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ENVIS Newsletter
Forest Genetic Resources & Tree Improvement

VAN VIGYAN

INSTITUTE OF FOREST GENETICS AND TREE BREEDING

(Indian Council of Forestry Research and Education)

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IN THIS ISSUE

From the Director's Desk

With increasing interest in raising profitable tree species on available lands in the country, there is a growing awareness on the significant role of tree genetic resources in providing economic solutions for rural areas. Programmes like the Green India Mission and Trees Outside Forests encourage tree planting throughout the country especially along bunds, in unproductive or fallow lands and as agroforestry crops. They aim to enhance tree cover outside natural forests to check the alarming rate of shrinkage of this natural resource.

The ENVIS newsletter is an effort to disseminate information generated on FGRs and tree improvement by various organisations. Through this effort, the Institute would be able to keep all stakeholders updated on the status of forest genetic resources, provide detailed information on various tree improvement activities already carried out and being pursued on different tree species in various parts of the country for the benefit of all, supply information on availability of quality planting material of tree species, periodic publication of research activities carried out on FGRs by different stakeholders which includes research organizations, state forest departments, universities, wood based industries etc.

In this issue of the quarterly newsletter under ENVIS, 'Know your tree' section carries information on Mahogany tree. We plan to bring out information related to FGRs and tree improvement in the form of articles, reports and documents. The ENVIS team sincerely looks forward to your suggestions and feedbacks and seeks your support and co-operation.

R.S. Prashanth
Director

INDUSTREES FOR INDUSTRIES

Breeding trees for mere biomass is getting obsolete globally, time now demands to breed specific industrial traits from appropriate genetic resources. In 1996, when Eucalypt domestication on Red Gums got initiated at Institute of Forest Genetics and Tree Breeding (IFGTB), pedigreed hybrid even at intra-specific level was a distant dream. Though success stories existed within the country and elsewhere, to IFGTB, intersectional hybrids (*Exsertaria x Transversia*) remained a hypothesis. With *E. grandis* having smaller flowers and relatively smaller pollen compared to *E. tereticornis,* it was assumed the cross would be failure as style length of the seed parent could act as a structural barrier. To our surprise, the cross was a success and the first plantation of *E. tereticornis x E. grandis* as a block plantation was established at Panampally, Kerala (10° 47'N 76° 45'E) during 2003. From testing in over three locations it was found that *Teregrandis* selections could produce over 180 kg of wood biomass within a period of sixty months. In 2008, at its full rotation the *Teregrandis* yielded 47-48% pulp (control *E. tereticornis* yielded only 42%) when tested at the TNPL R&D. Eventually with R&Ds of industries such as Messrs. TNPL and ITC hybrid breeding took a positive turn through signing up formal collaborative projects during 2010 and 2011 respectively. Over eleven accessions of *Teregrandis* at an age of 20 months are currently being tested at Kagithapuram, Karur, TNPL campus (11° 02' N 78° 01'E) (See Picture).

Parallely, tests with a commercial ply industry R&D indicates usage of *Teregrandis* with its 15% higher face and core veneer yield over untested seed origin red gums. In terms of minor timber *Teregrandis* has all the right properties of being used in several wood based industries. Producing the first set of controlled crosses in *Corymbia torelliana* x *C. citriodora* was also a highly successful one and in the current year the said cross could be cloned with a success rate of over 90%. It is well known that *Corymbia torelliana* x *C. citriodora* (*Torcit)* is known for its 50-52 % high pulp yield globally. Currently, under various projects hybrids in over fourteen locations are being tested with different combinations. Be it pulp, veneer or minor timber, all selections are expected to emerge from the Dihybrid pilot trials. Eventually trihybrids, tetra hybrids and hexahybrids would be made realities. To conclude breeding for a specific trait eventually leads to development of *market Ideotypes.* This means more efficient carbon fixing and improved economic returns in farm forestry.

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** Tamilnadu Newsprint and Papers Limited, Karur

+ ITC R & D limited

E. tereticornis X *E. grandis* hybrid clone showing superior performance compared to the adjacent ruling clone at TNPL campus @ 20 months

KNOW YOUR TREES - MAHOGANY

Distribution

Swietenia mahagoni, commonly known as West Indian mahogany belongs to the family Meliaceae. Mahogany family is almost exclusively tropical in distribution, with more than 500 species in some 45 genera mainly in SE Asia, with a smaller number in tropical America. *S. mahagoni* is a humid zone species with natural distribution in the Caribbean region (S. Florida, Bahamas, Antilles, Haiti and Jamaica). The species is overexploited in its natural distribution area. It has been extensively planted in southern Asia (India, Sri Lanka, and Bangladesh) and in the Pacific (Malaysia, Philippines, Indonesia and Fiji). Further, it has also been introduced into cultivation in West Africa.

Botanical Description

S. mahagoni is a tall tree, up to 30 m high, with a short butressing base, up to 1 m diameter. The crown is large, spherical with heavy branches producing dense shade. The bark in young trees is smooth and greyish, becomes darker and furrowed with age. The tree is deciduous in areas where it is subject to drought.

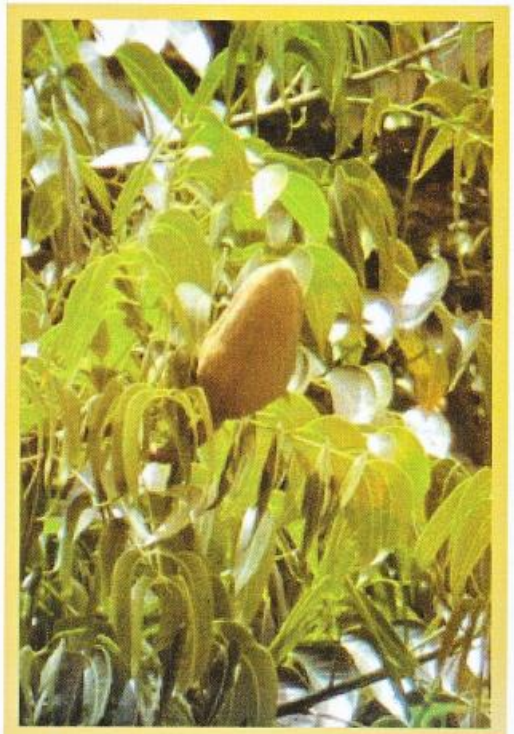
Swietenia mahagoni - A Single tree

Photo credit:
A. Mayavel, IFGTB, Coimbatore

Leaves are even, pinnate, 10-20 cm long, with four to eight pair of shiny leaflets. Leaflets are dark green, lance-shaped and each leaflet measures 3-6 cm long and 0.7-2.5 cm broad; there is no terminal leaflet. The flowers are produced in axillary panicles. Panicles are glabrous, shorter than the leaves. Each flower is small, 6-8 mm across and bears five white to greenish-yellowish petals. Seeds are winged, enclosed in light brown capsule about 6-10 cm long and 4-5 cm diameter.

Reproductive Biology and Breeding System

Flowers are unisexual and the tree is monoecious. Flowering and fruiting are regular and annual but varies according to climate and takes place shortly before the rainy season. Pollination is effected by insects. Hybridization is frequent, especially with *S. macrophylla* where the species grow together. Usually only one flower in the inflorescence develops into a fruit, while others are aborted, even if fertilization occurs. Development from flower to mature fruit takes about 8-10 months. Some fruits remain on the tree while the new flowers appear. Due to



Fruit in tree

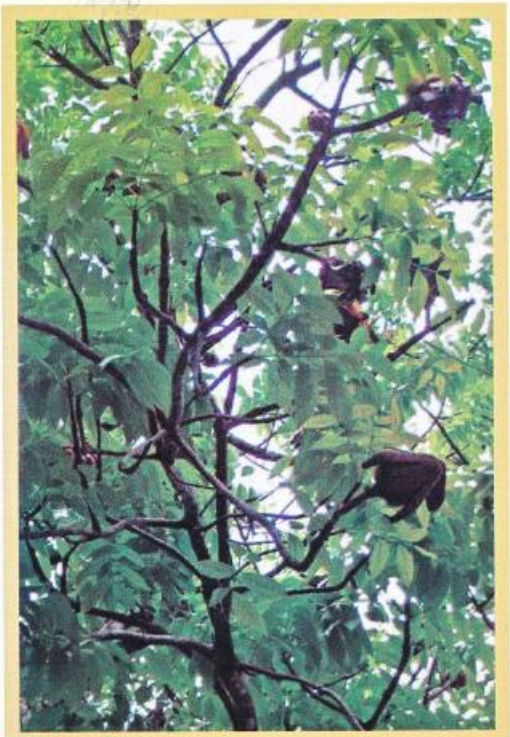
Photo credit:
Dr M.V. Durai, IFGTB, Coimbatore

the long time it takes for the fruit to develop, crop assessment can usually be undertaken several months before harvest. Mahoganies usually exhibit regular annual flowering and fruiting from about 10 to 15 years of age but fruit set can be low due to pollinator limitation.

The fruit is a pear-shaped dehiscent capsule, erect, 8-20 cm long, and 10-12 cm in diameter, with 5 valves splitting upward from the base. Outer valves are woody, 5.7 mm thick, inner valves much thinner; smooth or indistinctly pitted when mature. The fruit splits open from the base or from both base and apex simultaneously when dry. The centre of the fruit has a thick, woody 5-angled columella extending to the apex from which the seeds hang pendulous by their wings, leaving conspicuous scars after their release. There are usually 35-45 seeds per fruit. Each seed is 6-9 cm long, pale straw-brown, compressed, crested and extended into a wing at the attachment end. Seeds are wind-dispersed.

Genetics and Tree Improvement

So far, systematic tree improvement program of *S. mahagoni* has not been practiced. Plus trees selection, establishment of provenance trials and germplasm assemblages are yet to be initiated. The species has been categorized as Endangered globally and finds a place in Appendix II of CITES.

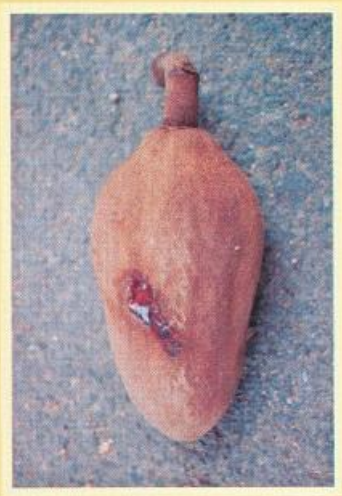


Fruiting branches

Photo courtesy:
CIFOR, Bogor, Indonesia

Seed Collection, Processing and Nursery Techniques

The fruits are preferably collected from the trees just before they split open. Green as well as brown fruits may contain ripe seed. The centre of the fruit stalk turns brown as the fruit matures. Seeds are mature when they turn dark brown. Fruits from smaller trees may be reached with extended pruners or flexible saws, larger trees must be climbed for collection. One kilogram contains 1200-2000 seeds.



A fruit of *S. mahagoni*

Photo credit:
A. Mayavel, IFGTB, Coimbatore

Mature dry fruits or dry seeds collected from the forest floor can be stored for some days in sacks without significant deterioration, but since the fruits are bulky, pre-processing in the field is often desirable. Depending on maturity, the fruits will split open after 1-4 days of drying. Seeds are easily released by raking or gently shaking the fruits. Fruit parts (valves and columella) are removed by hand. The bulk can be further reduced by manual dewinging. After extraction, the seeds should be dried to a moisture content of approximately 6-7% for short term storage, or below 4% for long term storage.

Seeds can be stored for several months. Storage at 15° C prolongs viability to 3-6 months. Cold storage (2-5° C) with 4-5% moisture content extends viability to several years. The seeds must be stored in air-tight containers.

Pretreatment is generally not necessary but for seeds stored at low moisture content, soaking in water for 12 hours can improve germination.

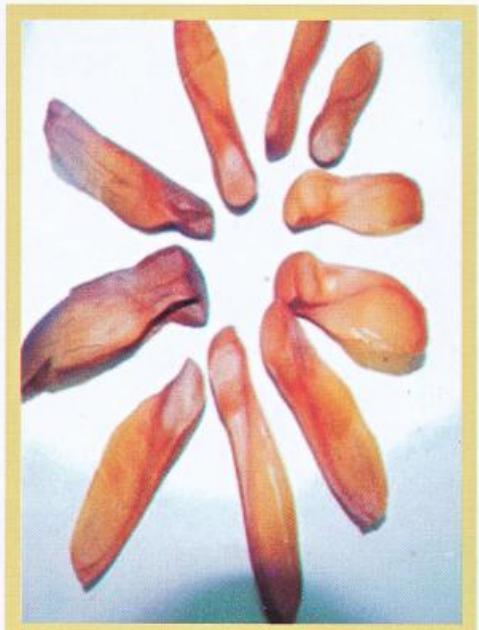
Seed germination

Seeds are sown in sand bed that contains 3-7 cm deep furrows or holes or directly in containers. Germinating seeds should be under shade and kept moist. Germination is hypogeal and seeds usually germinate in 10-20 days after sowing. The seedlings should be kept under shade until planting and can be planted in the field when they are about 50-100 cm tall.

Mahogany may be propagated vegetatively. Stumps of seedlings and young trees are able to coppice, providing a source of new shoots suitable for propagation by leafy cuttings. Serious damage of mahogany plants by pests and diseases has rarely been recorded in nursery. Attack by *Hyesipyla* spp. can be controlled with insecticides under nursery conditions.

Dried fruit

Photo credit:
Dr M.V. Durai, IFGTB, Coimbatore



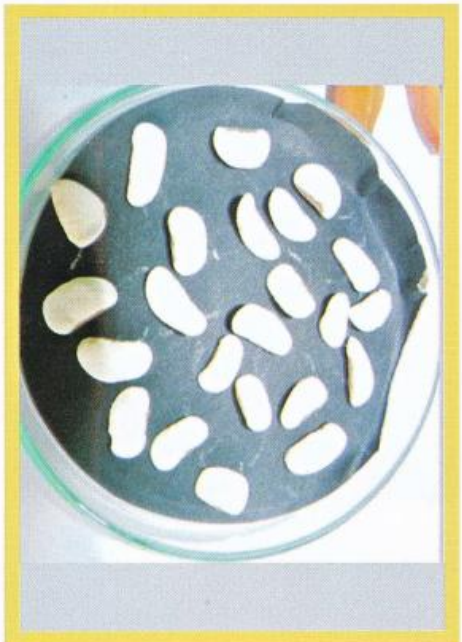
Seeds of Mahogany

Photo credit:
Dr M.V. Durai, IFGTB, Coimbatore

Silviculture, Plantations and Management

Mean monthly temperature of mahogany planting sites should fall in the range of 15 - 35° C. Mahogany grows well on sites receiving annual rainfall of 1000-4000 mm. Mahogany appears to grow satisfactorily on a wide range of soils from clay to coarse sandy. It prefers slight alkaline soils, but also can sustain growth in acid soils with pH as low as 2.5. The tree can be successfully established on steeps and unstable slopes and is effective in reducing soil erosion. Stand productivity is highly influenced by rainfall patterns, soil type and slope position.

The total recorded mahogany plantation area around the world is approximately 200,000 ha, although this figure excludes the majority of private plantations. Mahogany has been widely planted outside its natural range, in the Caribbean, south Asian, south-east Asian and pacific ranges. But trials in Africa proved unsuccessful. There are fewer mahogany plantations within its natural range. Until recently, availability of naturally grown timber, combined with problems caused by the shoot borer, reduced the incentive to establish plantations.



Kernels of Mahogany

Photo credit:
Dr M.V. Durai, IFGTB, Coimbatore

The largest planted area is currently found in Indonesia, Fiji and the Philippines. These countries exhibit a rapid increase in the plantation area in recent years. It is impossible to document seed origins for many individual plantations. Outside the natural range of mahogany, many of the world's plantations appear to have been established using seed of Belizean origin.

Roots can raise sidewalks when planted only 5-6 foot away. Root deflectors and barriers which direct roots to a deeper soil layer are recommended for this and other large-growing trees with surface root problems. Trees often develop several upright multiple leaders which significantly reduces wind and storm.

Although mahogany is tolerant to relatively infertile planting sites, application of appropriate fertilizers will stimulate the growth of young mahogany trees on such sites. However the effect of different fertilization regimes on growth rates and timber quality has not been properly investigated.

In general 2-3 weeding per year for 3 years may be sufficient for mahogany seedlings. In logged forest, creepers are often a serious problem and weeding of planting lines may be required 4-12 times during first year with gradual reduction in intensity over a 5 year period. Spot weeding is the most suitable technique where the shoot borer is active.

Pruning is an effective means of improving the form of young trees, particularly those which have been attacked by the shoot borer as long as it is carried out regularly over a period of 3 to 7 yrs after planting. Pruning is important in low density plantations where there is little competition between clones and thus less chance of natural recovery of vertical growth.

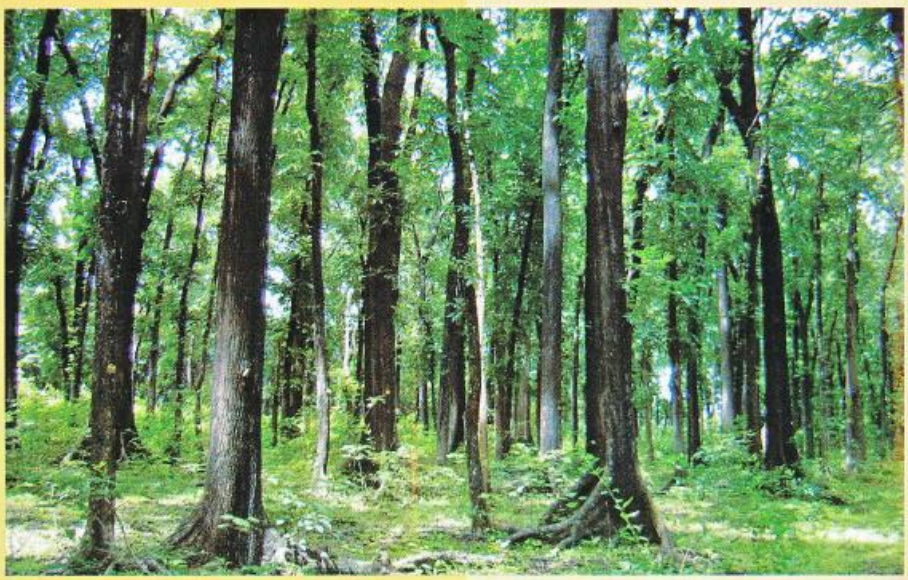
Thinning should be carried out on a 5-10 year cycle depending on the growth rate. The first thinning may be systematic, but should emphasize producing well formed final crop trees and selective thinning is recommended over the rest of the rotation. If stands are stocked with sufficient number of well formed trees, it may be possible to take crown thinning before the end of the rotation. For plantations stocked at densities that are sufficient to encourage the development of acceptable tree form and timber quality, a rotation length of 30-50 years is anticipated depending on site quality.

Agroforestry practices

Mahogany-based agroforestry system has the potential of converting a stand from a rehabilitation condition to a restorated one especially in degraded uplands. Mahogany has been successfully planted in agroforestry systems, typically with maize and bananas. The trees will grow rapidly under such conditions. The use of such systems may be possible if mahogany is planted at low densities along with shade-tolerant perennial crops.

Growth and Yield

The timber of *S. mahagoni* is regarded as superior to the timber of other species of the Meliaceae. It is valued for its small dimensional movement, lack of distortion and good finishing qualities. Comparisons between natural and plantation-grown timbers indicate that plantation-grown timber is slightly less dense and lighter in colour; with coarser grain. The sapwood of plantation timber which



Permanent Preservation Plot of *S. mahagoni* at Nilambur, Kerala

Photo credit:
Dr Kannan C.S. Warrier, IFGTB, Coimbatore

is unmarketable in most countries occupies the outer 2.5 to 5 cm of a merchantable tree. The ratio of sapwood to heart wood is greater in faster growing trees. Observations from natural forests indicate that timber quality of plantations can be improved by reducing growth rates and extending rotation length. Timber quality may be enhanced by genetic improvement of planting stock.

If managed correctly the maximum mean annual increment for densely stocked plantation ranges between 10 and 25 $m^3ha^{-1}yr^{-1}$ depending on the site quality. Low density conversion line plantings have a mean annual increment of only 4-8 $m^3ha^{-1}yr.^{-1}$

Important Insect-Pests and Diseases

Some insects such as the tent caterpillars, tip moth, webworm, scale, leaf notcher, and leaf miner can cause significant problems. Borers usually infest stressed trees. No diseases are of major concern. *Nectria* infections on branches are often predisposed by some other stress or any injury to the tree. These infections can be seen in the branch crotches.

Wood properties and Utilization

Usually, Mahogany has a straight grain free of voids and pockets. The wood is reddish-brown in colour, darkens over time and displays a beautiful reddish sheen when polished. It has excellent workability and is very durable. These properties make it a favourable wood for crafting furniture.

Mahogany resists wood rot, thus making it suitable for boat construction. It is often used for making musical instruments, particularly the back, sides, or neck of a guitar, and at times the top (soundboard) as well.

Mahogany is also used for drum making, because of its integrity and capability to produce a very dark, warm tone.

References

Gullison, R.E., Panfil, S.N., Strouse, J.J. and Hubbell, S.P. 1996. Ecology and management of mahogany *(Swietenia macrophylla* King) in the Chimanes Forest, Beni, Bolivia. Botanical Journal of the Linnean Society 122: 9-34.

KNOW YOUR TREES - MAHOGANY

Lyhr, K. P. 1992. Mahogany Silviculture and Use of American Mahogany (*Swietenia* spp.). The Royal Veterinary and Agricultural University, Copenhagen.

Nataniela, V., Singh, K. and Lal, S. 1997. Seed production of *Swietenia macrophylla* (Large-leaved Mahogany) in Fiji. Pacific Islands Forests & Trees 4/97: 7-11.

Soerianegara, I., Lemmens, R.H.M.J., Eds. 1993. Plant Resources of South-East Asia No. 5(1). Timber trees: major commercial timbers. Wageningen, Netherlands: Pudoc Scientific Publishers.

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ON A MISSION TO POPULARISE MAHOGANY

The seeds of a mahogany (*Swietenia macrophylla*) tree spiralling to the ground in the characteristic "helicopter" fashion sowed the germ of an idea in the mind of a Bengalurean. Since then, S.R.N. Murthy, an advocate in the High Court of Karnataka, has made it his mission to popularise the tree species. He can be seen collecting mahogany seeds across the city. Besides a host of other benefits, the tree, he found, has high commercial value. The tree can be harvested, and, depending on the space, can be sold for Rs. 10,000 or Rs. 20,000 after five or 10 years respectively.

As the tree provides shade, grows fast, counters soil erosion, does not spoil asphalted roads and is used for making furniture (and guitars), he thought it could be

Avenue of mahogany trees at Cubbon Park in Bengaluru. *Photo: K. Murali Kumar*

promoted. In the last decade, he gave away eight lakh saplings in several districts of the State. Over the past two years alone, he collected two lakh mahogany seeds and saplings were given away for social forestry and afforestation projects of schools and colleges in Karnataka.

-Renuka Phadnis
Published on 20th April 2015
Source:http://www.thehindu.com/news/cities/bangalore/on-a-mission-to-popularise-mahogany/article7120457.ece

Contact Details for Growth Promoters and Biopesticides Developed at IFGTB (Tree Rich Biobooster, Hy Act & TreePAL)

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RECENT LITERATURE ON FGRs & TIP

1. Costa, L.S., Corneleo, N.S. and Stefenon, V.M. 2015. Conservation of forest biodiversity: how sample size affects the estimation of genetic parameters. Anais da Academia Brasileira de Ciências 87(2): 1095-1100.

2. Debeljak, M., Ficko, A. and Brus, R. 2015. The use of habitat and dispersal models in protecting European black poplar (*Populus nigra* L.) from genetic introgression in Slovenia. Biological Conservation 184: 310-319.

3. Duminil, J., Mona, S., Mardulyn, P., Doumenge, C., Walmacq, F., Doucet, J. and Hardy, O.J. 2015. Late Pleistocene molecular dating of past population fragmentation and demographic changes in African rain forest tree species supports the forest refuge hypothesis. Journal of Biogeography 42: 1443-1454.

4. Khodwekar, S., Staton, M., Coggeshall, M.V., Carlson, J.E. and Gailing, O. 2015. Nuclear microsatellite markers for population genetic studies in sugar maple (*Acer saccharum* Marsh.). Annals of Forest Research DOI: 10.15287/afr.2015.360

5. Medina-Macedo, L., Sebbenn, A.M., Lacerda, A.E.B., Ribeiro, J.Z., Soccol, C.R. and Bittencourt, J.V.M. 2015. High levels of genetic diversity through pollen flow of the coniferous *Araucaria angustifolia*: a landscape level study in Southern Brazil. Tree Genetics and Genomes 11: 814 10.1007/s11295-014-0814-1.

6. Miyamoto, N., Ono, M. and Watanabe, A. 2015. Construction of a core collection and evaluation of genetic resources for *Cryptomeria japonica* (Japanese cedar). Journal of Forest Research 20: 186-196. DOI: 10.1007/s10310-014-0460-3

7. Sannikov, S.N., Shavnin, S.A., Sannikova, N.S. and Petrova, I.V. 2015. Ecological and genetic principles for the selection and classification of forest genetic reserves. Russian Journal of Ecology 46(1): 1-6.

8. Santos, A.S., Cazetta, E., Filho, J.S.M., Baumgarten, J., Faria, D. and Gaiotto, F.A. 2015. Lessons from a palm: genetic diversity and structure in anthropogenic landscapes from Atlantic Forest, Brazil. Conservation Genetics. DOI :10.1007/s10592-015-0740-2.

9. Thwe-Thwe-Win, Hirao, T., Watanabe, A. and Goto, S. 2015. Current genetic structure of teak (*Tectona grandis*) in Myanmar based on newly developed chloroplast single nucleotide polymorphism and nuclear simple sequence repeat markers. Tropical Conservation Science 8(1): 235-256.

10. Umesh Babu, M.S. and Nautiyal, S. 2015. Conservation and management of forest resources in India: ancient and current perspectives. Natural Resources 6: 256-272.

11. Wagner, S., Liepelt, S., Gerber, S. and Petit, R.J. 2015. Within-range translocations and their consequences in European Larch. PLoS ONE 10(5): e0127516. doi:10.1371/journal.pone.0127516

12. Westergren, M., Bozic, G., Ferreira, A. and Kraigher, H. 2015. Insignificant effect of management using irregular shelterwood system on the genetic diversity of European beech (*Fagus sylvatica* L.): A case study of managed stand and old growth forest in Slovenia. Forest Ecology and Management 335: 51-59.

13. Wojnicka-Pültorak, A., Celiński, K., Chudzińska, E., Prus-Glowacki, W. and Niemtur, S. 2015. Genetic resources of *Pinus cembra* L. marginal populations from the Tatra Mountains: Implications for conservation. Biochemical Genetics 53: 49-61.

14. Yen, T.M. 2015. Relationships of *Chamaecyparis formosensis* crown shape and parameters with thinning intensity and age. Annals of Forest Research DOI: 10.15287/afr.2015.408

AGROFORESTRY/TREE BASED FARMING

Agroforestry has been identified as one of the key thrust areas and programmes for enhancing tree cover outside forests and ensuring economic security for the rural poor by the State Forest Departments, and ICFRE and its institutes in the country. The SFDs and ICFRE institutes have domesticated exotics and indigenous tree species to support agroforestry. Focused research on systematic tree improvement, silviculture, etc. has enabled enhancing productivity of mandated trees for farmlands to provide additional income from tree based farming.

Trees as large scale plantations and from agroforestry models have enabled wood based industries to flourish particularly after the advent of the 1988 Forest Policy which made an embargo on trees from forests to industries. ICFRE institutes and the State Forest Departments have continuously through structured programmes and projects enabled combing of genetically superior trees, identifying variations, bringing together the best of the genes through breeding and hybridization which has resulted in the development of quality planting stock. This has proven to be more productive than the local material that had been used by the tree growers in the country. For example, genetically improved planting stock developed through the research programmes of ICFRE (IFGTB), Coimbatore has enabled increasing the productivity of Casuarinas to 13 per cent in rain fed and 28 per cent under irrigated conditions over local planting stock which has increased the income per acreage substantially. This also applies to Eucalypts, Poplars, Acacias and a host of other fast growing species which find potential in agroforestry systems.

Casuarina- Maize based Agri-silviculture System

The following agroforestry models developed at IFGTB are economically viable and are acceptable among farmers of Southern India.

1. Casuarina- Maize based Agri-silviculture System - Planting of Casuarina in wider rows with tree density of 650 trees per ha (spacing of trees 2 m x 7 m) rotation period of 3 years. In the entire period of three years intercropping is carried out. Income generated will be 2-3 times that of the sole agricultural cropping system.
2. Teak based agroforestry system - Planting of teak in wider spacing of 8m x 4 m having tree density of 325 trees per ha with rotation age of the system as 5 years. The teak poles are harvested at the age five years. One teak pole will fetch Rs. 250 to Rs. 300. Intercropping is done up to three years without any loss in yield and in fourth and fifth year the yield loss in agricultural crops will be about 25 to 30% depending upon the crop compatibility.

Teak based wide-row alley cropping agroforestry system

3. *Acacia mangium* based wide row alley cropping system for irrigated lands - Among different agricultural

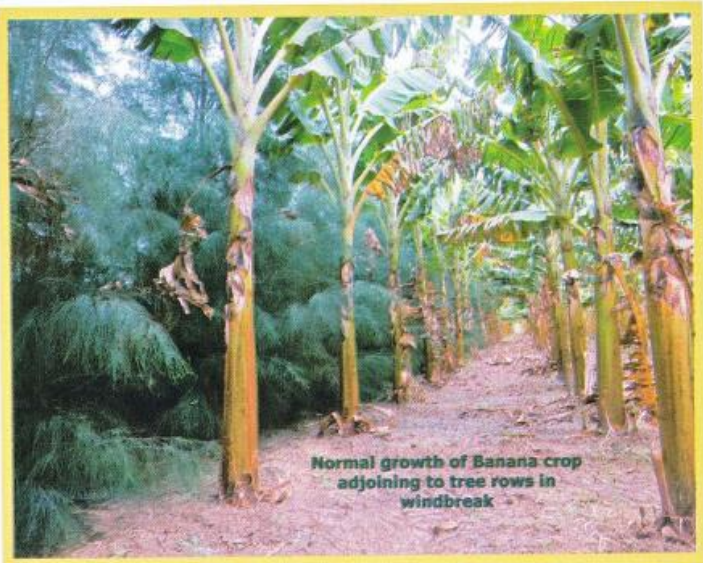
Acacia mangium based agroforestry system for irrigated lands

crops intercropped with *A. mangium,* blackgram, horsegram, fodder sorghum and beans were found to be compatible and onion was observed to be less compatible. The recommended agroforestry systems are i) *A. mangium* + Beans based system for Tamil Nadu and ii) *A. mangium* + Tapioca/Yam/Pepper based system for Kerala.

4. Teak and Casuarina based boundary planting system - Windbreaks of Casuarina on either side of teak tree in boundary planting to tailor the growth of teak by minimizing the desiccating effect of strong wind on teak terminal shoot growth and by providing competition for shade to enhance height increment in teak which is a strong light demander.

Growth of teak (age: 2 years) with wind breaks of Casuarina in Puthinampatty, Trichy district of Tamil Nadu

5. Windbreak Agroforestry systems with superior clones of *Casuarina junghuhniana* (Windbreak with Casuarina and Banana crop) - IFGTB has developed five productive clones of *C. junghuhniana* viz. IFGTB -WBC 1, IFGTB-WBC 2, IFGTB-WBC 3, IFGTB-WBC 4 and IFGTB-WBC 5 exclusively for windbreak Agroforestry. These clones have more number of branches, greater branch thickness, wider branch angle along with greater growth rate and biomass productivity and are suitable as windbreaks. Farmers' experience of cultivating plantain under windbreak agroforestry system with these superior clones demonstrated good compatibility of Casuarina and banana for co-cultivation.



Windbreak Agroforestry system by IFGTB in the farm field in Coimbatore district, Tamil Nadu

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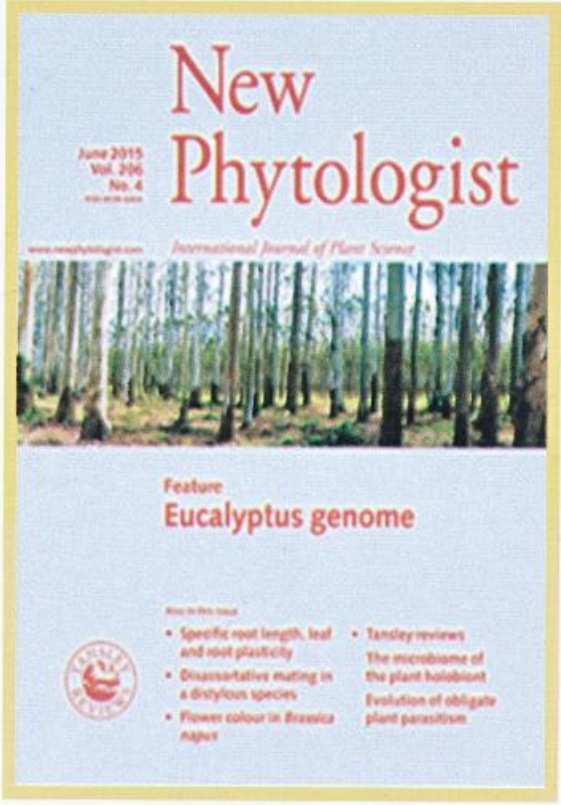
CELEBRATING THE EUCALYPTUS REFERENCE GENOME

Attaining a sustainable energy future lies in understanding the molecular basis of growth and adaptability in hardwood trees utilized for biomass production. *Eucalyptus* species are the most preferred woody plants possessing faster growth potential and hence form the widely planted harwood trees in the world. Due to their multiple utility across continents, Eucalypts are listed as the Candidate Biomass Energy Crops by the US Department of Energy (DOE). Eucalyptus was selected in 2008 as a 'Community Science Program Project' for the DOE Joint Genome Institute, a DOE Office of Science User Facility. In June 2014, an international consortium of researchers, including DOE JGI scientists, released the reference genome of *Eucalyptus grandis.* Building off the *E. grandis* tree genome that researchers at the DOE Joint Genome Institute helped sequence and analyze, several researchers demonstrate the utility of the reference genome in the June 2015 special issue of New Phytologist.



This issue highlights the two major themes focused by scientists based on the reference eucalyptus genome. These are that adaptive evolution can be applied to crop breeding for bioenergy applications, among others, and that the genome sequence enables the development of tools to further improve this genomic resource.

The Eucalyptus genome data are available publicly through the DOE JGI's comparative plant genomics portal known as Phytozome, now in its 10th revision (http://bit.ly/Phytozome-Eucalyptus). A brief video featuring Jerry Tuskan, a longtime DOE JGI collaborator at Oak Ridge National Lab, and a member of the original team who worked on the eucalyptus genome, can be viewed at http://bit.ly/eucalyptusTuskan.

Publication

Strauss, S.H. *et al.* 2015. Plant scientists celebrate new woody plant genome. New Phytologist 206(4): 1185-7. doi: 10.1111/nph.13443.

Related Links

http://onlinelibrary.wiley.com/doi/10.1111/nph.13443/abstract

http://jgi.doe.gov/why-sequence-the-eucalyptus-tree/

http://phytozome.jgi.doe.gov/pz/portal.html#!info?alias=Org_Egrandis

http://jgi.doe.gov/just-food-koalas-eucalyptus-global-tree-fuel-fiber/

http://jgi.doe.gov/eucalyptus-grandis-genome-2-0-community-resource/

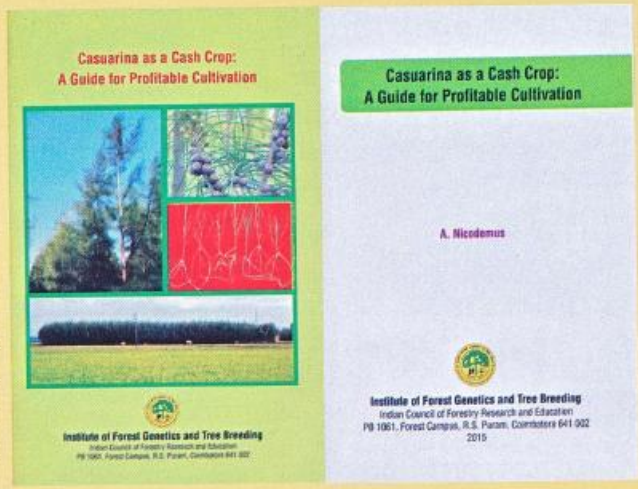
Information source

http://jgi.doe.gov/celebrating-the-eucalyptus-reference-genome/

BOOKS PUBLISHED

Books Published

IFGTB always strives to communicate with its stakeholders particularly the tree growing farmers about the latest developments and techniques for increasing plantation productivity. Since short rotation tree crops like Casuarina are harvested from the second year itself, it is essential that high yielding varieties and efficient cultivation practices are deployed. IFGTB has developed and released fast-growing clones and have standardized cost-effective and site-specific plantation techniques for Casuarina. In order to popularize these resources a user-friendly field guide called "Casuarina as a Cash Crop: A Guide for Profitable Cultivation" has been published. It was released by Shri Ashok Lavasa, Secretary, Ministry of Environment, Forests and Climate Change, Government of India and the first copy was received by Shri R.S. Prashanth, Director, IFGTB in the presence of Dr B. Gurudev Singh, Group Coordinator (Research) and Dr A. Nicodemus, Scientist and author of the book.



UPCOMING EVENTS

September 2015

- XIV World Forestry Congress, Durban, South Africa, 07-11 September 2015
- Air Quality Assessment, Prediction and Control for Industrial Areas, The Department of Environmental Science & Engineering, Indian School of Mines, Dhanbad (Jharkhand), 17-19 September 2015
- 10th World Bamboo Congress, Damyang, Korea, 17-22 September 2015

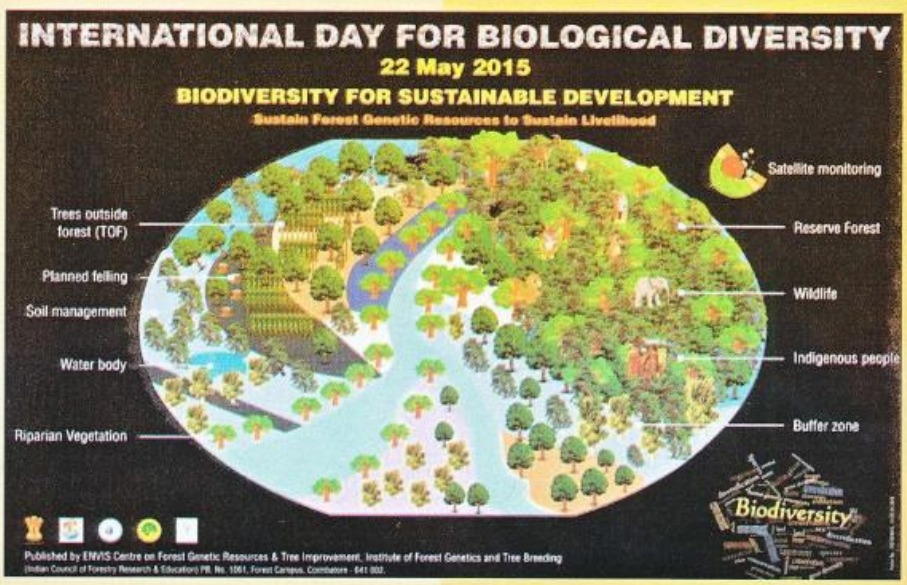
October 2015

- Second International Conference on Tropical Biology, Bogor, Indonesia, 12-13 October 2015
- Root and Butt Rot of Forest Trees, Antalya, Fethiye, Bodrum, Turkey, 12-18 October 2015
- IUFRO Eucalypt Conference 2015 - Improvement and Culture of Eucalypt, Zhanjiang City, Guangdong , China, 21-24 October 2015

ENVIS ACTIVITIES AT IFGTB

International Day for Biological Diversity 2015

The International Day for Biological Diversity was observed on 22 May from the year 2001, the date in which the text of the Convention on Biological Diversity (CBD) was adopted by the United Nations in Nairobi, Kenya. Since then, a wide range of events are organized throughout the world to realize the importance of biodiversity in future. Each year celebration is marked by focussing on various themes of biodiversity. The 'International Day for Biological Diversity 2015' was celebrated on 22 May at IFGTB-ENVIS. The programme was attended by all the members of the Advisory Council of ENVIS at IFGTB. Dr Kannan C.S. Warrier, Scientist-E & ENVIS Co-ordinator gave the welcome address. The Director, Shri. R.S. Prashanth, IFS, briefed the importance of biodiversity and released a poster to create awareness on this year's theme 'Biodiversity for Sustainable Development'. The theme reflects the importance of efforts made at all levels to establish a set of Sustainable Development Goals (SDGs) and the relevance of biodiversity for achievement of sustainable development. On the occasion, the second issue of the newsletter (Van Vigyan) was also released.
For more global events visit: https://www.cbd.int/idb/2015/



ENVIS ACTIVITIES AT IFGTB

World Environment Day

World Environment Day (WED) was celebrated on 5th June 2015 at ENVIS Centre in IFGTB. The theme of this year is 'Seven Billion Dreams. One Planet. Consume with Care'. The main focus of this year's theme is that the well-being of humanity, the environment, and the functioning of the economy, ultimately depend upon the responsible management of the planet's natural resources. Evidence is building that people are consuming far more natural resources than what the planet can sustainably provide. According to the United Nations, many of the Earth's ecosystems are nearing critical tipping points of depletion or irreversible change, pushed by high population growth and economic development. By 2050, if current consumption and production patterns remain the same and with a rising population expected to reach 9.6 billion, we will need three planets to sustain our ways of living and consumption. Hence, based on this year's theme IFGTBENVIS released an awareness poster for consuming with care. In other words, it means living within planetary boundaries to ensure a healthy future where our dreams can be realized.

For further information visit: www.unep.org/wed/#

ABOUT IFGTB

Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore is a National Research Institute under the Indian Council of Forestry Research and Education. IFGTB envisions a wood secure society. The Institute primarily aims to carry out research to improve productivity of forest tree species through conventional breeding programmes and biotechnological interventions. The major areas of research include tree improvement , breeding, planting stock improvement, marker assisted selection, genomics, clonal propagation, agroforestry systems, climate change research, integrated disease and pest management, seed handling and testing, eco restoration and conservation.

ABOUT ENVIS

ENVIS established by the Government of India, in 1982 has been on providing environmental information to decision makers, policy planners, scientists and engineers, research workers, etc. all over the country. It is a comprehensive decentralized information system on environment involving effective participation of institutions / organisations in the country actively engaged in work relating to different subject areas of environment. A large number of nodes, known as ENVIS Centres, have been established in the network to cover the broad subject areas of environment with a Focal Point in the Ministry of Environment & Forests.

INSTRUCTIONS TO CONTRIBUTORS

Dear Author/ Subscriber/ Contributor,

We invite contributions to the ENVIS Newsletter issues! The ENVIS Centre at IFGTB focuses on Forest Genetic Resources and Tree Improvement. It aims to act as a window for quality scientific publications and a forum for presenting your thinking on the challenges in the fields of FGRs and tree improvement. The ENVIS Newsletter, Van Vigyan, a quarterly publication, publishes original research articles, reviews, reports, research highlights, news-scan etc., related to the thematic area of the ENVIS Centre. Original research and review articles, notes, research and meeting reports are invited for the newsletter. Details of forthcoming conferences / seminars / symposia /trainings / workshops also will be considered for publication in the newsletter. Articles may be sent in Times New Roman (with font size 12) in double spacing with a maximum of 5-6 typed pages. Photographs/line drawings and graphs need to be of good quality with clarity for reproduction in the newsletter. Only electronic submission will be accepted.

Details may be sent to: ifgtb@envis.nic.in.

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