), water tank/ reservoir (5x3), Germination bed (6x4), Hardening bed (6x4), mother plant area (10x25) and compost pits (2.5x2) and toilets (7x5) = 377 M^2 that will be needed.

Step 6: Double this figure to allow for space between the structures (377 x2 =754M^2).

Step 7: Add results from steps 5 and 6 to give an estimate of the total area that will be needed for the nursery (281 + 754 = 1035 M^2 = Approx. 2 *ropani*).

Annex 3: Specific standards and criteria for seven types of nursery stocks

	Polypot size, color, thickness	Height in cm/m	Root collar diameter in mm	Production period & purpose	Species and purpose
Container raised single year	3"x7" to 4"x7", black and 200 gauge	≥25 - 30 cm	≥2.5 - 3.0 cm	3 months to 1 year- for **patch or block or irregular** planting	Ipil, tanki, bakaina, lapsi, utis, pine, Flemingia, Moringa
Container raised multi-year	5”x8” or (6"-10", 10"-14"), black pots; at least 200 gauge	≥50 cm to 1 m	≥5 mm to 10 mm	2 to 4 years for **urban/avenue, road side, ceremonial & canal** planting	Champ, Tejpatta, kapur, timur, walnut, F religiosa, F. bengalensis, F benjamina and any fruit trees
Large ball rooted seedlings	NA	≥50 cm to 1 m	≥5 mm to 10 mm	6 months to 2.5 years depending upon the species and purpose (urban, roadside, canal and ceremonial)	*Terminalia arjuna, Syzygium cumuni, Mangifera indica, Albizia lebbeck, Albizia procera* etc
Stump (3-5 cm stem & 20-25 cm root portion)	Spacing in beds – 10 cm to 30 cm based on species	1 m to 2.5 m	8 mm to 25 mm	1 to 2 years	*D. sissoo, T. grandis, Grewia optiva*, *Cassia siamea*, *Leucaena* spp, *Azadirachta indica*
Cutting	5”x8” or (6"-10", 10"-14"), black pots; at least 200 gauge	15-25 cm length and 30 cm for rooted plants	8mm to 25 mm depending upon species	4- 5 months or 18 months	*Populus deltoids, Daphne, Morus alba, pear, Taxus baccata*
Bamboo seedlings	No of shoots or buds/ cutting = 3	≥ 1 m -2 m	≥ 4 cm diameter	18 months to 3.5 years depending on species and altitude	*Abundent lateral roots with dense fibrous roots*
Grafted fruit seedlings	Min 5”x8 to 10”x14” and > 200 guage thickness	≥ .5 m -1 M	≥ 10 mm	> at least > 2 years	*Mango, Litchi, Orange, Avocado, Apple*

Annex 4: Application form for nursery accreditation

(*To be completed by the applicant*) adopted from Grigorio et al 2010

Name of the Nursery: _____

Name of the Nursery Operator/ manager: _____

Address: _____

Telephone: _____Email:_____

Enclose the following:

1. Photograph of the nursery
2. Certificate of attendance to trainings related to nursery seedling production
3. Human resource involved
4. Nursery set up and facilities
5. Land area available and production capacity
6. List of seedling species registered for production and trade
7. Source of germplasm and record keeping
8. Business permit from the local government where the business is located
9. Authenticated tax clearance
10. An accreditation/administrative fee of NPR 500.00 shall be paid to the DFO upon application for individual applicant and NPR 1,000 for cooperative, corporation, small and cottage industries, NGO, private group and academic applications.