

**Guidelines for Establishment and Management of Certified
Bamboo Nurseries**

Bamboo Technical Support Group – KFRI

Kerala Forest Research Institute, Peechi

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Guidelines for Establishment and Management of Certified Bamboo Nurseries

1. Background

The National Bamboo Mission, (NBM) which has the mandate of holistic development of the bamboo sector in the country, focuses on forestry and non-forestry sectors with a major thrust on increasing productivity through plantations of selected priority species. To achieve this, use of high quality planting stock having potential for higher yield as well as adopting scientific management in all future plantation programmes is of paramount importance. The production of quality planting stock can be achieved through a regulated network of nurseries set up for production of certified planting material. This document delineates the process for establishment of Certified Bamboo Nurseries spread over the country under the monitoring of NBM through the Bamboo Nursery Certifying Agencies. The certification process involves application to the Bamboo Nursery Certifying Agencies – for approval based on certain essential and desirable criteria and granting of Certification based on inspection. The present Guidelines and the Manual for Establishment of Certified Bamboo Nurseries is the result of the scientific interaction by the Bamboo Technical Support Group (BTSG-KFRI) with the experts of the ICFRE and will pave the way for bamboo growers and forest managers to achieve the target of NBM.

2. Scope :

The objective of the present Guidelines is to facilitate the aspiring nursery manager to obtain certification for a Certified Bamboo Nursery. It gives an overview of the essential as well as desirable infrastructure and the management regime to be adopted for large scale production of quality bamboo planting material through seeds, culm and branch cuttings, rhizome transplants and hardening of micropropagated plantlets. Further details of setting up and managing a nursery will be available in the Manual for Establishment of Certified Bamboo Nursery available on the NBM website (www.nbm.nic.in).

3. Criteria for selection of nursery sites

The Nursery site should have the following features:

- Nursery site should be well drained
- Easy accessibility with good motorable roads.
- Availability of adequate labor force in the vicinity of the nursery
- Round the year availability of good quality water
- Located in area where edaphic and climatic conditions are conducive to rapid multiplication and healthy growth of propagules of the species of bamboo.
- Availability of good quality top soil preferably of alluvial type.

- Free from any legal encumbrances.
- Not affected by human interventions and wild animals.

4. Nursery layout and design:

The High-tech Bamboo Nurseries will have an area of 2 ha and a capacity to produce 50,000 propagules of the bamboo per ha per year. The Small Nursery of 0.5 ha and production capacity of 25,000 bamboo propagules per year will also be certified. The propagules will be duly certified for their quality. Efforts should be made to establish nursery at production cluster itself. The nursery should be properly fenced. Nurseries will be encouraged to go in for certification. Planting material for NBM/ MIDH will be procured from certified nurseries only.

It is desirable to have the nursery site divided into sectors so as to facilitate planning and implementation of different nursery activities in pre-designated areas which will give a modular design for the nursery.

A. Sector-1

The following infrastructural facilities may be accommodated in this sector. All future infrastructural developments/additions should also be planned and implemented only in this sector.

- Office:** An office building, best located near the main entrance with a reception, an office room for the nursery manager, hall for the administrative/technical and skilled staff and storage area for the nursery records are basic requirements. Adequate parking area for the visitors' vehicles and accessibility for vehicles for transporting propagules/nursery material to and from the nursery should be clearly planned.

In Certified Bamboo Nurseries, office automation at least at a basic level should be planned and implemented right from inception of the nursery so that all the nursery data gathered over time can be easily stored, verified and retrieved as and when required

Essential	Desirable
Office building	Mini laboratory (Electronic balance, Refrigerator, Oven, Seed Purity Board etc.)
Potting shed	
Potting media/ soil solarization or steam sterilization system with boilers	Jeep/trailer; vehicle shed
Net-house	Composting unit
High-tech green house having insect proof netting on sides and fogging/ misting systems.	
Drip/ sprinkler irrigation	

facilities	
Pump house with overhead water storage tanks	
Rhizome/ Clonal Bank *	

** In locations where space is a limitation, the Rhizome Bank may be located elsewhere but at a place easily accessible for obtaining material for propagation*

b. Laboratory: Though optional, all Certified Bamboo Nurseries should plan to have a mini laboratory attached to the nursery for use by the technical/skilled staff for observing/recording the growth and developmental irregularities if any, disease/pest problems, and nutritional deficiencies/imbances during the nursery growth of the planting stock. Facilities for storage of seeds under desiccation and low temperature should be made. Plant growth hormones and other chemicals also require proper storage facilities. A deep freezer/refrigerator would serve both the requirements. Necessary information/data are to be recorded and documented for future reference especially at the time of certification of planting material. A personal computer and accessories would therefore be essential.

Nurseries should also have facilities for the safe storage of chemicals including plant protection chemicals, fertilizers, tools etc. A water purification plant is to be provided if the water quality is not suitable and particularly if it interferes with the irrigation system. The availability of a Jeep with trailer is also desirable to facilitate transfers of planting material, fertilizers etc.

c. Composting unit: Setting up a composting unit attached to the nursery is desirable. The unit will consist of a roofed shed with partially open side walls for encouraging very good air-circulation, a shredder machine to chop the plant material, and sieves to clean the final product.

A portion of the composting shed can also be earmarked for developing a vermi-composting unit.

d. Media sterilization: Facilities for steam sterilization, soil solarization or fumigation of potting media are essential.

e. Potting shed: To carry out the work of preparing the containers, mixing the potting mix, filling the bags and potting the planting stock, a spacious shed is required in the nursery. The potting shed should be near the transplant bed with shade net so that potted planting stock can be transferred soon after potting to these transplant beds.

Mechanized container filling should be considered in case labour availability is low and costs too high.

f. Net house: A portion of the nursery should have Net house made of plastic shade nets that can cut the light intensity by 50%. These are available in different shades. These shade nets are to be stretched and spread over GI pipe fabricated structures. Mechanized shade regulation units with roller facility to roll up the shade net is presently available and can be easily installed in nurseries.

- g. High-tech green house:** Green-house with automated misting equipments and temperature control is desirable but low cost polytunnels can also be an alternative. Polytunnels are fabricated structures which can be set above the raised beds with the dome covered with UV resistant polythene sheets and sprinklers/misting units fitted inside to maintain desired humidity to encourage sprouting of buds.
- h. Irrigation systems:** In order to reduce the labour costs and to avoid wastage of water and to ensure higher survival with faster establishment and growth of bamboo planting stock, modern mechanized irrigation systems with sprinklers, misting units, high pressure pumps and filtering equipments for fertigation are essential components to be installed and used in nurseries.
- e. Pump house with overhead water storage tanks:** Pumping water from a bore-well or from a nearby river to an over head water tank will ensure continuous water availability in the nursery. Such an un-interrupted supply of water will enable the operation of sprinkler/drip/mist irrigation system in a most effective manner. To save space over head water tanks can also be installed above the RCC buildings in the nursery. The tanks should have enough storage capacity to meet at least 2 days irrigation requirements.

B. Sector-2

This sector of the nursery will accommodate the section of planting stock production. Different type of bamboo propagules (seedlings/branch/culm/rhizome/offset cuttings) are raised in different type of beds specially made for the purpose, as the management procedures are different. Raised beds for rooting the culm/branch cuttings, cubicles for propagating the offset/rhizome cuttings, transplant beds for the potted seedlings and open space for the rooted cuttings will have to be separately accommodated in this sector of the nursery.

Essential	Desirable
Container beds	Hardening area
Raised ferro - cement slab beds for rooting of culm cuttings	Grading and propagule despatch area
Ferro - cement ‘cubicles’ for rhizome cuttings	

C. Sector-3

It is essential to have a portion of the nursery (Sector-3) developed as a Rhizome Bank/Clonal Bank with selected high performing mother clumps of the priority species so that it will serve as a source of genetically superior material for vegetative propagation. This will enable the production of identified superior planting stock which can be sold with certification (refer to “Certification of Bamboo Planting Material” of NBM website (www.nbm.nic.in)). The Rhizome Bank/Clone bank can

be designed either as a block plantation or as a belt plantation along the periphery of the nursery as per the availability of space in the nursery. A Rhizome Bank is essential for every certified nursery but in locations where space is a limitation it may be located at a convenient place but easy access is to be ensured.

It should be ensured that the physiological age of the mother clumps is such that the flowering age does not interfere with a profitable commercial plantation due to gregarious flowering and death immediately after establishment. The spacing in the Rhizome/Clonal Bank depends on the species but can be lower than that adopted for plantations since full clump size and canopy is not attained as vegetative material is constantly removed for propagation. To keep the Rhizome Bank in active growth phase, proper irrigation or fertigation, preferably by providing drip irrigation, is desirable.

In regions where the planting season is such that plants have to be maintained in the nursery for a longer period (15-18 months), the shade net nursery area will be double of that required otherwise. In such situations, the area available for the Rhizome/Clonal bank would be limited and additional space will have to be found.

5. Nursery records to be maintained (All documents in soft and hard copies)

i. Nursery Journal

The nursery journal is necessary to keep the record of nursery activities and produced at the time of inspection by an NBM authorized officer/scientist/technician. The journal should contain details as listed below.

- a. A plot chart showing the location of different sectors and purpose for which they are being used.
- b. A list of different bamboo planting stock being produced and maintained in the nursery with details of its origin of the parent material.
- c. Annual production target for each type of planting stock from the nursery.
- d. Propagation protocol/method used for each batch of planting stock with date of collection of propagaules, date of hormone application, date of shifting to containers, and after care provided.etc.
- e. Whether macro-proliferation was carried out, if yes the age at which it was done/potting mix used/size of bag to which potting was carried out.
- f. Dates when grading was carried out.
- g. Date of dispatch of each batch of the planting stock.

For details, please see the Manual for Establishment and Management of High-tech Nursery on NBM website (www.nbm.nic.in).

ii. Staff /Mazdoor attendance registers

iii. Stock register

The Register should record all details regarding the production and sales of planting stock raised in the nursery so as to assist in the nursery evaluation in meeting its annual targets.

6. Compliance with certification process

Certified Bamboo Nurseries are envisaged as part of a system leading to production of certified high quality bamboo planting material for future plantations under NBM scheme. The management system should therefore be compliant with the certification process developed by NBM (See “Certification of Bamboo Planting Material” on NBM website (www.nbm.nic.in)). A batch tracking system should be implemented with proper documentation through certificates, records, labeling/tags to ensure traceability of the chain- of- custody of each and every uniform batch of planting material from the original mother clumps to the Clonal Garden/Rhizome bank, propagation system and point of sale nursery. Ideally an automated system with bar-coding and printed labels should be implemented and should accompany every item dispatched from the Certified Bamboo Nursery.

7. Management mechanism

The sale price of bamboo planting stock will depend on the production cost but a rational pricing scheme should be instituted subject to evaluation by NBM. The nursery is expected to meet all the running and maintenance cost from the sale of planting material thus becoming a self sustaining venture. The funds thus made available and the NBM contribution will be maintained as a ‘revolving fund’ for meeting the expenditure in operating the nursery in the long-term. Such a fund could be managed by the Nursery Manager who can operate a dedicated bank account for the purpose

8. Nursery certification procedure

The Application Form for Certification of Nurseries may be downloaded from the NBM website (www.nbm.nic.in (for the format, see Appendix 1&2)). The completed Form, with copies of the essential documents, is to be sent to the nearest Bamboo Nursery Certifying Agency (see list of such approved Agencies on the NBM Website (www.nbm.nic.in)) along with the prescribed fee electronically or as Demand Draft. The Proforma for documenting the diagnostic features of seeds and planting material of bamboo (Appendix 4) is also required to be submitted to ensure that only certified bamboo material correctly identified by an expert approved by NBM, is used for mass propagation and production of Certified Bamboo Planting Material. The Proforma also forms the documentation to be maintained by the nursery indicating the origin of all planting material.

After the preliminary screening, all eligible nurseries will be inspected by a team deputed by the Bamboo Nursery Certifying Agency. The Inspection team comprising of a forest officer not below the rank of Conservator of Forests and a Scientist (expert in bamboo identification) from any of the research institutions of ICFRE/ State Governments e.g. KFRI. In case the nursery meets with all the norms of NBM, Certification will be awarded (for format see Appendix 3) which will be valid for two year and can be renewed on application with prescribed fee.

9. Training of staff

Since many of the procedures involved in bamboo propagation are substantially different from the standard procedures for horticultural or ornamental crops, personnel involved in operations in the Bamboo Nursery should be trained adequately. Such training can be arranged at one of the research institutes involved in bamboo propagation and with the help of the manuals and publications available on the subject.

Appendix 1

Application form for certification of bamboo nursery

1	Name of applicant	:	
2	Full Mailing Address	:	
			PIN : State:
3	Telephone Numbers	:	
4	Email	:	
5	Name and Location of Certified Bamboo Nursery (if different from address above):	:	
6	Signature of applicant	:	
7	Name & Designation	:	
8	Date of submission	:	

Application Fee of Rs. Received (Give details of transaction)
Application complete and valid: Yes /No
Signature of applicant with date:

Application Form complete in all respects with copies of all relevant certificates should be submitted to the nearest Bamboo Nursery Certifying Agency (See list on NBM website (www.nbm.nic.in))

Proforma providing details of proposed nursery facilities

Sl.No.	Particulars	Short descriptions (strike off if not applicable)	Remarks
1.	Extent of nursery (provide a layout diagram and copy of documents to show the ownership of the land)		
2.	Fencing	Chain link/ Barbed wire/ Brush wood	
3.	Availability of water source (specify the type of water source)	River/ Tank/ Well/ Bore well	
4.	Water storage capacity		
5.	Net house area		
6.	High-tech green house area		
7.	Whether or not misting/ fogging facilities available in the Green House?		
8.	Number of propagation beds and size of each bed.		
9.	Are proper mist/ sprinkler facilities available over propagation beds or not.		
10.	Rhizome/ Clonal Bank area		
11.	Names of species/ clones being propagated		
12.	No. of clones per species available in the Rhizome Bank/ Clonal Bank		
13.	Casual labour currently engaged/ day		
14.	Availability of personnel trained in propagation techniques	Yes/No	
15.	Number of propagules produced under each category/ year (specify the	Seedlings/Culm cuttings/Rhizome or Offset cutting/Branch cutting/Tissue culture propagules	

	number under each category		
16.	Type of propagules produced	Seedling/CC/RC/BC/TC*	
17.	Chemical storage facility and mini lab available	Yes/No	
18.	Manures/fertilizers used in nursery and dosage		
19.	Prophylactic treatments being administered for the control of diseases and pests		
20.	Whether grading procedures followed in the nursery: if yes size and range of grading		
21.	Average number of tillers/height of propagules at the time of sale		
22.	Age at which propagules are sold		
23.	Cost of per unit of planting materials		
24.	No. of propagules produced and sold in the previous year		
25.	Production capacity of the nursery		
26.	List of species and types of propagules being produced		

*CC – Culm cutting/ RC – Rhizome cutting/ BC – Branch cutting/ TC – Tissue culture propagules

Date:

Signature :

Place:

Name & Designation :

Seal of Nursery

Remarks of the Bamboo Nursery Certifying Agency		
1	Name and designation of expert	
2	Observations	<ol style="list-style-type: none"> 1. Whether or not the necessary infrastructure as given under the Guidelines for Establishment and Management of Certified Bamboo Nurseries are available. 2. Whether or not the nursery has all facilities and manpower to produce and certify quality planting stock as per the Guidelines. 3. Observations and comments of the experts(s) (please attach a separate sheet, if necessary).

Recommended/ Not recommended

Signature of the Bamboo Nursery
Certifying Agency with Seal

Appendix 3

Proforma of certificate to be issued by Bamboo Nursery Certifying Agency

Bamboo Nursery Certifying Agency

No

Date:

CERTIFICATE

This is to certify that M/s..... located athaving complied with the minimum requirements of the production standards as prescribed by National Bamboo Mission (NBM) Guidelines qualifies to be an Certified Bamboo Nursery for production of certified bamboo planting Material eligible for the NBM plantation programmes. The Certification is for a period starting from.....to..... and is subject to review if the standards are not met.

Signature of Authorized Signatory
Bamboo Nursery Certifying Agency
with seal

Appendix 4

Proforma for documenting the diagnostic features of seeds and planting material of bamboo

To be submitted to one of the experts in bamboo identification on the panel given in the NBM website (www.nbm.nic.in) to obtain approval as plant material used for propagation by Certified Bamboo Nurseries.

(The Proforma also serves as the documentation maintained by the nursery for plant material used for propagation)

A. Seeds			
<i>Species :</i>			
1	(Include digital photo of seeds of at least 1:1 magnification here) Add scale in the frame		Scale : 1 mm markings
2	Seed Weight: ----- gms /100 seeds (...../Kg)		
3	<u>Seed collection</u> Date: Location of flowering clump: State : District: Taluk: Forest Range: Address, if any: GPS coordinates: Landmarks, if any:	4	<u>Collected By:</u> Name : Affiliation/Designation: Address:
5	<u>Voucher specimen</u> Serial No.: Deposited at: a. Name of repository: b. Address:	6.	Storage Conditions: a. Temperature b. Container Germination test results:
	<u>Identification done by:</u> Name of expert: Affiliation:		<u>Annexure if any:</u> Photographs of clump, Sheath morphology, inflorescence

B. Planting material derived through mass propagation techniques			
<i>Species:</i>			
Age: 6 months/12 months /older (Specify)			
1	Culm sheath: Lower nodes (No.1-3) <i>(Include digital photos of 1: 1 magnification)</i>	2	Culm sheath: Upper (upper most 2 nodes) <i>(Include digital photos of 1: 1 magnification)</i>
3	Leaf sheath: Lower <i>(Include digital photos of 1: 1 magnification)</i>	4	Leaf sheath: Upper <i>(Include digital photos of 1: 1 magnification)</i>
5	<u>Other morphological features:</u> Trichomes on sheath: Length: Colour: Trichomes on leaf lamina Dorsal : Ventral: Length Colour <i>(Include digital photographs)</i>	6	<u>Length /breadth ratio of leaf lamina</u> Mean leaf length of 5 leaves : Mean leaf breadth of 5 leaves:
7	Branching pattern at the lowest available node <i>(Include digital photos of 1: 1 magnification)</i>	8	Culm diameter: a. Previous year's shoot b. Current year's shoot Internode length: a. Previous year's shoot b. Current year's shoot

c. Observations of the Expert

9	Identification of species	:	Identity of species in case of seeds:
		:	Identity of species based on juvenile morphology of propagules:
		:	Additional plant material /information required
		:	Visit to location required
		:	Other remarks:
10	Recommendations	:	(i) The plant material submitted is identified as : (ii) Comments, if any.
10	Signature , Date Name and Address of Expert	:	