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**APPROVED GUIDELINES FOR  
TESTING AND RELEASING OF  
TREE VARIETIES AND CLONES**



**INDIAN COUNCIL OF FORESTRY  
RESEARCH AND EDUCATION**

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# APPROVED GUIDELINES FOR TESTING AND RELEASING OF TREE VARIETIES AND CLONES

## DEFINITIONS

Clone	: The genetically uniform individuals (ramets) propagated vegetatively from a single sexually produced individual (ortet).
Clonal test	: A field planting of several to many clones to estimate relative performance of different genotypes (clones), but not necessarily provide information on breeding behavior.
Entry	: A newly developed line / strain / clone included for genetic evaluation in the multi-location trials.
Gene Bank	: Large collection of germplasm representing materials from various parts of the world for long term genetic improvement programme.
Genotype	: The specific set of genes possessed by an individual, both expressed and recessive.
Genotypic x Environmental interactions	: Changes in rank or levels of performance among individuals when tested in different environments through clonal and progeny trials.
Germplasm	: All materials produced by sexual and asexual means used for plant production.
Mass selection	: Breeding method whereby seed from a number of individuals is selected to form the next generation.
Population improvement	: Improvement of random mating population through a scheme of selection with or without progeny tests. It is essential to keep inbreeding to a low level.
Progeny test	: A test in which the breeding values of the parents are evaluated and ranked on the basis of the performance of their offspring.
Provenance	: The geographic origin of population. Mostly for the ultimate natural origin implying where the population evolved prior to human intervention.
Pure line	: Progeny of a single homozygous self-pollinated plant.
Ramet	: An individual vegetative propagule of an ortet called ramet.
Recurrent selection	: In cross-pollinated populations, scheme of selection (on the basis of phenotype or progeny tests) followed by inter-mating (in all combinations) of the selected plants or their selected progeny to produce the population for the next cycle of selection. In this kind of selection, more than one cycle of selection is practiced.
Trait or character	: A distinctive but not necessarily invariable feature exhibited by all individuals of a group and capable of being described or measured. A character of a given individual will have a certain

phenotype as determined by the individuals genotype and environment.

**Variety** : A distinctive seedling population or a clone, usually that possesses enough desirable characteristics to be commonly cultivated. Though in agriculture and horticulture all the plants with in a variety are usually quite uniform genetically, in forestry the variability within a variety is much greater.

### ABBREVIATIONS

<b>AIVTC</b>	: All India Variety Testing Committee
<b>FDCs</b>	: Forest Development Corporations
<b>GDP</b>	: Gross Domestic Product
<b>ICAR</b>	: Indian Council of Agriculture Research
<b>ICFRE</b>	: Indian Council of Forestry Research & Education
<b>MAI</b>	: Mean Annual Increment
<b>MLT</b>	: Multi Location Trials
<b>MoEF</b>	: Ministry of Environment and Forests
<b>NBSS&amp; LUP</b>	: National Bureau of Soil Survey and Land Use Planning,
<b>PPV&amp;FRA</b>	: Protection of Plant Varieties and Farmers' Right Authority,
<b>RVTC</b>	: Regional Variety Testing Committee
<b>SFDs</b>	: State Forest Departments

## INTRODUCTION

The total productivity of Indian forests is only 15 million m<sup>3</sup> of industrial timber and 195 million m<sup>3</sup> of firewood. However, the requirement of various woods by year 2010 has been projected to 344 million tonnes of fuel wood and charcoal, 37 million m<sup>3</sup> of industrial wood, 33 million m<sup>3</sup> sawn timber, 5.7 million m<sup>3</sup> pulp and paper wood and 1.3 million tonnes of wood based panels (Lal, 2000). The demand is likely to increase significantly to achieve 10 per cent gross domestic product (GDP) growth targeted for 11<sup>th</sup> five-year plan. The mean annual increment (MAI) of Indian forests is less than 1.0 m<sup>3</sup>ha<sup>-1</sup>yr<sup>-1</sup> against the world average 2.1 m<sup>3</sup>ha<sup>-1</sup>yr<sup>-1</sup> has been contributing largely to the deficit and is a cause of concern (Lal, 2000). In fact, India with just 2.5 per cent land area of planet earth is supporting 15 per cent of human population and substantially large population of livestock. Unsustainable land use practices have contributed to the degradation of about 20.17 per cent of the total geographical of landmass (Anon., 2003). The situation has been alarming and immediate steps are required to increase the productivity of forests substantially, either by enhancing the total forest cover or by increasing productivity per unit area. Ironically, it may not be feasible to increase forest cover with large population size, and the possible option to bridge the gap between demand and supply is to enhance the productivity of existing forests and plantations

Contribution of different tree improvement methods has significantly been realized for increased productivity globally. Though in India, a number of tree improvement programmes are being carried out since long, for selecting plus trees and clonal propagation, there has been limited research on testing of these superior plus trees through progeny and clonal trials on multi-location basis. In fact, there is no policy for tree breeder/geneticist to necessarily conduct systematic progeny/clonal trials before declaring them as elite planting stock.

The aim of forest geneticists and tree breeders is always towards development of superior genotypes of various forest species with higher merchantable biomass that are resistant to disease and insect-pests, with a wider adaptability to different soils and environmental conditions. It is a well known fact that a tree improvement programme is strategically essential, the interim gain of such programme mostly utilized by adopting clonal forestry and using improved seeds from production populations. The forest geneticists and tree breeders can also exert wide influence over the genetic variation of future forests and / or plantations by reducing costs.

## GENETIC IMPROVEMENT AND TESTING

An introspection of tree improvement programme carried out in India revealed that a number of divergent lines in *Eucalyptus tereticornis*,

*Eucalyptus camaldulensis* (Verma *et al.*, 1994), *Casuarina equisetifolia* (Kumar and Gurumurthi, 2003), *Tectona grandis* (Dakshindas and Gogate, 1995), *Gmelina arborea* (Kumar, 2007, Kumar *et al.*, 2003), *Populus deltoides* (Jones and Lal, 1989) still exists and could be used in breeding and tree improvement. In these species substantial improvement in yield could easily be brought, if new recombinants are synthesized using genetically distinct parents and propagated as far as possible clonally. Nevertheless, the recombinants need to be field tested prior to their introduction in afforestation programme.

In India, Eucalypts and Poplars are two major forest tree species that have been improved genetically, and the clonal plantations have been adopted in farm /agro-forestry systems on commercial scale (Lal, 1998). Screening of genetically suitable planting stock and its multiplication through clonal means involves higher cost and management during production. It is therefore, necessary not only to release the promising varieties but also register them with an appropriate agency so that unethical suppliers do not market inferior stock. For example, in the absence of registration of the planting stock, a large number of companies have already started marketing of clonal planting stock of Poplars in Punjab, Haryana, Uttarakhand and Uttar Pradesh (Lal, 1998; Chandra, 1998). The requirement of releasing of superior / promising varieties is a long pending issue and needs a resolution at the earliest possible (Kumar *et al.*, 2001).

In this context, concrete procedures are to be designed so that identified genotypes developed through extensive research are maintained, tested and most importantly made a part of plantation programme. The testing guidelines from submission of an entry to the release of a variety / clone are discussed hereunder :

#### TESTING COMMITTEES

To facilitate the identification and screening of elite genotypes, it is imperative that entire procedure is institutionalized to ensure a time bound schedule of operations. The programme may be carried out jointly by the researchers, foresters and forest based industries through Regional and All India Coordinated Trials. It is thus, proposed to constitute the Regional Variety Testing Committees (RVTCs) and All India Variety Testing Committees (AIVTCs) for uniform testing of selected genotypes in the following manner;

- **Regional Variety Testing Committee (RVTC) :** The regional institutes of the ICFRE may operate the RVTC for a particular location. The RVTC will consist of one chairperson, seven expert members and a member secretary. This committee will be constituted under the supervision of the Director of the regional institute in consultation with the Deputy Director

General (Research), Indian Council of Forestry Research and Education (ICFRE) in the following manner;

S. No.	Position RVTC	Organization
1	Chairperson	Director, Regional Institute of the ICFRE
2	Members (7)	<ul style="list-style-type: none"> <li>• Coordinator, Implementation Team</li> <li>• Two outside (other than ICFRE &amp; MoEF), subject experts</li> <li>• Four members from the State Forest Departments (SFDs'), Forest Development Corporations (FDCs'), State Universities, National Research Centre for Agroforestry, Forest Based Industries and progressive farmer</li> </ul> <p>The members should have appropriate qualification and may be specialized in analytical / organic chemistry, forest pathology, forest entomology, tree physiology</p>
3	Member Secretary	Head of the Division of Genetics / Tree Improvement / Tree Breeding of the regional ICFRE Institute

• **All India Variety Testing Committee (AIVTC):** Similar to RVTC, AIVTC will also be formed, and will be headed by a chairperson assisted by twenty expert members and a member secretary. The Director General, ICFRE will be the Chairperson of AIVTC and the Deputy Director General (Research), ICFRE will function as the Member Secretary for AIVTC. The Chairpersons of RVTCs' and Coordinators of the Implementation teams will automatically be the members of AIVTC. The constitution of the committee may be as follows:

S. No.	Position AIVTC	Organization
1	Chairperson	Director General, ICFRE
2	Members (20)	<ul style="list-style-type: none"> <li>• Two outside subject experts (other than ICFRE &amp; MoEF)</li> <li>• All the Chairpersons of the Regional Variety Testing Committee</li> <li>• Two ICFRE experts</li> <li>• All coordinators, implementation teams (8)</li> </ul>
3	Member Secretary	Deputy Director General (Research), ICFRE

## ADMINISTRATIVE REGIONS

In different agro-climatic regions, the soil and climatic conditions show a large variation. On the basis of these variations, the National Bureau of Soil Survey and Land Use Planning, Nagpur (NBSS&LUP) has identified twenty agro-ecological regions in India. It is proposed to make eight administrative jurisdiction of RVTC based on twenty agro-ecological regions and forest types (Table 1 and Fig. 1).

Table 1. Administrative regions proposed for the testing of planting stock.

RVTC Zones	Name of the Institute	States/Union Territories	Forest Types	Agro ecological regions*		
				No	Map unit	Physiography
I	Himalayan Forest Research Institute, Shimla	Himachal Pradesh and Jammu & Kashmir	Subtropical Pine	1	A13E1	Western Himalayas
			Himalayan Moist Temperate Himalayan Dry Temperate Sub-Alpine and Alpine	14	A15C/B//A/5	Western Himalayas
II	Forest Research Institute, Dehradun	Haryana, Chandigarh, Punjab, Uttarakhand, Uttar Pradesh and Delhi NCR	Tropical Moist Deciduous	4	N8D2	Northern plain & central highlands
			Tropical Dry Deciduous	9	N8C3	Northern plains
			Tropical Thorn	13	08C4	Eastern plains
			Shiwalik Sal	14	A15C/B//A/5	Western Himalayas
			Subtropical Pine Himalayan Moist Temperate Himalayan Dry Temperate Sub-Alpine and Alpine			
III	Arid Forest Research Institute, Jodhpur	Gujarat and Rajasthan	Tropical Dry Deciduous	2	M9E1	Western plain and Kachchha Peninsula
			Tropical Thorn	4	N8D2	Eastern plains
			Sub-Tropical Broad Leaved Hill	5	15D2	Central highlands and Gujarat plains
IV	Tropical Forest Research Institute, Jabalpur	Maharashtra, Chhattisgarh, Madhya Pradesh, Orissa	Tropical Wet Evergreen	4	N8D2	Eastern plains
			Tropical Semi Evergreen	5	15D2	Central highlands and Gujarat plains
			Tropical Moist Deciduous	6	K4D2	Deccan plateau
			Tropical Dry Deciduous	10	16C3/4	Central highlands
			Tropical Thorn	11	J3C3	Eastern plateau
V	Institute of Wood Science & Technology, Bangalore	Goa, Andhra Pradesh and Karnataka	Tropical Wet Evergreen	3	K6E1	Deccan plateau
			Tropical Semi Evergreen	7	K6D2	Deccan plateau (Telangana)
			Tropical Moist Deciduous	8	H1D2	Eastern ghats (TN uplands & Deccan plateau Karnataka)
			Tropical Dry Deciduous	18	S7CD25	Eastern coastal plains
			Tropical Thorn	19	E2B/A5	Western ghats & coastal plains
VI	Institute of Forest Genetics & Tree Breeding, Coimbatore	Kerala, Lakshadweep, Pondicherry, Tamil Nadu and Andaman & Nicobar Islands	Tropical Wet Evergreen	8	H1D2	Eastern ghats (TN uplands & Deccan plateau Karnataka)
			Tropical Moist Deciduous	18	S7CD25	Eastern coastal plains
			Tropical Dry Deciduous	20	T1B/A5 & T1A/B5	Islands of A & N and Lakshadweep
			Tropical Thorn			
VII	Institute of Forest Productivity, Ranchi	Bihar, Jharkhand, and West Bengal	Tropical Semi Evergreen	11	J3C3	Eastern plateau
			Tropical Moist Deciduous	12	J2C3/4	Eastern ghats and plateau
			Tropical Dry Deciduous	13	08C4	Eastern plains
			Littoral and Swamp	15	08BA/C5 & 08C/BA5	Bengal basin and Assam plains
VIII	Rain Forest Research Institute, Jorhat	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura	Tropical Wet Evergreen	15	08BA/C5 & 08C/BA5	Bengal basin and Assam plains
			Tropical Semi Evergreen	16	C11A5	
			Tropical Moist Deciduous Subtropical Pine Montane Wet Temperate Sub-Alpine and Alpine Sub-Tropical Broad Leaved Hill	17	D2A5	Eastern Himalayas Northeastern hills

\* NBSS&LUP (1992)

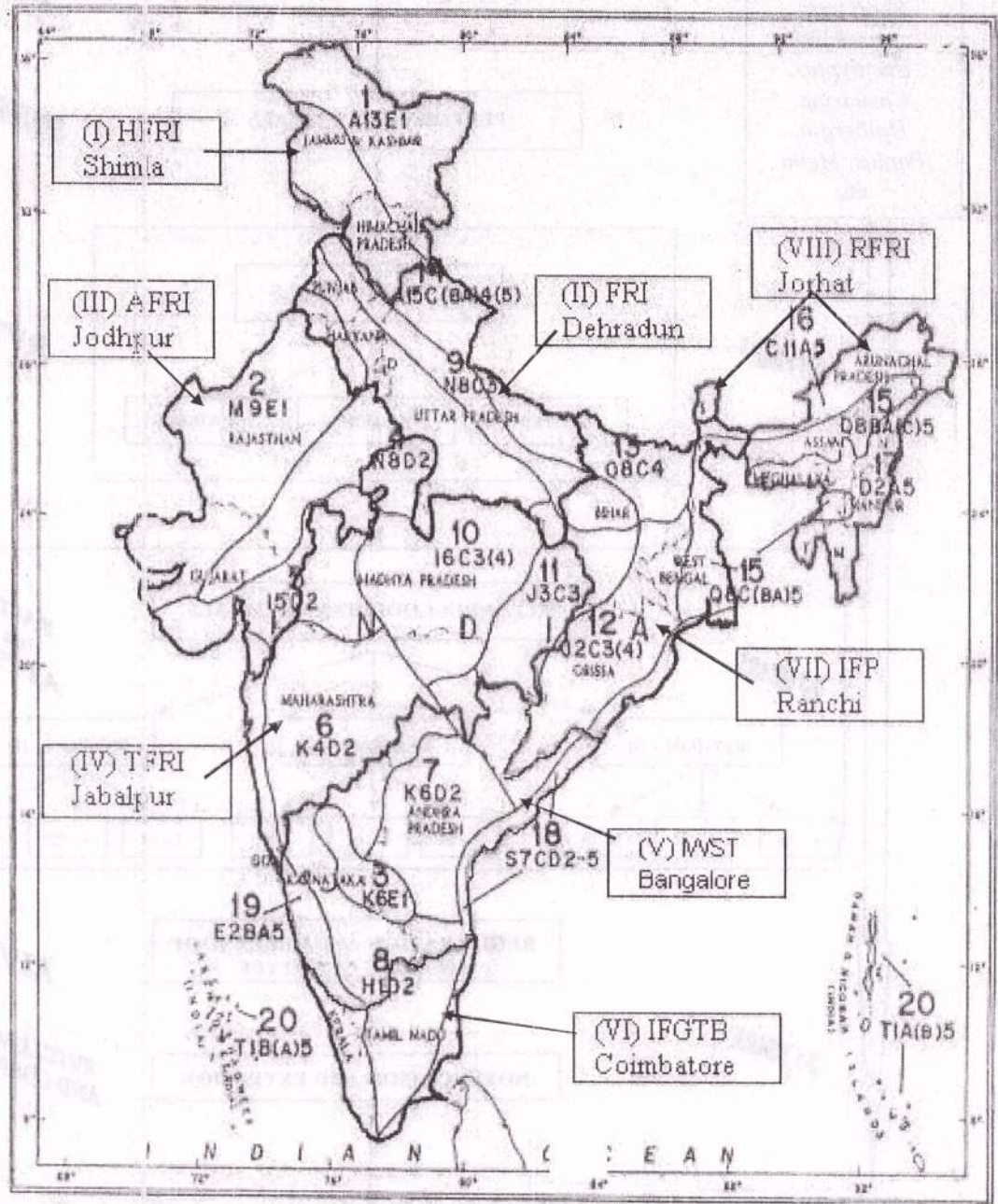


Fig. 1. Proposed eight testing regions of India



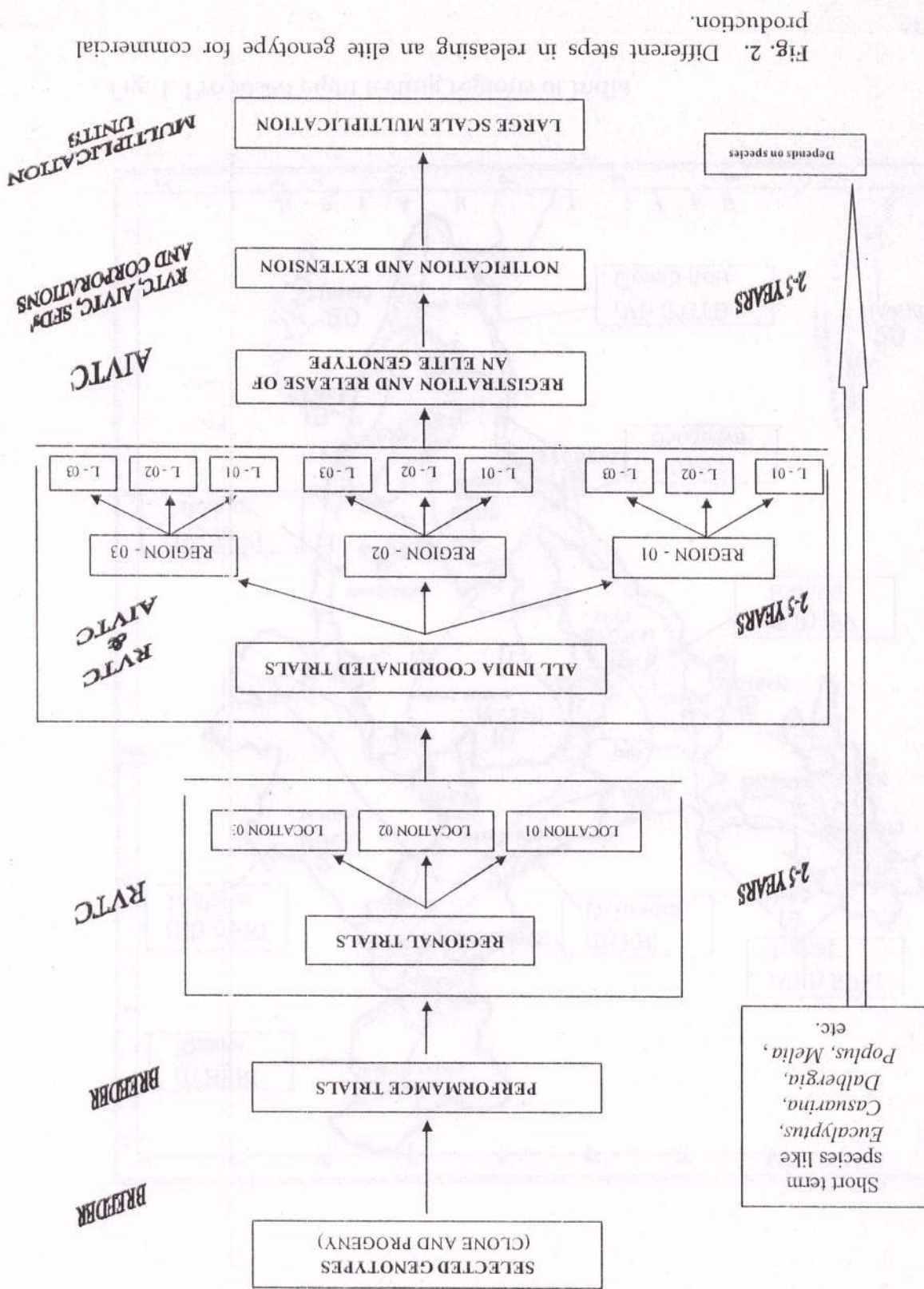


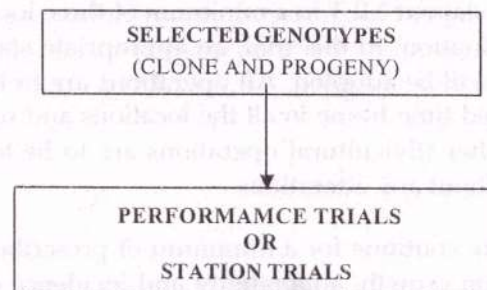
Fig. 2. Different steps in releasing an elite genotype for commercial production.

## ROLE OF COMMITTEES IN TESTING OF PLANTING STOCK

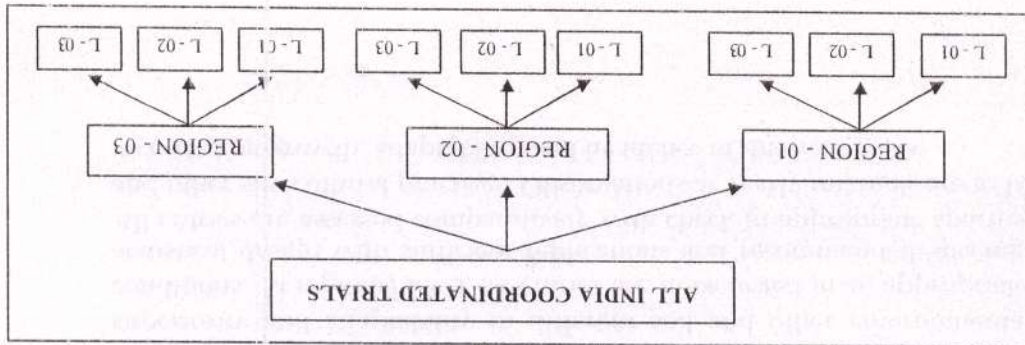
The superiority of various genotypes over checks /controls will be tested in different trials to be conducted at regional and all India basis. The genotypes showing promising results will then be recommended for release under proper name by the AIVTC. The released genotypes need thereafter to be popularized through various extension activities (Fig. 2).

- **Performance trials:** The performance trials are conducted by the breeder/geneticists, who are in the process of development and screening of superior genotype(s). Through performance or breeder's trials superior performers are screened and identified and promoted for regional and All India Coordinated Trials. These trials are conducted at the discretion of breeder and geneticist.

Under these trials, entries are tested in an appropriate statistical design with a minimum of three replications (number of replication may be enhanced to four to six depending upon the resources). Uniform conditions are applied to all the entries strictly. All entries are assessed comparatively with check in appropriate spacing and other silvicultural practices. Checks may be selected from locally available planting material with the State Forest Department and nurseries. Yearly observations are collected from these entries and are analyzed and compared. The best performing entries are promoted to the regional trials.

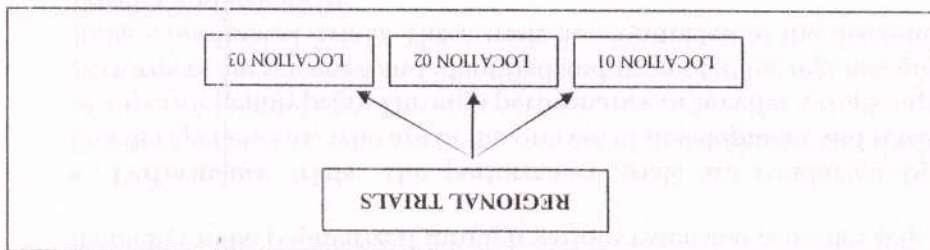


- **Regional trials:** The regional trials will be conducted in the supervision of RVTC to assess and evaluate the performance uniformly. The promoted entries from performance trials of different organizations will be laid out in a minimum of three locations of the region belonging as far as possible to different agro-ecological zones for examining their superiority and adaptability in different soil and other environmental conditions. At regional level, all entries are to be tested in an appropriate statistical design with sufficient replications and recommended spacing. All entries are assessed comparatively with check in appropriate spacing and other silvicultural practices. Observations at yearly intervals are to be recorded on growth, adaptability and incidence of different pests.



The MLTs may continue for a minimum of prescribed period and yearly observations on growth, adaptability and incidence of different pests are to be recorded. Additionally, emphasis should also be given on advanced traits like wood properties and suitability for the industry. Top 1 to 5 entries may be recommended for release as a new variety(ies) / clone(s) in the annual workshop of AIVTC.

All India coordinated trials: These trials will be conducted in the supervision of AIVTC, and may be called multilocation trials (MLT). The entries in this trial may be restricted to the maximum of five from a single region. These trials will be conducted to select outstanding entries for the country through the evaluation of best regional entries. The AIVTC will receive entries from different RVTCS annually. The entries received by AIVTC will be given uniform code for unbiased evaluation. Entries received during the year may become a set, to be evaluated in a minimum of three administrative regions of its distribution. The AIVTC may provide design and observation sheet for MLTs. It is momentous to layout MLT in a minimum of three locations of each region for wider evaluation. In this trial, an appropriate statistical design along with a check will be adopted. All operations are to be completed strictly within specified time frame in all the locations and regions. The planting design and other silvicultural operations are to be followed as provided by AIVTC without any alterations.



After tabulation and analysis, selected entries may be recommended for release at regional level or promoted to the All India Testing Trials under AIVTC. The breeders' trial could even be converted to one of the regional trial by RVTCC to save time, manpower, and material.

## EVALUATION AND INSPECTION

- **Submission of entries**

It will be the first step in the process of carrying out evaluation and testing of promising entries to be recommended for release and deployment at a commercial scale. The Principal Investigators and/or Co-Investigators working on genetic improvement of a particular tree species will conduct breeders' / performance trials themselves. These trials will help in selecting some entries for promotion to the regional trials, to be conducted by the breeder himself using proper statistical design along with a check or control. The control used in this trial need to be the best genotype available in that particular species in the location or region so that the entries with better performance than the control are selected for further testing.

The entries found promising at breeder / performance trial will be promoted to the RVTC of that particular region. The details of the entry along with the planting material in sufficient quantity should also to be supplied for the test. The entries to be tested along with their details are to be submitted to the Member Secretary, RVTC in a proforma attached as Annexure I. An entry (progeny / clone) will be tested under regional trial and all India trials only as per the preference / choice of the breeder / grower.

- **Experimental designs**

Forestry experiments often require large areas, are usually of long duration and variations in the experimental material are high. Appropriate statistical techniques are required to address these issues. Such experiments cannot be designed using a thumb rule for all the locations/sites. Considerations of plot size, availability of experimental material, shape of land, presence of biotic factors, etc. affects the type of design that needs to be adopted for the experiment. All the more important is the analysis across sites to account for multi-location trials, which are inherent in any tree introduction programme. Techniques like bi-plot analysis, joint regression analysis are available for analyzing data generated from multi-location trials. Stability and adaptability are equally important, as the investments in forestry practices are usually large and any deviation from a logical sequence is bound to affect the results or returns at a later stage.

Designs such as Alpha - designs (row - column designs), incomplete block designs, lattices designs, etc., are available to design forest tree varietal trials. In case the number of varieties/clones are large, special designs that cover relatively less area and allow comparisons of all the pairs should be used. However, such issues can be addresses only after

the details of experimental material, land availability for the experiment, spacing, etc. are available. It is therefore, important to consult a statistician for proper designing of experiments and analysis of results.

- **Evaluation parameters**

Though the parameters for evaluation under different trials, both for long and short rotation tree species, will vary with species and the purpose for which it is being evaluated, a brief list of morphological parameters to be included for regional and all India trials could be as follows:

- Survival rate
- Height of the plants / trees
- Collar diameters / diameter at breast height
- Self pruning ability
- Branching habit
- Clear bole height
- Incidences of disease
- Incidences of major insects
- Mean annual increment and yield or biomass production
- Any other specific parameter

However, the list of parameters will change substantially when the end use is very specific. For example if a species is being tested for the production of higher volume of wood and quality pulp then additional parameters need to be included during the tests. Similar could be the case with medicinal plants whereby the bio-active principals will be main parameter for identification of suitable cultivar.

- **Timeframe**

It is necessary that all the trials are evaluated in a time frame for the testing at various levels, so that eclipse of long gestation period is taken care in a very effective manner. Indeed the real testing process starts from the establishment of regional trials. It is suggested that for short rotation tree crops like *Eucalyptus*, *Casuarina*, *Gmelina*, *Leucaena*, *Melia* etc. the evaluation for growth traits may begin from first year onwards. However, inspection for specific traits like pulping and timber quality should start only after half of the rotation age. In such cases, the chemical analysis for pulping needs to be taken up only after 5 to 6 years of age.

- **Implementation teams**

Once the entries to be tested are finalized and coded, the planting material will be supplied to the implementation team for the establishment of trials in the fields. After the establishment of trials, the implementation team will visit the trials periodically and will ensure data recording and updating of plantation registers etc. The team will inspect the growth trends and other valuable parameters for proper

interpretation. The team will also ensure that uniform inputs are provided as far as possible to all the trials over the locations and durations. Inspection teams at regional and all India level will be as per following:

S. No.	Implementation team*	Details
1	Coordinator	A tree breeder / geneticist / expert of ICFRE Institute
2	Members (5)	<ul style="list-style-type: none"> <li>• One outside (other than ICFRE &amp; MoEF), subject matter expert</li> <li>• Two tree breeders or geneticists of the regional institute(s) of ICFRE, of which one should be the species specialist</li> <li>• One forest statistician</li> <li>• One member from either State Forest Department (SFDs') or Forest Development Corporation (FDCs') or State University or Wood Based Industry</li> </ul>

\*Note : The implementation team will be supported by two Research Assistants and four contractual staff (JRF/SRF/RA) to be provided by the regional ICFRE institutes for effective execution of the ground level works

#### EVALUATION MECHANISM

The implementation team will also have the responsibility of the evaluation of the trial at periodic intervals and give its feedbacks to RVTC. In short rotation tree species like *Eucalyptus*, *Casuarina*, *Dalbergia*, *Gmelina* and others, it is recommended that implementation team starts inspection right from second year itself so that even the early trends are known. The team will ensure that all the entries are examined properly without any biasness.

#### AVAILABILITY OF LAND FOR THE TRIALS

The regional and all India trials will be established in the land earmarked for this purpose. Member Secretary, RVTC and AIVTC will discuss this issue with various state forest departments and get some land allotted from the state for this purpose. This will be done in consultation with the breeders, where the entries are to be evaluated. The state forest departments should provide quality land for this purpose. When an industrial tree is being tested, various wood based industries may also be contacted for providing the required land.

#### RELEASE OF ELITE VARIETY (CLONE / PROGENY)

Elite entries (clones / progenies) identified by RVTC or AIVTC as new variety will be released in the annual workshop of the variety releasing

committee (VRC). In this workshop, the Principal and Associate Investigators of the project will be invited.

The proposal for release of identified variety is to be moved in a prescribed proforma by the Principal and Associate Investigators. The proforma and evaluation observations of MLTs at the stages of testing are to be supplied by the Principal and Associate Investigators. Subsequently, Principal and Associate Investigators may incorporate evaluation details of performance, Regional and All India Coordinated Trials in the prescribed proforma and submit to the variety releasing committee (VRC) in a stipulated time. The workshop may consider the proposal for release of variety if it records substantial superiority over the check with regard to yield and / or other traits of economic value. A variety / clone may also be considered for release if it is comparable to the check or control in yield and superior to other important characters like resistance to the pests.

The variety considered for release may be given proper name in consultation with Principal and Associate Investigators following proper procedure / guidelines. Further, they should be permitted for planting in demonstration trials, and multiplied on large scale.

#### VARIETY RELEASING COMMITTEE

The Director General (Forests), Ministry of Environment and Forests, Government of India will be Chairperson of the Variety Releasing Committee (VRC). There will be ten other members and a member secretary for the committee as detailed below;

1	Director General (Forests)	Chairperson
2	Director General, ICFRE (Chairperson, AIVTC)	Co-Chairperson
4	Chairpersons, RVTCs	Members (8)
5	Principal Chief Conservator of Forests (on rotation)	Members (2)
6	Two Specialists with outstanding contributions in the field of genetics and breeding	Members (2)
7	Deputy Director General (Research), ICFRE	Member Secretary

The proposal for release of a variety may be submitted by the Principal and Associate Investigators to the Member Secretary, Releasing Committee at least six months in advance. The proposal may list all the

details of identified variety(ies) / clones, its pedigree and methods used for its development.

The Member Secretary, Variety Releasing Committee may screen and scrutinize the proposal in consultation with the Chairperson for validation of the facts supplied in the proforma (Annexure II). The Principal and Co-Investigators may accordingly be informed for detailed presentation in the workshop.

ICFRE will maintain the record of the tested and released varieties in the form of registration at ICFRE level, and an accession number will be allotted to the released variety / clone. A certificate for the released and tested varieties will be issued by the ICFRE to the concerned breeder / developer.

Once the VRC finds a variety suitable for the release, it will issue the details of the variety as per proforma given in Annexure III.

#### **NOTIFICATION AND EXTENSION**

Once a variety or a clone is released for large scale planting, systematic notification and extension may be carried out. The ICFRE will take necessary steps so that all the released varieties / clones are published in gazette of Government of India. These varieties need also to be notified in all forestry and related research journals and newspapers along with brief description. It will also appear in annual reports and newsletters so that end users are made aware about promising planting stock. It would be of immense use if the information is also placed on the website of ICFRE and the MoEF.

Thereafter, proper extension programme to popularize the identified varieties / genotypes may be carried out vigorously. Advertisements in national and local newspapers and magazines in different languages, highlighting the advantages of the improved planting stock over unimproved stock, are followed regularly. Leaflets giving the details of identified varieties are to be prepared and distributed among the users. Besides, the print and electronic media need to be tapped wherever possible to derive maximum mileage. Regional and national workshops may also be held and researchers, forest officials / managers and wood based industries must be made aware of the improved planting stock and the economic benefits expected to be accrued. It would be appropriate if a notification from the MoEF is released to make mandatory on the state forest departments that further plantations of that particular species will be carried out compulsorily with the released variety only.



## REGISTRATION

The Intellectual Rights of the proposed / released variety need to be safeguarded through its registration with the Protection of Plant Varieties and Farmers' Right Authority, New Delhi (PPV&FRA). Once a variety has been proposed for its release on commercial scale, the Principal and Associate Investigators must take necessary steps simultaneously for its registration by furnishing the stable morphological descriptors with PPV&FRA.

## FINANCIAL IMPLICATIONS

The described procedure of testing and releasing of tree varieties and clones is technically essential component for enhancing the productivity and also an important step to protect the intellectual property rights of the forestry resources. It is therefore essential to develop required infrastructure and resources for testing and releasing of tree varieties and clones. The financial requirements to complete all the procedures will be met by the ICFRE / MoEF. The ICFRE in turn will charge nominal fee from different organizations / individuals enterprising to test their planting stock. With the help of the document prepared by the Technology Information, Forecasting and Assessment Council (TIFAC), Department of Science and Technology, New Delhi (Anon., 2007), the cost for testing and evaluation of different entries supplied by different organizations both at Regional and All India basis has been worked out as follows;

S. No.	Name of the organization	Cost of testing per location	
		Regional	National
1	ICFRE / State Governments / ICAR and other Government R & Ds	Rs. 25,000	Rs. 50,000
2	Commercial organization	Rs. 50,000	Rs.1,00,000
3	Individuals and Farmers	Rs. 5,000	Rs. 10,000

## CONCLUSION

The entire spectrum of operations will require about ten to fifteen years of research and extension work with constant monitoring. It is envisaged to obtain the cooperation of the agencies that stand to gain directly by the research findings. The wider canvas and systemization of the process of analysis and transfer of improved planting stock will help in bridging the gap between demand and supply of different woods. It may even be

made mandatory that all the State Forest Department and State Forest Development Corporations use only improved planting stock in future plantation programme.

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MID-TERM EVALUATION PROFORMA INDIAN COUNCIL OF FORESTRY RESEARCH AND EDUCATION			
Name and address of the evaluator			
Name and address of other team members		1.	
		2.	
Date of evaluation/period of recording			
Design of experiment			
Other relevant details			
GENERAL INFORMATION			
1.	Date of planting	2.	Design of experiment
3.	Species name	4.	Common name
5.	Spacing of trial	6.	No. of entries
7.	State	8.	Forest Division
9.	Altitude	10.	Latitude
11.	Longitude	12.	Temperature
13.	Soil type	14.	Topography
15.	Fertilizers	16.	Pit size
a. Basal dose	b. Top dressing	17.	Other silviculture practices
i.	i.	i.	
ii.	ii.	ii.	
iii.	iii.	iii.	
TECHNICAL INFORMATION			
Characters	Static	PHOTOGRAPH OF THE TRIAL	
Survival rate			
Height (m)			
Diameter at breast height (cm)			
Clear bole height (m)			
Collar diameter (cm)			
Straightness			
Crown diameter (m)			
Crown shape			
Branching habit			
Pruning			
Flowering			
Fruiting			
Disease			
Insects			
Others			

## STATISTICAL ANALYSIS AND OUTPUTS

- i. Analysis of variance
- ii. Analysis of different genetic tests
- iii. Adaptability analysis
- iv. Stability analysis
- v. Performance over the years and locations
- vi. Ranking of entries (traitwise)
- vii. Conclusion

Signature of the evaluators

## ANNEXTURE III

<b>PROFORMA FOR NOTIFICATION OF A VARIETY</b>	
<b>INDIAN COUNCIL OF FORESTRY RESEARCH AND EDUCATION</b>	
1.	State / Region
2.	Name of the species
3.	Name of the variety under which released
4.	Year of release
	a. Parentage and details of the pedigree
	b. Source of material
	c. Breeding methods
5.	General characteristics of the variety
6.	Institute responsible for maintaining the breeding stock
7.	Details description of the variety / hybrid. Please give minimum of two identifiable and distinguishable morphological characteristic of the variety and hybrid
8.	Details of the resistance for disease, insects and other pests
9.	Recommended silvicultural practices
10.	Recommendation of the VRC on the basis of the workshop
11.	Signature of the members of VRC
	<b>Member 1</b>
	<b>Member 2</b>
	<b>Member 3</b>
	<b>Member 4</b>
	<b>Member 5</b>
	<b>Member 6</b>
	<b>Member 7</b>
	<b>Member 8</b>
	<b>Specialist 1</b>
	<b>Specialist 2</b>
	<b>PCCF 1</b>
	<b>PCCF 2</b>
	<b>Member Secretary</b>
	<b>Co-Chairperson</b>
	<b>Chairperson</b>