KFRI EVERGREEN

Half Yearly Newsletter of the Kerala Forest Research Institute, Peechi

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KFRI restructured to meet new research challenges

In view of the science policy of the State Government for promoting scientific research for the benefit of the society and the state in general, the Kerala Government took a proactive step by replacing the State Committee on Science, Technology and Environment (STEC) by the Kerala State Council for Science, Technology and Environment (KSCSTE). The council came into existence on 21 November 2002 as a registered Society and new rules and regulations were implemented subsequently from June 2003. The main objective of the Council is to harness science and technology programmes for socio-economic development and improvement of the quality of life and environment in the State. As the linkage between R & D institutions like KFRI and the local governments would have profound influence in strengthening the decentralization process in the State, KFRI would strive hard towards human resource development and livelihood improvement by enhancing the resource base of bamboos and other natural resources in different Panchayaths across the state.

As one of the R &D Centres of KSCSTE, KFRI looks forward to a bright future in terms of scientific excellence and meaningful interaction among all the R & D Centres of the Council in addressing issues and problems of our State in a more effective and meaningful way.

The year 2003-04 was very significant in the history of KFRI as it took a major step of far reaching consequences for bringing inter and multi-disciplinarity in research by restructuring the research set up from classical approach in vogue right from its inception in 1975 to thematic approach and implementing it during February 2004.

This change was brought about through the recommendations of the High Level Committee constituted (Dr. P. S. Ramakrishnan (Chair), Dr. C. Chandrasekharan, Prof. H.Y. Mohan Ram and Dr. Ram Prasad) by the erstwhile Governing Body of KFRI to review KFRI's R & D activities in toto to sharpen the focus on research for appropriate futuristic perspectives. The High Level Committee noted that KFRI has not moved with time and the research organization has a highly fragmented structure with serious impediments for interdisciplinary/multidisciplinary research. Considering this, the Committee recommended restru cturing of research in KFRI to facilitate not only interdisciplinary/multidis ciplinary research but also address forestry research in the fast changing scenario the world over with emphasis on social dimensions. In the restructured set up seven Programme Divisions namely Research Monitoring and Evaluation Unit, Sustainable Natural and Plantation Forest Management, Forest Ecology and Biodiversity Conservation, Forest Protection, Forest Utilization, Forestry and Human Dimensions and Forest Information and Management System are organized on an interdisciplinary basis to ensure interdisciplinary interactions. In addition there are three supporting Programme Divisions namely Extension and Training, Library and Information and Instrumentation. Hence, 15 Divisions viz. Entomology, Pathology, Ecology, Soil Science, Plant Physiology, Wildlife Biology, Statistics, Forest Economics, Botany, Silviculture, Agroforestry, Non Wood Forest Products, Wood Science, Genetics, Research Monitoring and Evaluation are grouped into different Programme Divisions headed by a Programme Coordinator. Whenever such a drastic change is brought about in a system in vogue for long time, it takes a while to get accustomed to the new one. I do hope that in coming years it will have a favourable impact on quality and direction of research which will be beneficial to the stakeholders and society at large.

Dr.J.K.Sharma
Director

Issue Highlights

Edible Rattan
International Teak Conference
Mammals in Kerala Forests
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Rattan shoot- a tasty and nutritious food

A pilot scale plantation of edible rattan .

Although, rattan is most popular as a raw material to the furniture industry, it is no longer used for furniture alone. In many parts of the world, rattan finds use in food and medicine also. Many species of rattans supply edible shoots or 'palm hearts'. The shoots can be made part of many delicious food and nutritious dishes.

Each stem of rattan has one active growing point (meristem) at the stem tip that produces new leaves and stem. The unlignified tissues produced by this meristem form the edible rattan shoot or palm heart. This vulnerable shoot is protected by the overlapping leaf sheaths, which have to be removed before consuming. The shoots are consumed either raw or cooked. Most species taste bitter when raw and cooking will reduce its bitterness. According to Thai people rattan shoots possess medicinal properties, hence the bitter taste. Compared to bamboo shoots, which are crunchy, rattan shoots are rather soft. Ethnic communities in South East Asia, Lao PDR and North Eastern Thailand are widely using the shoot tips. Processed and canned shoots are exported to China, France and United States from Lao PDR and Thailand which are the major contenders in the international market. Cultivation of rattans for the production of edible shoot has already been started in these countries and its commercial viability has been established. Some of the commercially cultivated species success include *Daemonorops jenkinsianus, Calamus tenuis, C. viminalis and C. siamensis.*

Cleaning the shoots by removing leaf sheaths

In India, rattan shoots are eaten in north eastern states. A recent study conducted by KFRI on selected rattan species, *C. thwaitesii, C. hookerianus, C. rivalis and C. tenuis*, showed that these species are rich sources of nutrients. Rattans are rich in proteins, ascorbic acid, and mineral nutrients like phosphorus, potassium, calcium, magnesium, zinc, copper, iron, and manganese. Rattan farming for shoots is a new venture in India which has immense potential in the rural sector. Lao PDR and Thailand export dried shoots to USA at a price of US $ 50 per Kg (about 30 shoots). Rattans can come up well where regular flooding would damage most other crops. Extraction can be started after 15-17 months after the establishment of the seedlings and the edible shoots can be harvested for many years thereafter, offering a return that is competitive with other edible plant cultivation. It may be possible to interplant an annual crop in the first year. Once harvesting begins, shoot production is rapid. Many shoots would be availbale at any onetime, in different stages of development.

C. Renuka and James P. Thomas
Botany Division

The International Conference on Quality Timber Products of Teak from Sustainable Forest Management, 2-5 December 2003, KFRI, Kerala, India : A Report

The international conference on *Quality Timber Products of Teak from Sustainable Forest Management (SFM)* was held at the Kerala Forest Research Institute, Peechi, Kerala, India, during 2-5 December, 2003, to address the following crucial issues:-

The specific objectives of the conference were:

- To provide an international forum for critical appraisal of the role of teak plantations in tropical timber development programmes and market situation, including the recent research findings in environmentally acceptable and socially desirable conditions.

His Excellency Shri. Sikander bakht delivering the inaugural address

- To identify the constraints and strategic solutions for sustainable utilization of plantation grown teak

The conference was sponsored by the International Tropical Timber Organization (ITTO), Japan; International Union of Forest Research Organisations - Teak Wood Working Party (IUFRO 5.06.02); Ministry of Environment and Forests, Government of India; Indian Council for Forestry Research and Education (ICFRE), Dehra Dun; Floresteca Agroflorestal LTDA, Netherlands, Council of Scientific and Industrial Research (CSIR), New Delhi; National Bank for Agriculture and Rural Development (NABARD), Mumbai.

The conference was inaugurated by His Excellency Sri Sikander Bakht, Governor of Kerala State, and inaugural session was presided over by Mr. K. Sudhakaran, Hon'ble Minister for Forests and Sports, Govt. of Kerala. The keynote address was delivered by Dr. D. N. Tiwari, Member, Planning Commission, Govt. of India. Mr. R.P.S. Katwal, IFS, Director General, Indian Council of Forestry Research & Education and Chairperson of the National Organizing Committee briefed the rationale of the conference. Dr. J. K. Sharma, Director, Kerala Forest Research Institute, welcomed the dignitaries and the conference delegates. Special addresses were delivered by Mr. Bivash Ranjan, Assistant Director General of Forests on behalf of Mr. N.K. Joshi, IFS, Director General, Minsitry of Environment and Forests and Special Secretary to Government of India. Mr. P. K. Surendranathan Asari, IFS, Principal Chief Conservator of Forests, Kerala, Dr. Ma Hwan Ok, Projects Manager, Forest Industries, ITTO, Japan and

Presidential address by Shri. K.Sudhakaran Hon'ble Minister for Forests and Sports, Kerala

Mr. R.P.S. Katwal, Director General, ICFRE delivering speech on the rationale of the conference

Prof. Takashi Okuyama, Coordinator of IUFRO Teak Wood Working Party, Japan. Dr. K. M. Bhat, the Conference Convener proposed vote of thanks.

A total of 175 delegates representing 26 countries from Asia, Australia, Africa, Europe and North, Central and South America participated in the conference including one day inconference field excursion. In addition to the scientists from various research organizations/universities, the target beneficiaries of the Conference were small timber holders/ farmers, processing entrepreneurs, traders, State Forest Departments, Forest Development Corporations, practicing foresters and policy makers. A total of 69 oral papers and 26 posters were presented in sixteen different sessions.

RESOLUTIONS OF THE CONFERENCE

Preample

The excellent properties and versatile nature of teak (*Tectona grandis* L. f.) timber and its suitability for an array of uses are well documented. The potential for raising and managing teak in different agro-ecological zones and under natural forests, plantations, and agroforestry situations as well as outside forests under varying intensities and mixtures is being increasingly recognized. This has led to intensive domestication and cultivation of teak in countries/regions beyond its natural habitat in the tropics. Despite the value of teak timber and its increasing demand, its full potential for providing revenue, rural income, employment opportunities and development of value-added downstream processing is not fully utilized. Although, considerable amount of research has gone into refining various aspects of teak silviculture, management and utilisation, knowledge on teak still suffers from serious gaps in certain vital aspects such as quality of planting stock, land categorization for species-site matching, short rotation intensive management, protection from pests and diseases, downstream processing with respect to the environmental conservation measures and marketing. Furthermore, the overall impact of range of benefits accrued from teak plantations to meet community requirements of wood products needs to be better understood to ensure the long-term

Glimpses of the Conference

Dr. Ma Hwan Ok, Japan & Dr. D.N. Tewari, India

Prof. Takashi Okuyama, Japan

A view of the participants

sustainability of teak wood resource.

Considerations

In line with the conference theme - Quality Timber Products of Teak from Sustainable Forest Management (SFM) in meeting the growing teak wood demands of the modern society and taking cognizance of the dynamic nature of technology, socio-economics, market, institutions, governance, policy and policy instruments, the following points need to be considered.

- To regain the pre-eminence of teak in view of its sterling properties, to reduce production cost and to improve the quality of teak wood and to adjust to the changing market requirements and specification
- To meet the existing and emerging demand for teakwood at prices fair to the consumer and remunerative to the producer.
- To keep the forest land under appropriate use "where it will produce most and deteriorate least" by adopting species/ provenances/varieties for their productivity, socio-economic benefits and utility.
- To install equity (social/gender) and sustainability as prime considerations without compromising on the imperative of efficiency (i.e., input-output relationship).
- To facilitate the involvement of different categories of investors (MNCs to local farmers), for mobilizing resources and to ensure adequate return on investment.
- To involve people, community, NGOs and other stakeholders in the process of planning and development of teak, to continuously enhance technology, management, value addition, marketing system and institutional support.
- To add incremental doses of competitive advantage (eg. reflected in efficiency of technology, human resource and governance) to the natural comparative advantage of teak, and to guide the dynamism of the situation in positive and appropriate direction.
- To benefit from the valuable experience of other institutions and countries with the aim of avoiding duplications and supporting sustainable forestry development.

Kerala Declaration

As part of the resolutions/recommendations, the International Conference hereby strongly urged and called upon the national governments, research institutions and agencies, international assistance and donor organizations, investors and funding agencies, to collectively and collaboratively strive for addressing the following 13 points which will promote the tropical timber development programme for meeting the societal needs of quality timber products.

1. Formulate and enforce appropriate (sub) policy on teak within the national forest land use and economic policies ensuring sustainability and long term security of investments.

1. Evaluate and document the present condition of the teak crop/resource, and critically appraise the technology in use in the context of the new developments in research and linkages of research findings on teak with field practices.
2. Undertake appropriate steps to refine and package up-to-date technology for application in realistic field conditions involving, for example seed technology, plant genetics, silvicultural practices, agroforestry systems, protection, harvesting, product development, processing and value addition.
3. Research efforts should be directed to improving the productivity with fast grown and quality timber and designing new products for new markets and address technology transfer issues and commercialization of innovative and new products and services with a role of intellectual property, patents and licensing practices for better encouragement and support.
4. Recognizing the need for new teak producer countries to be aware of the danger posed by potential outbreaks of the teak defoliator, *Hyblaea puera*, teak growers need to implement appropriate pest monitoring systems, the international organizations to support basic research and work towards prevention of outbreaks and developing suitable non-chemical methods for control of the pest by taking advantage of research already carried out in Asia.
5. Conduct comprehensive studies on 'socio-economics' of teak, under different technological systems (monoculture, mixed planting, agroforestry, etc.), in comparison to other forest crops/products to demonstrate its economic viability/superiority and potential (in terms of competitive and comparative advantages) – as a means to attract investment flows.

1. Design and disseminate guidelines and codes of best practices relating to various steps and stages of teakwood production and utilization through adequate extension mechanisms.
2. Develop integrated research and education, and the link between education and sustainable forest management (SFM) with multidisciplinary and multifaceted approaches that establish SFM and build partnerships for training and evaluation.
3. Identify and analyse unsolved and emerging problems (both technical and nontechnical) and initiate and implement measures to address them adequately in a coordinated and collaborative manner.
4. Collect, develop and disseminate trade/market information to promote

and facilitate market access and success for teak products.

5. Establish and implement a comprehensive system of planning (involving long, medium and short term plans and sites/locations, systems and market and so on) to avoid arbitrariness and *ad-hocism* in teak resource development.

6. Promote/facilitate establishment of targeted financing (in terms of adequacy and timeliness) to ensure that plans on teak development are financially supported.

Networking

1. Strengthen the system of regional and international collaboration, co-ordination and networking to promote exchange of research results and experience, trainings and human resource development between countries of tropical Asia, Africa, Latin America and the Caribbean, supported by private sector, including communities and relevant international agencies.

Termiticidal treatment for root trainer-raised eucalypts planting stock

Treatment against termites is a pre-requisite in raising forest plantations especially for the exotics like eucalypts. Termites attack the root portion and the susceptible period is the initial six months. An effective treatment methodology, i.e. drenching the basketted seedlings with the insecticide solution, was in practice for the polybag raised seedlings. However, the recent trends in plantation forestry such as the use of clonal planting material and root trainers made the methodology standardise with polybag seedlings inadequate. In seedlings the termite attack was always noticed on the taproot as ring barking, but in the clonal material the termite attack is often limited to the lower stem portion that gets buried in the soil. Further standardisation of the treatment methodology for termite control in clonally propagated and root trainer raised planting stock became necessary. Field trials were carried out during 1999-2000 for standardising the insecticide, its concentration, and the treatment methodology.

Based on the field trials, Chlorpyrifos 20EC was found to give effective protection. The treatment methodology was as follows. The root-trainer block with seedlings were dipped in a 0.5% a.i. solution of the insecticide kept in a plastic tray of appropriate volume. The root trainer block was held in the

New infrastructure for KFRI

KFRI is in the process of developing infrastructural facilities to strengthen its research and extension activities. A multi-storied building to provide additional laboratory space, conference/meeting rooms as well as exhibition area; a training centre to provide specialized training on various aspects of tropical forestry for participants from India and abroad and a trainees' and research scholars' hostel for accommodating participants of the various training programmes are being built up, utilizing the funds received from the Planning Commission, Government of India as additional central assistance to the tune of Rupees 500 lakhs. The foundation stones of the various buildings were laid on 1 April 2003.

Shri. Therambil Ramakrishnan, MLA, laying foundation stone of the Training and Extension Block

Shri. P. P. George, MLA inaugurating the new Herbarium Block

solution for a minute to aid complete penetration of the insecticide within the potting medium (fig.1). The blocks were then placed on stand and a plastic tray was kept beneath to collect the excess insecticide solution.

The treatment was found effective for more than a year, which was sufficient to tide over the vulnerable period of attack by termites under normal conditions. In this method one litre of the insecticide solution would be enough for dipping 100 root trainer blocks (2400 seedlings) and the cost works out to Rs 0.25/- per seedling. This method is advantageous as it is effective, easy to perform, cheap and utilises only the minimum quantity of insecticide.

The treatment can be performed on the day or one day before planting out in the field. The seedlings should be well established in the root trainers so that the potting medium is held intact by the roots and is not drained out while dipping. The present findings are based on treatment with four-month-old *Eucalyptus tereticornis* clones established in root trainer with vermiculite medium. The treated seedlings in root trainer should not be kept for longer periods. Also spillage of insecticide solution on to the foliage may be prevented.

R.V.Varma and P.R.Swaran
Entomology Division

Abundance of major mammals in Kerala forests

In Kerala State, wildlife census of large mammals using scientific census techniques was conducted in three points of time during 1993, 1997 and 2002. The first census was conducted in all the forest divisions of the State with sampling in all the forest divisions. The second census was conducted with sampling carried out in one third of the forest blocks and in the third, all the forest blocks were included. The different techniques employed included, line transect sampling with direct sighting of animals, line transect with indirect evidences, block count of animals, tiger sampling using pugmark census etc. Besides these there has been several census of endangered species such as Nilgiri tahr, grizzled giant squirrel, lion-tailed macaques, tigers etc.

This note is based on the latest statewide census conducted by the Kerala Forest Department and the Kerala Forest Research Institute in 2002. The data were collected by trained census volunteers with the help of tribal trackers. The details presented in the following table is based on the data of the animals from the block counts with the direct sighting all over the forest divisions of the State. The table gives a ready reckoner of the sighting data of the of the major large herbivore mammals in the state in a geographical perspective (from North Kerala to South Kerala) and giving a picture of the estimates that could be anticipated based on the census information.

Several refinements of census techniques could be thought of and tested in the field to get reliable estimate of major target animals. One such area is on the elephant estimate for the whole state based on dung counts where a crucial factor to be considered is the dung decay rate in different habitats (evergreen forests, semi evergreen forests, southern montane temperate forests, moist deciduous forests, dry deciduous forests, shola forests, bamboo brakes, reed brakes etc.) of the State. The dung decay rate is quite likely to vary considerably in these diverse habitats. Care can also be taken to eliminate areas, which do not have elephants distribution in the recent past. I hope that this will give an insight and generate interest in the further refinement of the state wildlife census operations in the future.

FOREST SEED CENTRE IN KFRI

A Forest Seed Centre has started functioning in the KFRI main campus at Peechi. The Centre known as Kerala Forest Seed Centre (KFSC) is a joint venture of KFRI and the Kerala Forest Department (KFD) under the World Bank assisted Kerala Forestry Project.

The objective of the Centre is to collect seeds of superior trees/stands, process, grade, store and supply to KFD and other governmental departments, non governmental agencies, farmers other interested in seed of forest tree species for propagation. The center has got good laboratory facilities to undertake research and provide training to forestry professionals, researchers, students and others interested in seed science.

The Centre has facilities for processing, grading and storage of seeds at low temperature, seed testing for pests and diseases and certification for seed weight, purity and viability.

Seeds of teak (*Tectona grandis*), rosewood (*Dalbergia sissoides* and *D. latifolia*), bamboo, rattan and several other tropical species in Kerala will be available for sale. The list of tree seeds available will be provided on request.

The seeds supplied will be certified for source, purity, germination percentage and number of seeds per kilogram or gram.

Further information can be had from:

The Scientist in Charge
Kerala Forest Seed Centre
Kerala Forest Research Institute
Peechi 680653, Thrissur, Kerala
Phone: 0487 2698063
Email: seedcentre@kfri.org

Sighting data of eight mamals during the wildlife census in Kerala forests*

Forest Divisions (North of Palakkad Gap)	Number of animals sighted							
	Elephant	Gaur	Sambar	Spotted deer	Wild boar	Malabar giant squirrel	Nilgiri langur	Lion-tailed macaque
North Wayanad	18	36	10	47	9	71	85	
South Wayanad	28	19	16	120	26	55	57	
Wayanad Wildlife	335	295	422	1719	134	250		
Aralam Wildlife	18	10	27		8	57	60	28
Kannur	1		6	1	23	29	14	
Kozhikode	21		18		1	11	4	
Nilambur North	77	4	69	92	198	100	153	28
Nilambur South	77	23	15	72	84	21	40	2
Silent Valley		4		2		27	67	120
Mannarkkad	12	1	13	17	56	23	17	1
Palakkad	37		22	28	38	47	38	
Sub total for forest divisions North of Palakkad Gap	***624***	***392***	***618***	***2098***	***577***	***691***	***535***	***179***
Forest Divisions (South of Palakkad Gap)	**Number of animals sighted**							
	Elephant	**Gaur**	**Sambar**	**Spotted deer**	**Wild boar**	**Malabar giant squirrel**	**Nilgiri langur**	**Lion-tailed macaque**
Nemmara	16	49	36		29	71	122	67
Parambikulam Wildlife	90	293	214	319	121	92	411	79
Thrissur			9	77	96	33		
Thrissur Wildlife	18	19	21	19	17	63	35	
Vazhachal	94	24	43	27	44	86	192	20
Chalakkudi	59	10	16	22	38	91	34	
Malayattur	284	15	63	4	86	50	27	
Kothamangalam	10		2		28	4		
Kottayam	36		7		16	21	2	8
Idukki Wildife	55		7		15	38		
Munnar	137	162	168	9	371	129	351	
Munnar Wildlife	55	85	20	80	13	6	24	
Periyar	124	418	194		385	170	505	92
Konni	87	8	29		309	27		
Ranni	291	47	125		127	137	148	23
Achenkovil	8	5	21		33	51	25	2
Punalur	6	5	7		192	26		
Thenmala	7	2	33		35	32	21	18
Shendurney	22		7		25	39	28	19
Thiruvananthapuram	106	107	42		173	46	54	34
Agasthyavanam	14	6			17	10		
Thiruvananthapuram Wildlife	153	125	17	2	105	128	133	4
Sub total for forest divisions South of Palakkad Gap	***1672***	***1380***	***1081***	***559***	***2275***	***1350***	***2112***	***366***
Grand total for all the forest divisions of Kerala State	**Number of animals sighted**							
	Elephant	**Gaur**	**Sambar**	**Spotted deer**	**Wild boar**	**Malabar giant squirrel**	**Nilgiri langur**	**Lion-tailed macaque**
	2296	**1772**	**1699**	**2657**	**2852**	**2041**	**2647**	**545**

**Source: Population estimation of major mammals in the forests of Kerala – 2002. by P.S.Easa, M.Sivaram and E.A.Jayson. KFRI Consultancy Report 09, Kerala Forest and Wildlife Department & Kerala Forest Research Institute.*

The above figures are based on the block count method

Animals not sighted

K.K. Ramachandran
Wildlife Biology

Local volume tables for *Acacia mangium* and *Acacia auriculiformis*

Large scale planting of *Acacia auriculiformis* took place in Kerala as part of the Social Forestry Project during 1980's. More recently, plantations of *Acacia mangium* and *A. auriculiformis* have been raised in different parts of the State as part of the Kerala Forestry Project with an intension to use them for pulpwood. Volume tables are useful for estimating growing stock or for assessing productivity and these are quite often asked for. Attempts to develop local volume tables for southern Kerala for these to species are reported here. No local volume table for the region has been reported for *Acacia mangium*. Jayaraman and Rajan (1991) had reported provisional tree volume table for *A. auriculiformis* based on data from different parts of Kerala State.

Acacia mangium belonging to family Fabaceae and subfamily Mimosoideae, has become a major plantation species in the humid tropical lowlands of Asia. Its success is due to extremely vigorous growth (annual wood volume increment of over 30 $m^3 ha^{-1}$ on favourable sites), tolerance to very acid and low nutrient soils, ability to grow reasonably well where competition is severe, such as on grasslands, relative freedom from diseases, wood properties which potentially make it acceptable for a wide range of end uses, and ease of establishment. Plantations in Indonesia and Malaysia are the resource base for a large pulp and paper industry. Other uses include fuelwood, building and furniture timber, and manufacture of particle boards.

Acacia auriculiformis. also belongs to subfamily Mimosoideae of family Fabaceae. Few other species can match the ability of *A. auriculiformis* to grow on harsh sites in the tropics. Its rapid early growth rate, ability to fix nitrogen, tolerance of infertile, acid, alkaline, saline or seasonally waterlogged soils and moderate dry seasons make it a useful species for the rehabilitation of degraded lands. It has been widely planted for fuelwood production, erosion control, ornament or shade mainly in Asia, but also in Africa and South America. The stem form can be improved significantly by selection and breeding, providing outstanding prospects for industrial plantations to produce paper pulp and other timber products.

The target populations were the plantations of *A. mangium* and *A. auriculiformis* raised under the Kerala Forestry Project in Thiruvananthapuram and Punalur Forest Divisions. A total of 1800 ha have been planted under the two species in the Forest Divisions mentioned. The exact area planted under the two species in the said region was difficult to obtain as several plantations contained multiple blocks of the two species without records of area under such subdivisions.

Plantations raised in years 1999 to 2003 were selected from each Forest Division. Only a few plantations were left out from the whole set. The seedlings used for planting were raised in root-trainers. Planting was done mostly during June-August, at a spacing of 2.5 m x 2.5 m. Terraces of 1 m x 0.7 m were taken around each planting pit and fertilizers were applied based on soil testing. Casualty replacement was undertaken during the first year of planting. The previous vegetation in most of the cases was eucalypts.

Trees of different size classes were sampled from plantations of *A. mangium* and *A. auriculiformis* of around 2 to 5 years of age. Altogether 14 trees of *A. mangium* and 10 trees of *A. auriculiformis* were felled for the purpose. Measurement of girth at breast-height was taken before felling. Length of the tree from base to the tip of the crown was measured after felling. In order to measure the volume, girth (both over bark and under bark) was measured at the base, middle and tip of each billet of 3 m length starting from the base. When the terminal billets fell short of 3 m, their lengths recorded separately along with the girth measurements required for computation of volume. The lower limit of utilizable volume was set to 10 cm girth over bark. For computation of pulpwood volume, the lower limit was set to 15 cm girth under bark. Volume of each billet was computed using Newton's formula (Chaturvedi and Khanna,1982).

The range of diameter, height and volume of the trees used for construction of the volume tables are furnished in Table 1.

Table 1. Range of diameter, height and volume of trees used for the study

Attribute	*A. mangium*		*A. auriculiformis*	
	Minimum	Maximum	Minimum	Maximum
Dbh (cm)	7.48	20.24	4.04	14.86
Height (m)	7.0	20.5	5.1	18.0
Commercial volume (m^3)	0.013	0.308	0.005	0.214
Pulpwood volume (m^3)	0.009	0.253	0.001	0.139

The aggregated volume of billets of individual trees was regressed on the corresponding diameter at breast-height (dbh). The diameter was arrived at using circular approximation of basal area of the tree. The following functional form was employed for relating volume with diameter.

$$\ln V = a + b \ln D \qquad (1)$$

where V is the commercial volume or pulpwood volume as the case may be (m^3)

D is the diameter at breast-height of the tree (cm)

a and b are the parameters

Prediction equations developed

The volume equations fitted are reported in the following. The term V_c refers to over-bark volume of wood to a lower limit of 10 cm girth over bark. The term V_p refers to under-bark volume of wood to a lower limit of 15 cm girth under bark.

For *Acacia mangium*,

$$\ln V_c = -9.882 + 2.927 \ln D$$
$$(0.446)\ (0.178) \qquad (2)$$

Adjusted R^2 of the above equation was 0.954 and Mean Square Error (MSE) was 0.034. The figures in parentheses are standard errors of the estimates.

$$\ln V_p = -10.529 + 3.073 \ln D$$
$$(0.454)\ (0.182) \qquad (3)$$

Adjusted R^2 of the above equation was 0.956 and MSE was 0.035.

For *Acacia auriculiformis*,

$$\ln V_c = -9.382 + 2.853 \ln D$$
$$(0.515)\ (0.259) \qquad (4)$$

Adjusted R^2 of the above equation was 0.931 and MSE was 0.089.

$$\ln V_p = -11.082 + 3.429 \ln D$$
$$(0.761)\ (0.383) \qquad (5)$$

Adjusted R^2 of the above equation was 0.898 and MSE was 0.195.

The adjusted R^2 values of the volume equations for *A. mangium* were higher than that of *A. auriculiformis*. This is probably because of the straight bole and lesser frequency of forking in *A. mangium*. The basal diameter of trees in such cases will thus directly reflect the volume carried by the tree. For both the species, the R^2 values were higher than 0.9 indicating the suitability of the functions for practical use. While using Equations (2) to (5) in practice, a correction factor of (MSE/2) has to be added to ln V before converting to original volume values.

As the height of trees was measured after felling, it was possible to include height as a predictor variable in the volume equations. This was avoided for two reasons. First, the R^2 values based on diameter alone were high enough for prediction and secondly, height is an attribute more difficult to measure.

Volume tables

The local volume tables prepared for the two species based on Equations (2), (3), (4) and (5) are given in Tables 2 and 3.

Table 2. Local volume table for *A. mangium*

Girth at breast-height (cm)	Pulpwood volume (m^3)	Commercial volume(m^3)
5	0.0001	0.0002
6	0.0002	0.0003
7	0.0003	0.0005
8	0.0005	0.0008
9	0.0007	0.0011
10	0.0010	0.0015
11	0.0013	0.0020
12	0.0017	0.0026
13	0.0021	0.0033
14	0.0027	0.0041
15	0.0033	0.0050
16	0.0040	0.0061
17	0.0049	0.0073
18	0.0058	0.0086
19	0.0069	0.0101
20	0.0080	0.0117
21	0.0093	0.0135
22	0.0108	0.0155
23	0.0123	0.0176
24	0.0141	0.0199
25	0.0159	0.0225
26	0.0180	0.0252
27	0.0202	0.0282
28	0.0226	0.0313
29	0.0252	0.0347
30	0.0279	0.0383
31	0.0309	0.0422

32	0.0340	0.0463
33	0.0374	0.0507
34	0.0410	0.0553
35	0.0448	0.0602
36	0.0489	0.0654
37	0.0532	0.0708
38	0.0577	0.0766
39	0.0625	0.0826
40	0.0676	0.0890
41	0.0729	0.0956
42	0.0785	0.1026
43	0.0844	0.1099
44	0.0906	0.1176
45	0.0970	0.1256
46	0.1038	0.1339
47	0.1109	0.1426
48	0.1183	0.1517
49	0.1261	0.1611
50	0.1341	0.1710
51	0.1426	0.1812
52	0.1513	0.1918
53	0.1604	0.2028
54	0.1699	0.2142
55	0.1798	0.2260
56	0.1900	0.2382
57	0.2006	0.2509
58	0.2117	0.2640
59	0.2231	0.2775
60	0.2349	0.2915
61	0.2471	0.3060
62	0.2598	0.3209
63	0.2729	0.3363
64	0.2864	0.3521
65	0.3004	0.3685
66	0.3148	0.3853
67	0.3297	0.4027
68	0.3451	0.4205
69	0.3609	0.4389
70	0.3772	0.4577

Table 3. Local volume table for *A. auriculiformis*

Girth at breast-height (cm)	Pulpwood volume (m^3)	Commercial volume(m^3)
5	0.0001	0.0003
6	0.0002	0.0006
7	0.0003	0.0009
8	0.0004	0.0013
9	0.0006	0.0018
10	0.0009	0.0024
11	0.0012	0.0031
12	0.0017	0.0040
13	0.0022	0.0051
14	0.0028	0.0062
15	0.0036	0.0076
16	0.0045	0.0091
17	0.0055	0.0109
18	0.0067	0.0128
19	0.0081	0.0149
20	0.0097	0.0173
21	0.0114	0.0199
22	0.0134	0.0227
23	0.0156	0.0258
24	0.0181	0.0291
25	0.0208	0.0327
26	0.0238	0.0365
27	0.0271	0.0407
28	0.0307	0.0451
29	0.0346	0.0499
30	0.0388	0.0550
31	0.0435	0.0604
32	0.0485	0.0661
33	0.0538	0.0721
34	0.0596	0.0786
35	0.0659	0.0853
36	0.0726	0.0925
37	0.0797	0.1000
38	0.0873	0.1079
39	0.0955	0.1162
40	0.1041	0.1249
41	0.1133	0.1340
42	0.1231	0.1436
43	0.1335	0.1535
44	0.1444	0.1639
45	0.1560	0.1748
46	0.1682	0.1861
47	0.1810	0.1979
48	0.1946	0.2101
49	0.2089	0.2229
50	0.2238	0.2361

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Jayaraman, K. and Rajan, A.R. 1991. *Yield from Acacia auriculiformis plantations in Kerala*. KFRI Research Report 81. Kerala Forest Research Institute, Peechi, Kerala. 25 p.

K. Jayaraman
Statistics Division

New Book

Bio diversity Documentation for Kerala:

INSECTS. The handbook contains information on 4027 species of insects recorded from Kerala. IThe document is organised in systematic sequance at higher taxonamic levels and the species are listed alphabetically. Under each species, it's distribution in Kerala along with ecological data and litarature citation are given. Pages: Approximate 280

Non-wood Forest Products (NWFPs) constitute an important element of the livelihood security of the tribal people in Kerala state. Although NWFPs are present almost ubiquitously in the forests, there has been concern about the sustainability of these resources, especially in view of changing land use patterns and over-exploitation of these resources. Commercialisation and associated over extraction of NWFPs and establishment of forest plantations have led to serious erosion of the resources in many parts of the state. This study is a logical continuation of two earlier studies where NWFP spectrum and its regeneration problems in the natural forests and collection, marketing and management of NWFPs in the state were closely examined. The studies revealed that present system of management of NWFPs is ineffective particularly due to lack of participation of interest groups in the management. In view of this, the present study has attempted to develop participatory management programme to promote biodiversity conservation and sustainable use of NWFPs. To translate sustainable development principles into practice requires knowledge of both ecological and economic systems. Hence, analyzing interlinkages between both the systems relating to NWFPs, the study attempted to formulate a model participatory management programme through implementation of an action plan. The study was carried out at Wayanad Wildlife Sanctuary (WWS) in the Western Ghats.

In the ecological analysis, an attempt was made to evaluate the occurrence and abundance of NWFPs in the natural forests and plantations of WWS in the Western Ghats. The species richness of NWFPs varies among the sites within the sanctuary, but the natural forests consistently has greater density, diversity and biomass productivity for most NWFPs as compared to plantations. With regard to environmental and edaphic factors, understorey light availability was greater in the plantations (between 39 and 62% of full light in the plantations and between 26 and 50% in the natural forests). Data on NWFP productivity show that for all 10 selected NWFP species, the natural forest sites are superior to the plantations, despite pronounced inter site variations.

The economic analysis was carried out at micro level (society/hamlet), which helped in identifying the most needy among the primary stakeholders. The quantity of NWFPs collected and collection charge projected a declining trend over the years, which reflected in the poor socio-economic conditions of the collectors. Low returns per unit effort and more time spent and more distance traveled for collection, coupled with less share of proposed sale value lead to the collection a distress and less attractive job. The marketing of products by the Federation is not very effective partly due to the operation of intermediaries and partly due to market imperfection. Net result is that the tribes continue to live below the poverty line. However, NWFP collection continues in the area due to lack of other job opportunities.

The study indicated that there exists a close linkage between ecological and economic systems of NWFPs and a change in one system affects the other either positively or negatively. For instance, demand-pull and consequent price increase result in over extraction of species in great demand. Thus, appropriate management interventions are required to prevent the depletion and to conserve the biodiversity.

A participatory programme has been developed based on two basic assumptions: (i) there exists a close linkage between ecologicial and economic systems relating to NWFPs and (ii) sustained income is one of the prerequisites for the success of the management. The programme was developed based on the implementation of an action plan which consists of forming a resource management committee, preparation of micro-plan and testing of probable impact of management on collection, marketing and vegetation structure of the forests. NWFP resources were quantified at the sanctuary as well as hamlet/foraging area levels. The determinants of household participation in the participatory management were identified.

One of the important features of the programme is that it gives high emphasis on activities leading to enhance resource availability in the forests through enrichment planting, preservation of gene pool area, species substitution in the harvesting regimes, etc. and income of the col-

lectors through open market sale, value addition, etc. The programme also emphasises the importance of training and awareness creation among the interest groups on various aspects and activities of participatory management for better conservation and sustainable utilisation of NWFPs. The study has proved that effective implementation of participatory management would enhance the income of the tribes and reduce pressure on NWFP species, which are essential for conservation of biodiversity of NWFPs in the study area. Long and short term strategies/ activities for the above purpose are also presented in the report.

A survey on mycorrhizal association in , *Tectona grandis*, *Eucalyptus camaldulensis*, *E. deglupta*, *E. globulus*, *E. grandis*, *E. pellita*, *E. regnans*, *E. tereticornis*, *E. tessallaris*, *E. urophylla*, *Dalbergia latifolia*, *Santalum album*, *Gmelina arborea*, *Acacia auriculiformis*, *A. aulacocarpa*, *A. crassicarpa*, *A. mangium*, *A. mearnsii*, *Paraserianthes falcateria*, *Bombax ceiba*, *Swietenia macrophylla*, *Ailanthus triphysa*, *Pterocarpus santalinus*, and *Terminalia paniculata* raised in plantations and in natural stands in different parts of the State was conducted and their mycorrhizal status and mycorrhizal dependency were studied. Biodiversity of mycorrhizal fungi in rhizosphere soils from representative sample plots of these 23 plantation species was also studied. All the forestry species studied exhibited arbuscular mycorrhizal (AM) association. All typical AM features like arbuscules, vesicles, intra-cellular hyphal coils, extra and intra radical hyphae, etc. were observed in root samples of most of the tree species studied. However, per cent root infection as well as characteristics of arbuscules and vesicles varied among the host species. Teak exhibited a high level of AM fungal root colonization in most of the 70 teak plantations surveyed with a mean AM fungal root colonization of 32.4 per cent irrespective of differences in age, elevation and edaphic conditions. The highest infection (>865) was recorded in plantations belonging to 11-20 years old; both young (<10 year-old) and old (>40 year-old) teak trees showed comparatively low AM fungal root infection. *Swietenia macrophylla* recorded the least (2.5%) AM fungal root colonization, while all other forestry species like *D. latifolia*, *S. album*, *G. arborea*, *P. falcataria*, etc. exhibited moderate to high AM colonization.

Rhizosphere soils of all the forestry species exhibited a remarkable diversity of AM fungi and the population in each host species comprised of 11 to 85 fungal species belonging to six genera viz., *Glomus*, *Sclerocystis*, *Acaulospora*, *Scutellospora*, *Giagaspora* and *Entrophospora*. Among these *Glomus* and *Acaulospora* were the most predominant genera encountered with large number of species as well as high spore densit. *Glomus* was represented by 7 to 44 species, while *Acaulospora* represented 2 to 15 species in most rhizosphere soil samples. AM fungal root colonization as well as AM fungal spatial distribution, species diversity and community composition were highly influenced by host as well as available phosphorus and nitrogen in the soil. Among these, soil pH accounted for around 35 per cent of the total variability in AM fungal root colonization in teak. However, exchangeable cations (Ca) was found to be the most influential variable affecting the AM root colonization in eucalypts. Biodiversity indices of AM fungi in each host plantations were worked out separately; relative abundance of AM fungi was measured using Shannon-Weiner and Simpson's indices and beta and gamma diversity were also estimated for each plantation species.

Ectomycorrhizal fungal (ECM) association was recorded in eucalypts, acaia, teak, rosewood and *G. arborea*. However, ECM association was predominant in *Eucalyptus grandis*, *E. tereticornis* and *Acacia auriculiformis* as evidenced and characterized by various forms of heterorhizy as well as different ECM fungal partners. More than 37 ECM fungi belonging to Sclerodermatales, Lycoperdales, Aphyllosphorales, and Agaricales were found associated with different hosts; of these *Pisolithus tinctorius*, *Sleroderma verrucosum*, *S. cirinum*, *Laccaria* spp., were the most predominant ones. Ectomycorrhizal synthesis was carried out employing eucalypt seedlings and pure cultures of *P. tinctorius*, *S. verrucosum* and *L. laccata*.

Laboratory and nursery trials were carried out to improve the planting stock of selected tree species viz., *T. grandis*, *S. album*, and *D. latifolia* using AM fungi viz., *Glomus fasciculatum*, *G. mosseae*, and *A. appendicula*. In teak, seedling height as well as total biomass increased in AMF treated seedlings. *A. appendicula* treated seedlings recorded the maximum (>60%) mycorrhizal inoculation effect (MIE) followed by *G. fasciculatum* treated seedlings (38%). In *S. album*, treatment with a combination of *G. fasciculatum* and *A. appendicula* gave the maximum (>48%) MIE. In *D. latifolia* seedlings, inoculation with a mixture of *G. fasciculatum* and *A. appendicula* gave the maximum MIE of 39.58%.

Attempts were also made to exploit the ECM fungi, *P. tinctorius* and *S. verrucosum* to improve the seedlings of *E. grandis*, *E. tereticornis* and *Acacia mangium*. The ECM fungal inoculation has significant effect on seedling height increment, number of leaf pairs and also in seedling biomass production. Among various forms of inoculum tried, PT-spore-sand mix-

ture was found most effective and gave maximum MIE in *E. tereticornis* (>90%), *E. grandis* (>50%) and *A. mangium* (>123%). The PT-spore-slury and PT-mycelial beads were also proved to be efficient inocula, which gave maximum (>65%) MIE in *E. tereticornis* and *A. mangium*. However, more in-depth studies are warranted for selecting appropriate fungal partners for forest tree species as well as mycorrhization for their planting stock.

Baseline maps of Periyar Tiger Reserve (PTR) and surrounding areas were prepared as a consultancy project under the World Bank aided Eco-development Project. Source material for the mapping included field data, information from Management Plans, Survey of India topo sheets and satellite images. Multispectral images from IRS 1c Satellite taken in 1999 were used for the mapping. The relevant portions were extracted in four bands, RGB composite prepared and registered with respect to 1:50,000 Survey of India topo sheets. Supervised classification was carried out using modules of the GIS program IDRSI. The objective of the project was to prepare detailed maps with latest boundaries and land use changes.

The Survey of India topo sheets were digitized at 1:50,000 scale at contour interval of 100 m. A DEM (Digital Elevtion Model) was prepared for 3D view of the area. Field trips were carried out for ground checking of images GIS package, MAPINFO was used for the preparation of maps.

Maps were created on different themes for PTR as a whole, forest range and section wise. Political and administrative features of PTR and adjoining districts, panchayats and villages were prepared in one set of maps. Topographical features, hydrology and water level in the lake were mapped in detail. Settlements, estates, lease areas, etc. constituted another set of maps, many of which were GPS surveyed for demarcating boundaries. New roads, trek paths and firelines were GPS surveyed and added to base maps. Management zones, present and past, were plotted on maps. Vegetation was mapped in detail; classified satellite image was used as base layer to which additional details have been added. This was supplemented by structural analysis of tree composition from sample plots laid out for the purpose. Biodiversity hot spots have been analyzed and plotted. Maps of plantations have been updated. At detailed level, maps have been prepared with contour lines and place names in addition to topographical, vegetation and communication layers. Each Forest Section has been described in detail with detailed map and boundary clearly marked on topo sheets.

Rattan population in Kerala is diminishing drastically and hence there is an urgent need for evolving a strategy for scientific management and conservation of this valuable resource. Along with the preservation of existing natural resources, germplasm preservation and cultivation of commercially important species also have to be done. Before starting cultivation in large scale, suitable species for a particular locality should be selected and their performance assessed. In this context, the Kerala Forest Research Institute has initiated germplasm conservation and species trials to evaluate the performance of various species at different altitudes and also seed stands have been established.

Eight rattan species were evaluated for their performance at two different altitudes, 1000 m and 300 m, at Vazhachal and Nelliampathy. With regard to survival and total height, *Calamus baratangensis* was found to be the best species suited for higher elevations and *Daemonorops kurzianus* for lower elevations.

Seed stands for 12 commercially important rattan species were established of which four species have started flowering and fruiting. In the germplasm collection, 30 species of rattans have been established, some of which also have started flowering and fruiting. *Calamus perigrinus*, a species introduced from Thailand, has also started producing fruits regularly.

Rattans are dioecious and flower annually. Age of the plant at first flowering varies according to species. The time of initiation of flowering also varies slightly with locality from year to year. But a correlation between flowering and climatic conditions showed that both male and female plants flowered simultaneously when the rainfall was in the range of 400-500 mm, relative humidity 100%, wind speed up to 0.5 m/s and temperature up to 25 °C. Only *C. hookerianus* showed variation from this.

The time taken for emergence of inflorescence to fruit maturity was about nine months in *C. hookerianus*, eight months in *C. pseudotenuis*, 11 months in *C. thwaitesii* and six months in *C. rotang*. Anthesis of flower takes place during night between 1 and 4 AM. All the pollen is shed within 3 to 4 hrs. Male flowers are scented and sterile male flowers produce a droplet of nectar at the base of the flower. Female flowers do not produce nectar, but female flowers are receptive up to 12 to 14 hrs after opening. Pollen viability is lost in about 12 hrs from the time of anthesis. Even though the species studied have adaptations to both anemophily and entomophily, anemophily is more common. Embryo

development is relatively low. The developing shoot and root apices get shifted through an angle of 90° due to the growth of the cotyledonary lobe. During germination, a haustorium is developed by the progressive enlargement of the basal part of the embryo. After about one month of the onset of germination, the spongy haustorium completely fills the seed cavity. The fruits stored in closed plastic bags under room temperature remain viable for two months. Seeds in airtight bags kept at 5 °C maintain viability for 3 months.

A Database on Forest Resources of Kerala. Research Report No. 255 (2004) Sivaram, M.

Information on forest resources is essential in view of the complex nature of forestry and its contribution to the economic, social and environmental needs of the society. In this connection, a computerized database and retrieval software containing data collected from several agencies on forest resources of Kerala State has been developed. The topics covered in the database include forest area, forest plantations, forest products, biodiversity, forest weather, forest fire and revenue and expenditure of the Kerala Forest Department. The utility of the software for forest sector analysis citing specific accomplishments made in the project and its future expansion have also been discussed.

Resource Enhancement and Processing of Cane and Bamboo Species Suitable for Handicrafts. Research Report No. 256 (2004) Sharma J.K., Seetnalakshmi K.K,, Renuka, C., Muktesh Kumar, M S., Sarojam, N., Pandalai, R.C., George, K.T. Muralidharan, E.M., Mohanan, C., Sankar, S., Gnanaharan, R., Bhat, K.M., Hussain, K.H., Sankara Pillai K., Chacko, K.C., Chandrashekara, U.M., Induchoodan N.C., Damodharan T.K. and Raveendran, V.P

This project was implemented in collaboration with Rain Forest Research Institute, Jorhat, Assam and State Forest Research Institute, Itanagar, Arunachal Pradesh. The multidisciplinary project included survey and documentation of species used in handicrafts, adoption of propagation techniques, package of practices for cultivation, germplasm establishment, planting stock production through tissue culture and macropropagation methods, and, nurseries and demonstration plots establishment, in collaboration with user groups. Capacity building for cultivation and value added utilization through a series of training programmes and technology transfer was another important objective. Organization of workshops and meetings and publication of handbooks, directory and bibliographies were an integral part of the project to create awareness among all stakeholders and to emphasize the potential of bamboo and cane development.

- Eighteen species of canes and nine species of bamboos have been used for handicrafts in Kerala.
- KFRI Bambusetum, which hosted 25 species of sympodial bamboos at the onset of the project, was strengthened with collections from all over India, especially from north-eastern region and at present accommodates 59 sympodial and five monopodial species.
- Development of rapid micropropagation techniques for four species of bamboo and nine species of cane (rattan) were undertaken.
- Eleven bamboo nurseries were established including eight under joint-venture nursery programme in collaboration with interest groups like other institutions, NGOs, SHGs and Planters. Totally, 1,77,240 seedlings belonging to six species (*Bambusa bambos, B. tulda, Dendrocalamus giganteus, D. strictus, Ochlandra ebracteata* and *O. travancorica*) and 5,375 rooted cuttings of 13 species (*B. balcooa, B. pallida, B. polymorpha, B. striata, B. tulda, B. vulgaris* (green), *D. brandisii, D. giganteus, D. longispathus, D. membranaceus, P. ritcheyi, P. stocksii* and *T. oliveri)* were produced.
- Resource persons from KFRI trained scientists from partner institutions at north-eastern region through a training workshop organized at RFRI, Jorhat.
- Through a series of 24 training programmes, technology for cultivation and processing of cane and bamboo was transferred to 876 participants such as farmers, NGOs, SHGs, department officials and local body members from Kerala.
- The potential cultivators were familiarized with various species through field visits to bambusetum and nurseries. Through the feedback received from participants, species such as *Dendrocalamus giganteus, Thyrsostachys oliveri, Bambusa nutans, Dendrocalamus brandisii* and *Bambusa bambos* were rated as highly preferred for cultivation.
- KFRI established 14 demonstration plots in collaboration with user groups. In addition, publication of a newsletter in Malayalam *Muladhwani* (Voice of Bamboo), and All India Radio programme on the theme Bamboo: Tomorrow's Crop (*Mula, Nalathe Vila*) under the 'Farm and Home Programme (in Malayalam) were some of the important milestones covered for popularisation of organized cultivation of bamboo and cane.
- Oil curing technology, which was standardised by KFRI, was transferred through demonstration cum training in Kerala and Arunachal Pradesh.

- KFRI sponsored 13 master trainees for a training programme to acquire practical experience in use of hand tools designed by IIT Bombay and furniture items developed by NID, Ahmedabad.
- Eight handbooks, one directory and two annotated bibliographies are yet another outcome of the project which served as a ready reference of information to stakeholders involved in development of bamboo and cane sector.
- The extensive work done by KFRI in the field of bamboo and cane research is brought to limelight through hosting a separate site for this which is linked to KFRI website (www.kfri.org).

Consultancy/ Extension Reports

Dendrocalamus strictus Nees - A State of Art Review. Consultancy Project (59/2000). Seethalakshmi KK and Sankara Pillai K.

It is a compilation of information on the most common bamboo species, *Dendrocalamus strictus*. The report contains information on the systematics, distribution, cytology and genetics, ecology, flowering, seeds, anatomy, silviculture, pests and diseases, physical, chemical and mechanical properties, natural durability and preservation and uses of the species along with an introduction and annotated bibliography.

Production and supply of Kadam seedlings to Apsara Plastic Pvt. Ltd., Mumbai

Consultancy Report No. 12 (2003) Pillai, P.K.C.

The Kerala Forest Research Institute raised 35,000 Kadam (*Neolamarkia cadamba* (Roxb.) Boisser) seedlings at the KFRI Field Research Centre, Velupadam, out of which 17000 (plus 10% extra for casualty replacement) good quality seedlings of plantable size were supplied to Apsara Plastics Pvt. Ltd., Mumbai. The details of collection of seeds, nursery establishment, disease problems and growth of seedlings are given in the report.

Medicinal Plants in the *in situ* Conservation Area at Kavala Section, Vellikulangara Range, Chalakkudy Forest Division. Extension Report No. 03 (2003) Sasidharan, N.

The study was carried out in the medicinal plants conservation area at Anappantham in the Kavala Section in the Vellikulangara Range of Chalakkudy Forest Division. The altitude ranges from 80 m to 400 m above msl. The area is in two bits, each having an area of about 50 ha. The study revealed that the area is floristically very rich. One hundred and sixty one species of medicinal plants were identified from the area. These species are enumerated with relevant synonyms, *local name/s, brief descriptions, properties* and uses. The properties and uses were compiled from literature.

Assessment of Biodiversity and Preparation of Baseline Data in Chinnar Wildlife Sanctuary. Extension Report No. 05 (2003) Sasidharan, N.

Enjoying the Deccan climate and geography in the leeward side of the Western Ghats, Chinnar Wildlife Sanctuary shares unique features among the other protected areas in Kerala. Phytogeographically this area is more similar to the Deccan plateau and the vegetation is dominated by dry deciduous forests. Hill Pulayas and Muthuvans are the two ethnic groups inhabiting in the Sanctuary. They live in 11 different settlements within the Sanctuary. Hill Pulayas are settled in easily accessible areas such as Champakkad, Alampetty, Palappetty etc. Muthuvans are settled in the interior forest areas such as Vellakkal kudi, Olikkudi, Ollavayal, Mangappara, Thayannamkudi, etc. Muthuvans are more dependent on forest and forest products for their livelihood. In the past, they were engaged in shifting cultivation. In this study baseline data on the status of biodiversity around the settlements were generated with emphasis on plant diversity.

There are about 425 tribal families in the 11 settlements in the Sanctuary. Besides, there are also around 1,000 cattle reared by the tribals. The fuel for the tribals and fodder for the cattle are mostly met from the Sanctuary. Anthropogenic interferences have severely influenced the vegetation structure of the Sanctuary, particularly around the settlements. Disturbances have resulted in the establishment of several exotic weeds. Because of the wider adaptability of exotic weeds, they dominate over the herbaceous and shrubby indigenous species in the Sanctuary. *Lantana camara*, *Chromolaena odorata*, *Argemone mexicana*, *Parthenium hysterophorus* and *Vicoa indica* are the major invaders around the settlements with very high density and frequency.

New Book

Bio diversity Documentation for Kerala: **REPTILES.** The handbook contains information on 159 species of reptiles known from Kerala. In this compilation the species within each genus are arranged in alphabetical order. Details on the type, locality, habit and habitats, distribution in and outside Kerala, Status and important reference are given under each species

New Research Projects Initiated

Projects taken up under plan grant

KFRI 391/03: Macro-propagation of two commercial bamboos: *Bambusa balcooa* and *Dendrocalamus brandisii*. (Seethalakshmi, K.K. and Raveendran, V.P., April 2003 – March 2007).

KFRI 392/2003:Micropropagation of three selected species of bamboo. (Muralidharan, E.M. and Pandalai, R.C., 2003 April – 2006 March).

KFRI 394/2003L Protocol for evaluation of residual nutrients in the soil. Balagopalan, M. and Rugmini, P., 2003 April -2005 March).

KFRI 395/2003: Standardization of technology for edible bamboos in Kerala. (Kumar, M., 2003 April-2005 March).

KFRI 396/03: Standardisation of nursery and plantation techniques of mahogany with particular reference to soil, nutrition and shoot borer incidence (Thomas P Thomas, Mohanadas, K. and Rugmini, P., 2003 April –2005 March).

KFRI 397/2003: Standardization of potting media for balanced nutrition of teak seedlings in root trainers (Sujatha, M.P. and Maria Florence, E.J., 2003 April-2005 March).

KFRI 398/2003: Mass productivity of HpNPV, a biopesticide for teak defoliator management (Sudheendra kumar, V.V.,Varma, R.V. and Sajeev, T.V., 2003 April-2006 March).

KFRI 399/2003: Demonstrating the effect of controlling the teak defoliator on volume increment in teak in the permanent plots established at Nilambur (Varma, R.V. and Sudheendrakumar, V.V., 2003 April-2006 March).

KFRI 400/03: Modelling the growth of teak in relation to soil conditions in the Kerala part of the Western Ghats.(Rugmini,P., Balagopalan, M. and Jayaraman,K., 2003 April- 2006 March).

KFRI 401/03: Productivity and growth studies on sympodial bamboos and establishment of a monopodial bambusetum (Pandalai,R.C., Muktheshkumar, M. S. and Rugmini, P, 2003 April- 2006 March).

KFRI 402/2003: Establishment of an arboretum of rare and characteristic species of the moist deciduous forests of Kerala (Nair, K.K.N., Renuka, C., Muktesh Kumar, M.S., Yesodharan, K. and Unni, K.K., 2003 April-2006 March).

KFRI 403/2003: Growth and yield studies in species trial plots established by KFRI (Chandrasekhara, U.M. and Nandakumar, U.N., 2003 April-2008 March).

KFRI 404/03 : Development of conservation strategies for selected, endangered rattan species of the Western Ghats (Renuka, C. and P. Rugmini, 2003 April - 2006 March).

KFRI/405/2003: Phytochemical characterization and evaluation of the medicinal plant moovila for resource enhancement (N Sasidharan, 2003 April-2006 March).

KFRI 406/2003: Intensive cultivation for root production and technology for harvesting roots of five medicinal trees of Dasamoola (Chacko ,K.C. and Sasidharan, N., 2003 April-2006 March).

KFRI 407/2003: Upgradation of small timber and bamboo residues (Damodaran, T.K. and Thulasidas, P.K., 2003 April-2006 March,KFRI).

KFRI 408/2003: Appropriate technology for production of charcoal and activated carbon from bamboo (Dhamodaran, T.K., Gnanaharan, R. and Thulasidas, P.K., 2003 April-2006 March).

KFRI 409/2003: Standardization of bamboo cultivation practices for homesteads of Kerala. (Nandakumar, U.N. and Thomas P Thomas, 2003 April-2008 March).

KFRI 410/2003: Commercial volume tables for selected home garden trees of Kerala (Krishnankutty, C.N., 2003 April-2005March).

KFRI 411/2003: Ethno-botanical studies on the tribals of Palakkad and Malappuram Districts. (Yesodharan, K., 2003 April- 2006 March).

KFRI 412/2003: Mapping forest resources of Kerala (Vijayakumaran Nair, P.V., 2003-April-2004 September,).

KFRI 413/2003: Preparation of a bibliographic database of world literature on teak (Sarojam, N., 2003 March- 2004 February)

KFRI 415/2003: Maintenance of provenance trial plots of eucalypts and acacia and devlopment of new clones for establishment of Clonal Multiplication Area (CMA) (Florence, E.J.M. and Balasundaran, M.,2003 August-2004 July).

Project funded by external agencies

KFRI 416/2003: Classical biological control of *Mikania micrantha* with *Puccinia spegazzinii* (Sankaran, K.V. and Antha, V., July 2003- Decembers 2005, Dept. of International Development (DFID).

KFRI 417/2003: Indigenous knowledge in agroforestry and agrobiodiversity of Kerala (Sankar, S., 2003 September-2004 August,Kerala State Planning Board, TVM).

KFRI 414/2003: Development of a bamboo sector in Kerala: Resource enhancement (Seethalakshmi, K.K., Muralidharan, E.M., Sankar, S,, Pandalai, R.C., Raveendran, V,P.,2003 April-2004 March, Director of Industries and Commerce, TVM).

Extension projects

Ext. 39/2003: Yield prediction models for pulpwood plantations raised under Kerala Forestry Project (K.

Jayaraman).

Ext. 40/2003: Preparation of local volume tables *for Acacia auriculiformis* and *Acacia mangium* plantations raised under Kerala Forestry Project (K. Jayaraman).

CAMPUS NEWS

Seminars/Workshops/Conference attended

National

Dr. K.V. Sankaran presented a paper entitled ' Biology, Distribution and Management of the Weed *Mikania micrantha* in South-west India" .in the inception workshop of the project "Classical bio-control of *Mikania micrantha* with *Puccinia spegazzinii* organized by ICAR at New Delhi during 27-28 June 2003.

Dr. S. Kumaraswamy participated in the international workshop on 'Molecular Microbial Ecology' organized by University of Florida, USA and Center for Clean Environment and Technology, Bangalore, July 25-30, 2003.

Dr. K.K. Ramachandran and E.A. Jayson attended the "Southern Regional Workshop on Wildlife Conservation" during June 30-July 1, 2003 at Chennai and Captive Elephant Management Workshop organised by the MOEF during 26-27 August 2003 at Thiruvananthapuram.

Dr. K. K. Seethalakshmi presented a paper on "Research and Development Needs for Improvement of Bamboo Sector in Kerala" in the interaction meeting on Development of Bamboo Sector in Kerala organized by Kerala Bureau of Industry Promotion, Department of Industry and Technology Information Forecasting and Assessment Council (TIFAC), Panampilly Nagar, Cochin on August 29, 2003

Dr. N. Sasidharan attended the Medicinal Plants Board Meeting of the State Level Screening and Evaluation Committee for finalising the contractual farming projects to be recommended to the National Medicinal Plants Board on 15 September 2003 at Trivandrum.

Dr. M. Balasundaran attended a workshop to identify areas in which biotechnological intervention would lead to development of products/processes for commercial exploitation on 17 September 2003 at Trivandrum and presented a paper on proposed collaboration between KFRI and other institutions on biotechnological processes and products.

Dr. A.R.R.Menon attended the Workshop on Remote Sensing, organized in connection with World Space Week 2003, at V.S.S.C,Trivandrum on 8 October 2003.

Dr. R.V.Varma attended IV annual discussion meeting on "Biodiversity, Bio signalling and Biotechnology in Insect Plant Interactions" in the COSTED auditorium at Chennai on 29-30 November, 2003 and presented a paper – Pheromone trap monitoring system for forest insect pests.

Dr. M. Balasundaran attended the second annual coordination meeting of the investigators of the TEAKDIV project, 'Developing Know-how for the Improvement and Sustainable Management of Teak Genetic Resources' funded by European Union during 8-12 December 2003 at the Kerala Forest Research Institute, Peechi, Trichur

Dr. R.V.Varma attended the National seminar on "Biodiversity Conservation and Participatory Forest Management" in Devagiri St. Joseph's College at Calicut 11 December 2003 and presented a paper on "Forest insect diversity and conservation issues".

Dr. P. Vijayakumaran Nair and Dr. A.R.R. Menon attended the user interaction meeting at NRSA Hyderabad (10-12 January 2004).

Shri. P.K.C. Pillai participated in the seventh national seminar on 'Advances in Coastal Agriculture and Value Addition from National Perspective' at CPCRI, Kasargod organized by Indian Society of Coastal Agricultural Research, West Bengal during 21 – 24 January 2004.

Dr. E. A Jayson attended workshop on Wetland Birds at St. Aloysius College Elthuruth, Thrissur on 15 January 2004.

Dr. E.A. Jayson attended the Fifteenth Kerala Science Congress at CWRDM, Kozhikode, during 29-31 January 2004.

Dr. K.V. Sankaran participated in CABI Pre-Conference Seminar organized by CAB International, U.K. at Delhi on 13 February 2004.

Dr. K. K. Seethalakshmi participated in the VIIth World Bamboo Congress during 27th February to 5th March 2004 at New Delhi and presented the following paper Popularisation of bamboo cultivation in homesteads – Seethalakshmi, K.K., Sankar S., Pandalai, R.C., Raveendran, V.P., Muralidharan, E.M. and Chandrashekara, U.M.

Dr. S. Kumaraswamy attended international conference on 'Biogeochemistry of Estuaries, Mangroves and Coastal Ecosystems Management" during March 23-25, 2004, Jawaharlal Nehru University, New Delhi

International

Dr. K. M. Bhat presented two papers entitled "Mechanical behaviour of fast grown teak: new evidences" by K. M. Bhat and P.B Priya and " Advances in oil curing technology for rattans' by T.K. Dhamodaran and K.M. Bhat. In the IUFRO Division 5 conference, "Forest Products Research: Providing for Sustainable Choices" held at Rotorua, New Zealand during 11-15 March 2003.

Dr. M. Balasundaran and Dr. R.V. Varma attended the 5th meeting of IUFRO Working Party on Diseases

and Insects in Forest Nurseries at Trichur Hotels, Thrissur on 6-8 May 2003, and presented a paper on "Diseases and their management in clonal nursery" and " Diseases and Insect Pests in Forest Nurseries" respectively.

Dr. K.V. Sankaran presented a paper entitled "Ganoderma diseases of perennial crops in India- an overview" in the Third Workshop on 'Ganoderma Diseases of Perennial Crops' held at Medan, Indonesia during 24-26 March 2003. He also presented a paper entitled "When good trees turn bad- the unintended spread of introduced plantation tree species in India' in the Asia-Pacific Forest Invasive Species Conference organized by FAO at Kunming, China during 17-22 August 2003.

The following papers were presented in the International Conference on Quality Timber Products of Teak from Sustainable Forest Management, 2-5 December 2003, KFRI, Peechi organized under the auspices of International Tropical Timber Organization (ITTO) and International Union of Forest Research Organizations (IUFRO) & Govt. of India:

- Quality concerns of sustainable teak wood chain (Dr. K.M. Bhat)
- Timber value of teak from homegarden teak: Observations from Kerala (P.K. Thulasidas and K.M. Bhat).
- Optimal management of teak plantations (K. Jayaraman and B. Zeide).
- Insect diversity in teak plantations: A case study in Parambikulam Wildlife Sanctuary, Kerala State, India. (Mathew, G., Sudheendrakumar, V.V. and Rugmini, P.)
- Soil conditions and growth of teak in successive rotations in Kerala State, India (Balagopalan, M., Rugmini, P. and Chacko, K.C.).
- Future availability of teak wood from forest plantations in Kerala, India (Sivaram M and Krishnankutty, C.N.).
- Non-wood forest products resource in teak plantations and moist deciduous forests: A comparative study in the Thrissur Forest Division, Kerala (Sasidharan N and Sivaram, M.).
- Teak wood Price Projections for Kerala State, India (Krishnankutty, C.N., Mammen Chundamannil and Sivaram, M.).
- Significance of micronutrients on the growth of teak seedlings (Sujatha, M.P.).
- Why teak seed orchards are low productive? (Endira, E.P.).

Publications

Papers in Journals

Bhat, K.M. and Florence, E.J.M. 2003. Natural decay resistance of juvenile teak wood grown in high input plantations. *Holzforschung* 57: 453-455.

Chandrashekara, U.M. and Sreejith, K.A. 2003. Possible impact of climate change on tree species composition and diversity in lowland evergreen forests of Kerala, Western Ghats. *Indian Forester* 129:770-775.

Gigi K. Joseph and Ramachandran, K.K. 2003. Distribution and demography of the Nilgiri Langur (*Trachypithecus johnii*) in Silent Valley National Park and adjacent areas, Kerala, India. *Primate Conservation* 19: 78-82.

Gigi K. Joseph and Ramachandran, K.K. 2003. Demography of lion-tailed macaque (*Macaca silenus*) in an undistributed rain forest of Silent Valley National Park, Kerala, India. *J. Bombay nat. Hist. Soc.* 100(1): 65-71.

Jayasree, V.K., Renuka, C. and Rugmini, P. 2003. Root development in rattans 1. A quantitative study of the roots in two species of *Calamus* L.. *J. Bamboo and Rattan* 2(2): 135-151.

Jayasree, V.K., Renuka, C. and Rugmini, P. 2003. Root morphology and development in rattans II. Soil requirements and efficiency of the root systems of *Calamus thwaitesii* Becc. & Hook. and *Calamus rotang* Linn. in the seedling stage. *J. Bamboo and Rattan* 3(1): 3-13.

Krishnankutty, C. N. and Chacko, K. C. 2003. Estimation of plantable stumps in teak (*Tectona grandis* .) nursery beds: A study from Kerala (India). *Annals of Forestry*, 11(2): 222-226.

Kumar, M. and Remesh, M. 2003. Medicinal pteridophytes of Kerala, South India. *Indian Fern J.* 20: 1-28.

Kumar, M. and Ramesh, M. 2003. New species of *Schizostachyum* (Poaceae-bambusoideae) from the Andaman islands, India. *Blumea* 48: 187-192.

Mathew, G., Rugmini, P. and Binoy, C.F. 2003. Impact of forest fire on insect species diversity – A study in the Silent Valley National Park, Kerala, India. *Entomon*, 28(2): 105-114.

Muraleedharan, P. K., Sreelakshmi, K. and Sasidharan, N. 2003. Economics and marketing of medicinal plants in Kerala, *India. J. Trop. Med. Plants*. 4(2): 285-289.

Padmakumar, P.K., Sreekumar, V.B., Rangan, V.V. and Renuka, C. 2003. Palm leaves as writing material: History and methods of processing in Kerala. *Palms* 47(3): 125-130.

Padmanabhan. P. (2003) Prospects and problems of bee keeping in Kerala, South India In: *Journal of Palynology* 1 (39): 167-173.

Renuka, C., Manilal, K.S., Sreekumar, V.B. 2003. Medicinal palms in Rheede's Hortus Malabaricus. *Indian Journal of Traditional Knowledge* 2(3): 265-271.

Sasidharan, N. and Sujanapal, P. 2003. *Pteroceras monsooniae* (Orchidaceae) A new Species from India. *Sida* 20(3): 923-926.

Sasidharan, N. and Muraleedharan, P.K. 2003. Consumption of Medicinal Plants by the drug industry in Northern Kerala. *Journal of Non-Timber Forest Products* 10(3/4): 145-154.

Sivaram, M. 2003. Socio-economic causes of deforestation in Kerala State: An exploration. *Indian Journal of Forestry* 26(3): 291-294.

Sudheendrakumar, V.V. 2003. Reproductive behaviour of *Hyblaea puera* Cramer (Lepidoptera: Hyblaeidae). *Entomon* 28(2): 77-84.

Suma, T.B. and Balasundran, M 2003. Isozyme variation in five provenances of *Santalum album* in India. *Australian Journal of Botany* 51: 243-249.

Varma R.V., Renuka, C., Rangan, V.V. and Swaran, P.R. 2003. A new report of *Cerataphis palmae* (Ghesquire) = C. variabilis Hille Ris Lambus (Homoptera: Aphididae: Hormaphidinae) as pest of *Calamus dransfeildii*. *Entomon* 28(3): 261-262

Sasidharan, N, 2003. Red listed threatened tree species in Kerala: A Review. In: Jose Kallarackal, K Swarupanandan and JK Sharma (Eds.), *Proceedings of the Workshop on Conservation and Research Needs of the Rare, Endangered and Threatened (RET) Tree Species in Kerala Part of the Western Ghats*. KFRI, Peechi: 1-9.

Jayson, E.A. and Sivaperuman, C. 2003. Avifauna of Kole Wetlands of Thrissur. *Proceedings of the National Seminar on Wetland Avian Ecology*, St. Alosius College Elthuruth, Thrissur: 26-47.

Muraleedharan, P.K., Sreelakshmi, K. and Rugmini, P. 2003. Collections marketing and sustainable use of non-timber forest products in Kerala. In: A.J. Hiremath, G.C. Joseph and R. Uma Shaanker(Eds.), *Proceedings of the Conference on Policies, Management, Utilisation and Conservation of Non Timber forest Products (NTFPs) in the South Asian Region*: 68-69.

Edited books

Proceedings of the National Workshop on Policy and Legal Issues in Cultivation & Utilization of Bamboo, Rattan and Forest Trees in Private & Community Lands. Mohanan C., Chacko K. C., Seethalakshmi, K. K.,Sankar, S., Renuka, C., Muralidharan, E. M. and Sharma, J. K. (Eds.) (2002) Development Commissioner (Handicrafts), Ministry of Textiles, Government of India., United Nations Development Programme, New Delhi and KFRI, Peechi.

Bamboo Resource Development and Utilization in Kerala. Seethalakshmi, K.K Sankar, S. and Sharma J. K. (Eds.) (2002). Kerala Forest Research Institute, Peechi and Development Commissioner (Handicrafts), Ministry of Textiles, Government of India and United Nations Development Programme, New Delhi.

Muktesh Kumar. 2004. *The Bamboo Book: Field guide*. National Mission on Bamboo Applications, Technology Information, Forecasting and Assessment Council (TIFAC), New Delhi: 54p.

Nair, K.K.N; Mohanan, C.; George Mathew, 2004:

- Plantation technology: *Colophyllum polyanthum* (Kattupunna). KFRI Information Bulletin 18: 7p.
- Plantation technology: *Dysoxylum malabaricum* (Vella-akil). KFRI Information Bulletin 19: 7p .
- Plantation technology: *Garcinia gummi-gutta* (Kodam-puli). KFRI Information Bulletin 20: 7p.
- Plantation technology: *Gmelina arborea* (Kumbil). KFRI Information Bulletin 21: 8p.
- Plantation technology: *Grewia tiliaefolia* (Chadachi). KFRI Information Bulletin 22: 7p.
- Plantation technology: *Haldina cordifolia* (Manja-kadambu). KFRI Information Bulletin 23: 7p.
- Plantation technology: *Lagerstroemia microcarpa* (Ven-thekku). KFRI Information Bulletin 24: 8p.
- Plantation technology: *Melia dubia* (Mala-veppu). KFRI Information Bulletin 25: 7p.
- Plantation technology: *Vateria indica* (Vella-payin). KFRI Information Bulletin 26: 7p.

Matters of general interest

Dr. K. M. Bhat, as Member of the Conference Organising Committee and the Chairperson of Scientist Assistance Programme, was involved in various stages of Organising *IUFRO Division 5 Conference Forest Products Research: Providing for Sustainable Choices,* Rotorua, New Zealand during 11-15 March 2003.

Dr. K. K. Seethalakshmi participated in the *Expert Meeting on Development of User-friendly Manual for Propagation and Cultivation of Bamboo*. May 10, 2003 organized by National Mission on Bamboo Applications, TIFAC, New Delhi.

Dr. N.Sasidharan participated in *the Meeting of the Medicinal Research Group of Kerala* held at Arya Vaidysala, Kottakkal on 05.04.2003. Compiled the data collected from the Institutions working on medicinal plants in Kerala on human resource,

equipments available, publications, live collections, on going and future research programs. He also participated in the Workshop on *Development of Medicinal and Aromatic Plants Sector in Kerala* organised jointly by the Special Office for Biotechnology and State Medicinal Plants Board, Govt. of Kerala in Trivandrum. on June 23, 2003.

Dr. K. M. Bhat participated in the *Seventh Timber Sectional Committee (CED 9) Meeting of Bureau of Indian Standards* held in Bangalore during 23-24 July 2003 and contributed to the preparation/adoption of new Indian Standards: IS 5914, IS 5915 and IS 5916 on classification and nomenclature on rattans and rattan grading rules, based on the research work done in KFRI..

Dr. K. K. Seethalakshmi participated in the *Interaction Meeting on Development of Bamboo Sector in Kerala.* August 29, 2003 organized by Kerala Bureau of Industry Promotion, Department of Industry and Technology Information Forecasting and Assessment Council (TIFAC), Panampilly Nagar, Cochin. Presented a paper on Research and development needs for improvement of bamboo sector in Kerala

Dr. R. V. Varma acted as an adjudicator for the award of Prof. K K Nayar Prize for the best research publication in zoology, constituted by the Kerala University in 2003.

Dr. K.V. Sankaran participated in a *Meeting to Develop a Programme for Determining Bio-diversity in Panchayaths in Kerala* organized by KSCSTE at Sasthra Bhavan, Thiruvananthapuram

Dr. R.V.Varma attended the *Sasthra Poshini Meeting* organised by KSESTE on 2 October 2003 at Chelakkara Government School.

Dr. A.R.R. Menon attended the *SOF Meeting* at STED, Trivandrum on State of Environment Data Preparation for Kerala on 25 September 2003.

Dr. K.K.Ramachandran attended the *Meeting to Evaluate the Proposal for Environmental Awareness for Ecodevelopment Committee of Periyar Tiger Reserve*, on 8th January 2004 in Thiruvananthapuram.

Dr. R. V. Varma has been nominated as a *Member, Faculty of Environmental Studies of CUSAT* for a period of 4 years from December 2003

Drs. R. V. Varma and V V Sudheendra kumar attended a short term training course on *Biotechnology and Intellectual Property Rights* organised by the Department of Biotechnology, Govt. of India at the National Law School of India University, Bangalore during 24-29 March 2003.

Drs. P. Vijayakumaran Nair and A.R.R. Menon attended a *Training on Erdas GIS software* at Erdas India, Hydarabad during 13-23 January 2004.

The first patent application from KFRI entitled "*A Process for Cloning of Teak Trees by Production of Juvenile Epicormic Shoots from Branch Cuttings and Rooting of Shoot cuttings*" has been filed in the Patent Office, Chennai. Dr. J.K. Sharma, Director, KFRI and Dr. T. Surendran, Scientist, Plant physiology are the inventors of the technique.

Mr. Ganesh Panikkar, Final Semester B.Sc. Biotechnology student of Mar Ivanios College, Trivandrum did his dissertation work on the topic, "Genotype Characterization in *Tectona grandis* L. using RAPD Markers" and Ms. K.R. Smitha,, Ms. Ligi Thomas and Ms. Saumya Thomas, M.Sc. Biochemistry final year students from Kongunadu Arts and Science College, Coimbatore had their Summer Training under the guidance of Dr. M.Balasundaran.

Ms. P. Prathiba, M.Sc. Biotechnology student of K.S. Rangasamy College of Arts and science, Tiruchengode completed her dissertation work on the topic "Vertical transmission of *Hyblaea puera* nucleopolyhed rovirus". Dr. V.V. Sudheendrakumar guided the work.

Mr. K. Sankara Pillai and Mr. C. K. Vincent represented the State in the National Forest Sports and Games Meet, 2003 - 2004 held in Goa.

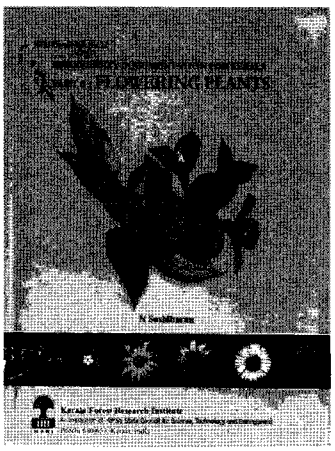
Obituary

It is with profound sadness that we announce the untimely death of our colleagues Smt. D. Sumangala Amma (48), Confidential Assistant on 4 July 2003 who was in KFRI service since 19-4-85. She was a very sincere and diligent employee and served KFRI with highest devotion in her duties.

May the almighty give the strength and comfort to her bereaved family members. May her soul rest in peace.

New releases

Biodiversity Documentation for Kerala
Part 6: Flowering Plants
N. Sasidharan



Flora of a region is very much fascinated by botanist especially taxonomists. For the first time, very comprehensive publication on flowering plants of Kerala has been brought out with author citation with its habit and habitat, district-wise distribution in Kerala, geographical distribution endemism and status. Colour photographs representing type plants are also given in most of the cases. Index to scientific names and index to local names provided in the publication enchance convenience of using the book. The publication is useful to biologists and varieties of sections of people.

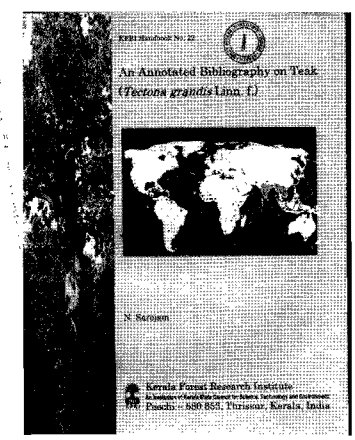
Hard bound; 18x24 cm; 702 pages; Rs 600/US $ 60 (ISBN 81-85041-57-1)

KFRI CD-3:

Forest Resources of Kerala- Database

The major themes covered in the database are forest administration, forest area, forest plantations, forest products, wildlife, forest weather, forest fire and revenue and expenditure of the Kerala Forest department. The database was developed by collecting data from several secondary sources and by communicating with various agencies. The sources include the publications of the Kerala Forest Department, Ministry of Environment and Forest, Department of Statistics and Economics, Directorate of Census, Communications with State Forest Departments, the research reports published by the Kerala Forest Research Institute and the articles published in journals. The data on many of the aspects are of time-series type covering the period 1980 to 2000. The required information can be retrieved from the CD in two or three clicks. The system also contains a glossary. It is proposed to refine and update the software periodically.

An Annotated Bibliography of Teak (*Tectona grandis* Linn. f.)
N. Sarojam



Teak is one of the most important timber species of the world. It occurs in natural forests and also grown as plantations in many parts of the world. Intensive research has been carried out on different aspects of the species which resulted in the generation of enormous quantum of information which are published in different forms like journal articles, reports, books, theses, conference proceedings etc. and are widely scattered. This annotated bibliography which contains 4781 references is an attempt to bring together literature on teak from world over since 1856. References are arranged under broad subject categories alphabetically by authors name. This exhaustive bibliography will facilitate to access any aspect of information on teak. This publication will be very useful to all those who are concerned with teak

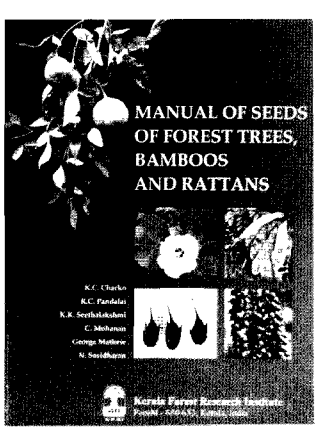
This bibliography is also available in CD and it is searchable

Soft bound; 24x28 cm; 549 pages; Rs 700/US $70 (ISBN 81-85041-60-1)

Manual of Seeds of Forest Trees, Bamboos and Rattans

The manual presents the basics of seed science and technology and provides detailed treatise on 113 species of forest trees, bamboos and rattan grown in Kerala. Nursery practices are also briefly dealt with. Source of information is provided to help the users especially researchers for acquiring further details if needed.
Information where source is not provided is based on studies carried out in KFRI as well as field experiments of the authors. The manual will serve as a field guide to practicing foresters, researchers, students and others involved in seed collection, handling and seed production.
K.C Chacko *et al.*

Hard bound; 18x24 cm; 331 pages; Rs 750/US $ 70 (ISBN 81-85041-40-7)



PRICE LIST OF KFRI PUBLICATIONS

		Price	
I.	**BAMBOO**	Rs.	US $
1.	An Annotated Bibliography on Bamboos of the World	550.00	50.00
2.	Field Identification Key to Native Bamboos of Kerala	100.00	10.00
3.	Commercial Bamboos of Kerala	50.00	10.00
4.	Nursery and Silvicultural Techniques For Bamboos	150.00	15.00
5.	Preservative Treatment of Bamboo and Bamboo Products	50.00	10.00
6.	Bamboo Resource Development and Utilization in Kerala: Proceedings of the Interaction Workshop, Thiruvananthapuram, July 2002.	25.00	10.00
7.	Information Resources for Bamboo and Cane Development in Kerala	75.00	10.00
8.	Micropropagation of Bamboo and Rattan	50.00	10.00
9.	Policy and Legal Issues in Cultivation and Utilization of Bamboo, Rattan and Forest Trees in Private and Community Lands: Proceedings of the National Workshop, Peechi. 2002	400.00	40.00
10.	Bamboo: A Crop (CD-ROM)	250.00	25.00
11.	Commercial Rattans of Kerala	50.00	10.00
12.	Oil Curing Technology for Value-added Rattan (Cane) Products	50.00	10.00
13.	Protection of Rattan against Fungal Staining and Biodeterioration	50.00	10.00
14.	Nursery and Silvicultural Techniques for Rattans	50.00	10.00
15.	Annotated Bibliography on Rattans of the World	350.00	35.00
16.	Field Identification Key for Rattans of Kerala	125.00	15.00
17.	Rattans of the Western Ghats: A Taxonomic Manual	100.00	10.00
18.	A Manual on the Rattans of Andaman and Nicobar Islands	175.00	20.00
19.	Rattan Management and Utilisation: Proceedings of the Rattan (Cane) Seminar, 29-31 January 1992, Trichur	300.00	30.00
20.	Structure and Properties of South Indian Rattans	75.00	10.00
21.	Palms of Kerala	200.00	20.00
III.	**TEAK**		
22.	Teak: Proceedings of the International Teak Symposium, December, 1991, Thiruvananthapuram, Kerala, India	200.00	20.00
23.	Teak (Information Bulletin)	25.00	10.00
24.	KFRI CD2: Bibliography on Teak (Tectona grandis L.f.)	500.00	50.00
25.	The Teak Defoliator	250.00	25.00
26.	Root Trainer Technology for Mass Production of Clonal Planting Stock	250.00	25.00
27.	Compost for Container Seedlings Production in Forest Nurseries	100.00	10.00
28.	Litter Dynamics, Microbial Associations and Soil Studies in Acacia auriculiformis Plantations in Kerala	75.00	10.00
29.	Plantation Technology: Calophyllum polyanthum (Kattu. Punna) (Inf. Bull. 18)	50.00	10.00
30.	Plantation Technology: Dyroxylum malabaricum (Vella-akil)(Inf. Bull. 19)	50.00	10.00
31.	Plantation Technology: Garcinia gummi-gutta (Kodam-puli) (Inf. Bull. 20)	50.00	10.00
32.	Plantation Technology: Gmelina arboree (Kumbil) (Inf. Bull. 21)	50.00	10.00
33.	Plantation Technology: Grewia titiaefolia (Chadachi) (Inf. Bull. 22)	50.00	10.00
34.	Plantation Technology: Haldina cordifolia (Manja-Kadambu) (Inf. Bull. 23)	50.00	10.00
35.	Plantation Technology: Lagerstroemia micracarpa (Ven. Thekku)(Inf. Bull. 24)	50.00	10.00
36.	Plantation Technology: Melia dubia (Mala-veppu) (Inf. Bull. 25)	50.00	10.00
37.	Plantation Technology: Vateria indica (Vella payin) (Inf. Bull. 26)	50.00	10.00
V.	NATURAL FORESTS		
38.	Biodiversity Documentation for Kerala. Part 3: Lichens	150.00	15.00
39.	Biodiversity Documentation for Kerala. Part 4: Bryophytes	150.00	15.00
40.	Biodiversity Documentation for Kerala. Part 5: Pteridrophytes	200.00	20.00
41.	Biodiversity Documentation for Kerala. Part 8: Fresh water Fishes	800.00	55.00

KFRI TRAINING PROGRAMMES IN TROPICAL FORESTRY

KFRI offers specialized training courses in various aspects of tropical forestry to meet the requirements of various stakeholders. It is also proposed to provide tailor-made training depending upon spaecific needs of the stakeholder.

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We intend to revise the mailing list based on the response of the readers. Kindly fill up the Readership Survey Form provided in this issue and send it to the following address:

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Ph.D awarded

Smt. T.B. Suma was awarded Ph.D for her thesis entitled "Studies on Genetic Polymorphism in *Santalum album* L" by the Cochin University of Science and Technology. She worked under the guidance of Dr. M. Balasundaran of Forest Pathology Division

Sri. C.F. Binoy was awarded Ph.D for his thesis entitled "Effect of Fire on Forest Insect Species Diversity- A Study in the Silent Valley National Park" by the University of Calicut. He worked under the guidance of Dr. George Mathew of Entomology Division

Shri. S. Abdul Kader was awarded Ph.D for his thesis entitled "Seed longevity and storage of Mahogany *(Swietenia macrophylla* King) and Hopea *(Hopea Parviflora)* by FRI Deemed University, Dehra Dun. He worked under the guidance of Dr. K.K. Seethalakshmi.