EVERGREEN

TRAINING WORKSHOP on Statistical Applications in Forestry Research at Kerala Forest Research Institute 6-10 May, 2002

Half Yearly Newsletter of the Kerala Forest Research Instiute

No. 47 September 2001

Withering Wood Science and Technology in India ?

While reflecting the KFRI updates especially in the areas of tissue culture, clonal multiplication and forest information system, a couple of pages of the current edition are devoted to accomplish the following two tasks: (a) a brief review of deliberations of the National Workshop *on "Policy and Legal Issues in Cultivation and Utilisation of Bamboo, Rattan and Forest Trees in Private and Community Lands"* held at KFRI during 7-9 August, 2001 and (b) a review of the new release from FAO on *"State of the World's Forests 2001"*.

If the policy workshop recommends for recognising the trees from farm lands as *farm produce* and not as *forest produce,* the FAO publication points to the debate among producer and user sectors on "*genetically modified organisms involving the trees*". In either case, wood is the end product and ultimate commodity that is being modified through various farm and plantation management practices. Wood scientists around the world are increasingly involved in locating the genes responsible for specific commercial wood properties which can be transferred from one tree to another for desired strength of the wooden structures for application in housing / building construction. One such fundamental property is timber stiffness (modulus of elasticity), which is now found more under genetic control than under the influence of environmental factors. Alas, the thought pondering over the forest research community however is – *whether wood science and technology wither in our country in view of the recent focus on tree resources for eco-restoration and biodiversity conservation?* For instance, various funding schemes of the Ministry of Environment and Forests (Government of India), the forest administrative head responsible for planning, promoting, and co-ordinating the national environmental and forestry programmes, hitherto had the following thrust areas: (a) environmental research promotion, (b) eco-regeneration, (c) wastelands development and afforestation and (d) environmental education and information. Undoubtedly, these are the essential core areas which would contribute in unequivocal manner to sustainable management of forest resources as well as to counter the effects of climate change. At the same time, the major concern is the need for revival of programme support in the field of wood science and technology for promoting the production, processing and trade of wood-based products particularly in setting the following national targets in industrial utilization of tree and non-timber resources of the country:

- promoting and supporting the use of juvenile/ thinning wood from plantations and trees outside forests (TOF) especially farm / agroforestry sectors and non-forest plantations
- adoption of improved processing techniques, better logging practices, and use of small dimensional timbers
- improved use of low quality timbers in plywood and veneer by substituting traditional high quality timbers such as teak and rosewood
- improving the productivity of plantations, processing of smaller trees, seeking opportunities for increased use of wood residues/waste and recycled fibres and efficient utilization of non-timber crops like bamboo and rattan.

It is perhaps with the above foresighted vision that the two eminent Indian wood technologists of the 20th century, K. S. Lauly and A. Purushotham, dreamt even two decades before for setting up an "Indian Institute of Wood Science and Technology" under the Department of Science and Technology (DST) and making out a case for converting it as the first university for wood sciences to offer facilities for education and training needs of the country.

Now, there is an increasing awareness that *wood quality and processing aspect is an integral part of total plantation technology*. For quality sawlogs, it is important to consider minimising timber defects such as fluting, bole taper, knots, etc. right from the stage of seed selection (appropriate species, its provenances / genetically

Non-destructive testing of wooden structures for modulus of elasticity by acoustic technique with mircophone- sound analyser

superior individual trees and clones as a part of breeding programme) at grower's level. This would have saved considerable efforts, energy and resource at processing stage to overcome the timber defects for quality products, had the wood technologist given the necessary technical inputs in various stages of the plantation programme for wood production.

The recent advances in processing technologies allow the use of smaller and younger trees. In Europe, North America, Japan and Oceania processing machines have now been developed to process efficiently and utilise small timber for jointed structures of desired dimensions and glulams that could find application in various uses as joinery, furniture, etc. Though the manufacturing cost is higher, the quality of wood products manufactured from small-diameter trees is generally as good or better than that manufactured from the traditional timber resource. This again underlines the crucial role of wood scientists in technological interventions in the down-stream processing for manufacture of value-added products from low quality/small diameter trees .

The wood industries in India have not yet geared up for efficient processing of small dimensional logs with the current structural set up and machinery. The investment needs for both plantation development and structural changes of the industries will be certainly high with at least 10-15% for institutional infrastructure/ support, research, training/human resource development, technology development and dissemination. In addition to seeking support of international developmental organizations, All-India coordinated efforts seem to be the only option in order to pool the limited resources for research and technology that would avoid duplication and facilitate effective and timely implementation of innovative technologies. As Leslie (2000) says, *"tropical forestry must somehow react and perform quickly in the production-processing-market chain, failing which rapid decline and low returns and outputs are inescapable"*

K. M. Bhat
Editor

From the Director's Desk

Resource crunch in academic institutions and research organizations is a world wide phenomenon. In developed countries, due to paucity of funds the positions of those researchers who are not carrying out useful research, are declared redundant and services terminated, thus bringing about a great shock in one's career. At least in India, still substantial amount of Government funding is available for research, which in other countries is largely industry based and highly competitive. Hence, it becomes imperative on our part to use the research funding judiciously in solving practical problems as well as in conducting basic research having applied value.

This calls for careful and thoughtful identification, formulation and implementation of research programmes with well defined objectives and outcome. In forestry research, where we deal with long duration crops, it becomes all the more important to address the problem with a multidisciplinary approach to have desired results of research in the fast changing scenario in tropical ecosystem posing numerous challenges due to deforestation and climate change. This requires a re-look at the way the forestry research is organized in the country.

Though in most of the temperate countries organization of forestry research is theme based such as Natural Forest Ecosystem/Management of Natural Forests, Productivity Improvement of Plantations/Management of Forest Plantations, Conservation of Biodiversity, Forest Information Management, etc., we continue to have classical approach in research organization, where each discipline such as Botany, Wildlife, Silviculture, Non-wood Forest Products, Wood Science, Entomology, Pathology, etc., is compartmentalized working independently without much meaningful interactions between the allied disciplines. Even if a research programme is taken up with multidisciplinary approach, it turns out to be personalized component wise "cut and paste research", thus lacking the real essence of multidisciplinarity, which is so crucial for addressing any forestry problem in an effective way.

When there is a mind set for a particular type of system in vogue for a long time in any organization, it is not easy to change the attitude of researchers as short-term personal interests come in the forefront rather than long-term institutional interests. Hence, for successful implementation of any re-organisation in research not only it requires institutional commitment on the part of researchers but overall paradigm shift in their approach which can be brought about through meaningful dialogue identifying pros and cons of old and new systems and a positive approach and assertiveness for a change for the betterment of forestry research.

KFRI, has completed 25 years and now looks forward to play a key role in forestry research, extension, training and education in the tropical region. To fulfill this dream and achieve long-term objectives, KFRI is planning to reorganize the research so that forestry problems can be tackled in more effective way with multidisciplinary approach which will also assist in transferring the results to end-users. This change if effected will certainly go a long way not only in the history of KFRI but forestry research as a whole in the country.

J.K. Sharma

CONTENTS

WELCOME

The New KFRI Newsletter Committee (2002-2003)

With the current edition of *EVERGREEN* we relinquish the editorial work and welcome the new committee to carry over the task. We also wish to thank all the contributors during our tenure.

Editor
For the Outgoing KFRI Newsletter Committee

Report

National Workshop on Policy and Legal Issues in Cultivation and Utilization of Bamboo, Rattan and Forest Trees in Private and Community Lands

7-9 August, 2001, Kerala Forest Research Institute, Peechi

Shri K. Sudhakaran, Hon'ble Minister for Forests delivering inaugural address

The National Forest Policy (1998) aims at increasing the tree cover in the country through massive afforestation and social forestry programmes to meet the requirements of fuel wood, fodder, non-timber forest produce and small timber, especially of the rural and tribal population. There is an ever-increasing interest among people to cultivate trees and bamboos in private and community lands for economic and ecological benefits. However, people are often discouraged by various legal and procedural constraints faced during felling (harvesting), transporting and selling (marketing) of timber and non-timber products. Though, some of the State Governments have already considered these problems and enacted amendments so as to relax some of the procedures and rules, which are still insufficient to promote the cultivation of multipurpose forest trees in private lands.

Various activities relating to forest and forest products are governed by the Indian Forest Act (1927) and the Forest (Conservation) Act (1980). Revision of the Indian Forest Act (1927) is under consideration. It was in this context that Kerala Forest Research Institute organized a national workshop on "Policy and Legal Issues in Cultivation and Utilization of Bamboo, Rattan and Forest Trees in Private and Community Lands", during 7-9 August, 2001 to address various problems relating to tree cultivation and marketing at the national level. A total of 149 delegates and invitees representing the State Forest Departments, Research Institutes, Non-governmental Organisations and Industries participated in the workshop deliberations. The workshop was also sponsored by the Development Commissioner of Handicrafts, Ministry of Textiles, Government of India and the UNDP.

The major objective of the workshop was to bring together farmers, planners, policy makers, administrators, user groups, non governmental organizations, legal experts, journalists, environmentalists, tax consultants, financiers and scientists to a common platform from all over the country to address the important issues relating to cultivation and utilisation of bamboos, rattans and forest trees.

Inaugural Session

The workshop was officially inaugurated by Shri K. Sudhakaran, Hon'ble Minister for Forests and Sports, Government of Kerala. Shri. P.P. George, MLA (Ollur), Kerala. presided over the inaugural session. The other dignitaries spoke on the occasion are: Shri G. C. Lagthasa, Hon'ble Minister for Forests and Environment, Assam; Shri Therambil Ramakrishnan MLA (Thrissur); Shri E.K. Bharth Bhushan Secretary, Department of Forests and Wildlife Government of Kerala; Shri. K. Balachandran Thampi, Chief Conservator of Forests, Kerala; Shri. G.K. Asthana, Deputy Director (UNDP); Shri. P. V. Pathrose, President, Pananchery Grama Panchayat. Dr. J.K. Sharma, Director, KFRI, welcomed the gathering and Shri. K.C. Chacko, Convener of the workshop expressed vote of thanks.

Welcome address : Dr. J. K. Sharma, Director, KFRI

Shri P.P. George, MLA delivering the presidential address

Shri G. C. Lagthasa, Hon'ble Minister for Forests Assam giving a special address

Vote of thanks by Shri K. C. Chacko

The inaugural session was followed by three Technical Sessions in which 39 papers were presented as shown below:

Technical Session 1: Legal and Procedural Constraints in Growing, Harvesting, Transporting and Marketing

1. Obstacles for forest development in India: N.S. Adkoli.
2. Trees growing in community/private lands in J&K-policy and legal issues in their cultivation and utilisation: P. Patnaik.
3. Legal, procedural and other constraints in growing, harvesting, transporting and marketing of the products in Kerala: A. K. Goyal.
4. Forest policies and issues outside forests - Kerala context: M. Govindan kutty.

Justice K Sukumaran (right) and Dr. Kumarvelu (left) conducting the Technical Session I

5. Production of industrial forest produce in private lands – policy and legal issues: T.K. Raghavan Nair.
6. Impact of legal amendments made in Tamil Nadu in promoting tree cultivation in farmlands: K.S. Neelakantan.
7. Private forest legislation in India and Madhya Pradesh Lok Vani Act 2001: Pankaj Srivastava.
8. Cultivation and utilisation of forest trees in private and community lands in the State of Goa: Rajiv Kumar.
9. Forest law - need to have a progressive legislation: A.C. Lakshmana, R.M. Palanna.
10. The scenario of forest laws and rules governing tree growing in public and private lands: S. John Joseph.

Technical Session II: Bamboo, Rattan and Tree species Grown in Private/Community Lands-Legal Issues

1. Bamboos, forests and laws: Justice K. Sukumaran.
2. Woody perennials in farmlands of Kerala-policy and legal aspects: B. Mohankumar, K.V. Peter.
3. Issues impeding growing and use of trees and other forest species in Kerala - a stakeholder analysis: U.M. Chandrashekara, K.A, Abdul salam, S. Sankar.
4. Problems of bamboo growers in Madhya Pradesh: P.K. Chowdhry.
5. Who killed the goose that laid golden eggs? Policies that led to the decline of homegardens of Kerala, India: K.P. Ouseph.
6. Legal and other constraints in growing, harvesting and selling of bamboo and timber: Tony Thomas kizha-kkekara.
7. Some policy changes for promoting rattan industry in Kerala: P.K. Muraleedharan, K.K. Seethalakshmi, V.P. Raveendran, K. Sreelakshmi.
8. Bamboo cultivation near forest areas - problems and apprehensions: K.C. Koshy.

Shri P. Patnaik (right) and Shri V. Gopinathan (left) conducting Technical Session II

Technical session III : Resource Enrichment, Utilisation, Marketing and Economics

1. Status of bamboo resources and its utilisation in Tripura: S.K. Pandey.
2. Studies on management of natural bamboo in foot-hills of Himalayas of Haryana State: D.R. Ramesh singh.
3. Bamboo productivity and marketing in Cauvery delta region: Tamil Nadu. R. Jambulingam.
4. Potentials of bamboo in agroforestry in India: J.S. Rawat, T.P. Singh, R.B.S. Rawat.
5. Bamboo and its uses in homestead-A case study in the Titabar block of Jorhat district of Assam: Anupchandra, Vijay Rawat, Rashmi Rekha Kalita, R. Borah, H. Mishra.
6. An insight into the utilisation pattern of bamboo and canes in handicraft industries of Assam and Manipur: S. Pattanaik, T.C. Bhuyan, K.C. Pathak, K.K. Sarma, C. Dekba, B. Meitram, R.C. Singh, H. Kaur.
7. People and forest: Extension interventions for bridging gap. S. Gopakumar, A.V. Santhoshkumar, K. Gopikumar.
8. Economics of bamboo grown on private/community lands: M.S. Haque, S. Kannapiran.
9. Cultivation and harvest of forest trees on private lands in Kerala – current problems and strategies for future: M. M. Animon, E.V. Anoop, T.K. Kunhambu.
10. Bamboo sector development in the north-east: Challenges and opportunities. K.G. Prasad.

Shri K. Subramanyan, Director, IFGTB Coimbatore conducting Technical session IV

11. Issues in the development and utilisation of natural resources in Uttaranchal: P. Todaria, D.S. Chauhan.
12. A national policy for agroforestry: R. Jambulingam.
13. Problems in cultivation and utilisation of forest trees and medicinal plants in Tamil Nadu: Sidappa, S., Viswanath, C.H., Muralidhara Rao, Saravanan.
14. Bamboo cultivation and traditional bamboo sector in Kerala: Madhu Narayan Baby.
15. Policy and legal issues in regard to tree farming on private/community lands in India: A.K. Sharda, M.V. Ramakrishna.
16. Policies and legal issues for agroforestry practices in Chattisgarh: Sunil Puri.
17. Plantation insurance: M.A. Aziz.
18. Sustainable harvesting and marketing of bamboo species in Uttaranchal: Sharmila Ribeiro, Jack Croucher.

On the second day discussions were held in five groups before presenting the recommendations by the group leaders

Group I: Forest Policy and Law

Chairman: Shri T.M. Manoharan; Co-Chairman: Shri Sivan Madathil; Rapporteurs- Dr. R.V. Varma, Dr. V.V. Sudheendrakumar.

Plenary session in progress

A typical agroforestry system

Group II: Policy Relating to Biodiversity Conservation.

Chairman: Dr. John Joseph ; Co-Chairman- Shri A.C. Lakshmana
Rapporteurs: Dr. K.V. Sankaran, Dr. S. Kumaraswamy.

Group III: Wood, Bamboos and cane Production.

Chairman: Dr. Denis Depommier; Co-Chairman: Shri A.N Singh
Rapporteurs: Shri. K.V. Mohammed kunhi, Dr. M.P. Sujatha.

GroupIV: Policies relating to wood/bamboo utilisation, value addition and marketing.

Chairman: Shri Ramesh Singh; Co-Chairman: Shri A.K Bansal
Rapporteurs: Dr. E.J. Maria Florence, Dr. M. Sivaram.

Group V: Economics and Financing

Chairman: Shri V.S. Oberoi, Co-Chairman: Shri M.S. Haq
Rapporteurs: Dr. M. Balasundaran, Dr. V. Anitha.
The group discussions were followed by the plenary session The panel consisted of Mr. V.S. Oberoi (Chairman), Mr. P. Patnaik Dr. S. John Joseph, Shri T.M. Manoharan, Dr. R.M. Singhal, Dr. M.S. Haq, Mr. A.C. Lakshmana, Dr. J.K. Sharma.

Field Study Tour

There was an optional field study tour on 9 August, 2001 The delegates visited a large sacred grove at Iringole, a handicrafts training centre managed by the Haritha Maithri Society for the Sambava community at Neeleeswaram, Angamaly; bamboo board factory at Angamali; oil palm plantation of the Plantation Corporation of Kerala Ltd.,Vettilappara (Angamaly); a home garden Agroforestry system at Konnakuzhy, Chalakkudy; bamboo and reed breaks at Vazhachal; a medicinal plant garden at Vazhachal; and the water falls at Athirappally, Charpa and Vazhachal.

Scared grove, Iringole

DRAFT RECOMMENDATIONS OF THE WORKSHOP

Preamble

To increase the tree cover to 33% as envisaged by the Government of India, afforestation of community lands/waste lands and farmlands need to be promoted. Economically important tree species, Bamboo and Rattan should be given priority.

To promote tree planting, laws should be made transparent and people friendly so that benefit can be accrued for better livelihood of people.

Laws differ from State-to- State and they do not provide many incentives for cultivation of bamboo and other tree species. There should be some broad-based uniformity with exceptions as per local/regional conditions varying from State to State.

The draft recommendations of the workshop are presented below:

Forest Policy and Laws

1. Forest policy should be people-friendly encouraging tree farming in non-forest areas by people and communities. Trees from farmlands should be referred to as farm produce and not forest produce, which should be restricted to produce from natural forest or forest plantations.

2. A review of regulatory and legal system should be carried out to remove impediments to promote tree farming and laws need to be simplified for cultivation, harvesting, transportation and marketing of economically important trees. Only in the interest of biodiversity or with regard to special circumstances, there need to be restrictions even on non-forest land.

Status of Land

3. Any law on the land tenure system, which inhibits farmers to grow trees, should be modified. In several cases there is ambiguity on the status of the land and this is providing disincentive in undertaking economic activities by the people. These ambiguities should be removed and a clear land use policy should define for private lands.

4. Non-forested revenue wastelands may be leased to people/Panchayats for cultivation of trees with provision for revenue sharing.

5. Before diverting any forestland for non-forestry use, the status of the land shall be determined by legal procedures such as dis-reservation. Such actions may be finalised as expeditiously as possible in the case of forestlands already assigned.

Tree Farming and Functioning

6. Selection of species and intensity of cultivation should be done according to land capacity.

7. Planting stock of good germ-plasm, superior quality certified seedlings

Lively discussions among the delegates

for site-specific ecological conditions should be provided to farmer by the Forest Department.

8. Village level service institutions/committees should be linked up with the Village Forest Committees of the Forest Department under JFM for promoting tree cultivation. These committees should be empowered to prepare and implement management plans for and to regulate utilisation of farm tree produce.

9. Critical area specific problems that have far reaching impact on availability/exploitation of gene pool and biodiversity conservation should be addressed on a priority basis at the national level.

Biodiversity Conservation

10. Incentives should be given to private cultivators of medicinal and other economically important plants by award, relaxation on land ceiling, soft loans, etc.

11. Incentive should be given to those who conserve and maintain biodiversity in sacred groves/Devarakatu. Participatory level monitoring groups need be constituted to monitor the conservation of sacred groves.

12. Resource should be inventoried and present level of sectoral demand and supply analysed. If fresh investment interventions are proposed, bulk utilisers should be identified and enhanced production and consumption should be matched.

Utilisation, Value Addition and Marketing

13. Traditional use of tree species should be documented with appropriate inputs from people and their utilisation should be encouraged, as prospective use has risks of market rejection.

14. Quality standards should be formulated for various end uses and quality consciousness giving emphasis on value addition at all levels of production, conversion to be generated considering different end uses.

15. Marketing of products has to be based on the principle of multiple selling points and end user channels. Steady and sustained efforts are to be made to alter traditional utilisation points.

Economics and Financing

16. Funds from Department of Wasteland Development under Rural Development Ministry should be routed through Panchayats and linked up to a service cooperative society for bamboo, cane etc., that will cater to the needs and requirements of this sector.

17. Appropriate marketing support should be extended to small growers of non-forest land. Credit based incentives may be provided by the financial institutions through loans, grants and subsidies. Taxation on such farm-grown bamboos and canes should be reviewed.

18. Micro-economic and feasibility studies should to be carried out to understand the resource dynamics.

19. Financial Institutions/ Banks should be made aware of the resource potential. Agencies such as Innovative Rural Housing Scheme, Investment Promotion Scheme under the Ministry of Rural Development should ensure adequate capital flow. Financial institutions like commercial banks should incorporate forestry experts to study the feasibility of such schemes.

Research, Transfer of Technology and Awareness

20. For each state and region, tree species suited to a particular eco-climate zone should be prioritised and promoted. Available scientific inputs from Indian and international institutions should be utilised.

21. Research institutions should develop and promote new technologies of preservation and processing for value addition to facilitate adoption by private sectors.

22. The State Forest Research Institutes should carry out the monitoring and evaluation of the resource dynamics.

23. Research institutions need to be funded to enable to do research and transfer technologies that are of direct relevance to growers. Effective coordination among research institutions needs to be promoted. Also, the needs of the clients should be assessed periodically to address the thrust areas.

There should be dissemination of information, and creation of awareness with respect to laws for cultivation of bamboos, rattans and forest trees in private and community lands

Training Workshop on Statistical Applications in Forestry Research

6-10 May 2002 , Peechi

Organised by
Kerala Forest Research Institute
Peechi

Sponsored by
Ministry of Environment and Forests
Government of India

Modern scientific research relies extensively on quantitative measurements and analyses. Forestry research is no exception to this. Even when researchers have a basic appreciation of the use of statistical methods, they are many times left behind of the modern trends and development in the methodology. This workshop is basically concerned with the need of the forestry researchers to refresh the basic material and review the modern developments in statistical methodology in various facets of its application in forestry research. Other than reviewing the developments that have taken place in the methodology, the workshop is expected to provide a forum for discussing the methodological problems faced by the researchers and for seeking solutions from the experts. Hands-on experience with computers and statistical software packages will be an added attraction of the training workshop. The workshop is intended to be of use to researchers in forestry research institutes and forest departments in India.

Contact:
Dr. K. Jayaraman
Convener, Training Workshop on Statistical Applications in Forestry Research
Kerala Forest Research Institute,Peechi 680 653, Kerala, India
Phone : 0487 - 282037
E-mail : jayaram@kfri.org

New Release from FAO

State of the World's Forests 2001

The *State of World's Forests 2001* is the fourth edition of FAO's flagship publication on forests produced every two years having brought out the first edition in 1995. The main purpose of this publication is to provide current, reliable and policy relevant information on the forest sector policy makers, foresters, natural resource managers, academicians, forest industrialists and the whole civil society. The report focuses on the status of forests, recent major policy and institutional developments and key issues concerning the forest sector *per se*. The publication has four parts which treat the different aspects as : *the situation and recent developments in the forest sector, key issues in the forest sector today, international dialogue and initiatives and lastly forestry in regional economic groups*. The key issues include:

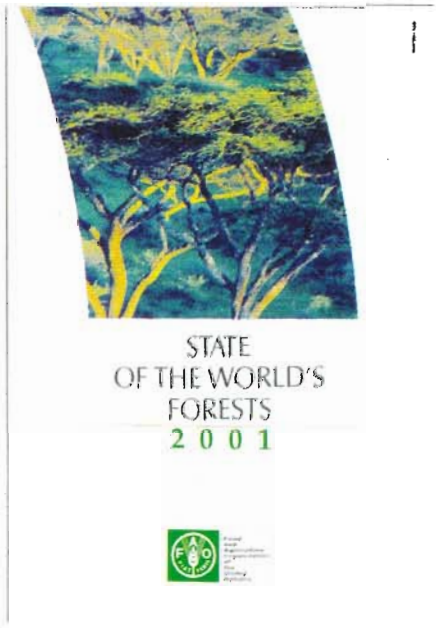
1. The status of forests: the global forest resources assessment
2. Climate change and forests
3. Forest biological diversity conservation: protected area management
4. Illegal activities and corruption in the forest sector

According to the most recent survey, there are an estimated 3870 million ha of forests worldwide, of which almost 95 percent are natural forests and 5 percent are forest plantations. Tropical deforestation and degradation of forests in many parts of the world are negatively affecting the availability of forest goods and service. While forest area in developed countries has stabilized and is slightly increasing overall, deforestation has continued in developing countries. The estimated net annual change in forest area worldwide during the past decade (1990-2000) was -9.4 million ha, representing the difference between the estimated annual rate of deforestation of 14.6 million ha and the estimated annual rate of forest area increase of 5.2 million ha. The causes of forest degradation are varied. This report discusses two recent causes of forest damage: severe wildfires in various parts of the world and the December 1999 windstorms in Europe. Storms struck Europe in December 1999, causing massive damage to forests and trees outside forests, seriously affecting many people's livelihoods and disrupting forest industries and markets.

Sustainable Management of Forest Resources

The publication also highlights recent technical, policy and institutional measures to improve forest management and conservation, reflecting the move to balance social, economic and environmental objectives. There is a global trend towards greater reliance on plantations as a source of industrial wood. The development of global plantation estate is quite recent, half of all plantations in the world are less than 15 years old. Asia has led plantation establishment, accounting for 62 percent of all forest plantations as of 2000. Other significant developments include: rising private sector and foreign investment in plantations in developing countries and an expansion of out grower schemes.

Another special mention in the publication is the traditional biotechnology that has long been



used effectively to increase the productivity of forest plantations. But the *debate on genetically modified organisms now involving the forest sector has attracted the recent attention of producer and users sectors* . Genetic modification of forest tree species has been considered for such traits as virus and insect resistance, reduced lignin content and herbicide tolerance. No commercial production of transgenic forest trees has been reported, although research trials are under way. The new biotechnologies offer potential opportunities but their development and use should be carefully planned.

According to the *State of the World Forests* 2001, two recent and very different approaches to improving forest management in production forests are the adoption of reduced impact logging (RIL) and restrictions / bans on logging. Many countries have recently imposed bans or restrictions on timber harvesting to conserve their forest resources or as a response to devastating natural calamities attributed, conservation of natural forests, in others, they have negatively affected the forest sector and local communities or simply transferred the problem elsewhere.

Governance issues

Increasing attention is being paid to institutional and governance issues in the context of sustainable forest management. *The state of the World's Forests 2001* focuses on two of these: illegal forest activities and community-based forest management. Worldwide, there is a growing awareness of the extent of illegal forest activities and of the immense financial, environmental and social costs that such activities incur. The involvement of communities in forest management is now a significant feature of national forest policies and programmes throughout the world.

Forest Goods and Services

A number of trade trends have continued, including an increased proportion of the total production of wood products being exported, more domestic wood processing occurring, increased trade among developing countries (particularly in Asia) and trade liberalization at a global level, even as some countries are introducing export restrictions.

The certification of forest products has been gaining acceptance and the area of certified forests has increased to roughly 90 million ha. Nonetheless, this represents only about 2 percent of the world's forest area and, notably, most certified forests are located in limited number of temperate countries. Recent developments include the further elaboration of national certification schemes, mutual recognition of certification processes, the favouring of certified wood products by major retail chains and buyers groups, and the certification of certain pulp and paper products and non-wood forest products.

Forest industries continue to adapt to changes in raw materials, namely the increased supply of plantation wood and of a wider range of species. Recent negotiations on the *Kyoto Protocol* of the Framework Convention on Climate Change have focused considerable attention on forests in the context of climate change. The Kyoto Protocol, if ratified, may have a profound effect on the forest sector, depending on which, and how, forest activities are included as eligible measures for climate change mitigation.

Protected area management

The conservation of biological diversity has become a feature of national forest policy and planning throughout the world. Major developments in their management include efforts to integrate conservation and

development needs, community-based conservation, an emphasis on ecosystem management and the adoption of a bioregional approach.

Most countries are now carrying out a national forest programme, which is an interactive forest sector planning process leading to a comprehensive forest policy framework. It often involves the revision of forest policies and legislation and wider stakeholder participation in forest planning and decision-making. Forest management is being influenced by free flows of labour, capital, goods and information between countries. NGOs and other civil society groups have become increasingly active in forest-related advocacy, legal action and natural resource management. Large companies have grown even larger and private enterprises own or control significant forest areas world wide.

International Dialogue and Initiatives

Countries were much divided on forest issues at UNCED. In October 2000, countries agreed to an international arrangement on forests, including the establishment of the United Nations Forum on Forests to promote the sustainable management, conservation and strengthen long-term political commitment and to promote the implementation of IPF and IFF proposals for action. The recent development of criteria and indicators for sustainable forest management has helped to define sustainable forest management better and to measure progress towards archiving it. Model and demonstration forest programmes being implemented in most regions of the world help to illustrate sustainable forest management in practice.

International development assistance agencies over the past decade have increasingly supported forest planning and national capacity building, encouraging participatory approaches, community-based management and equity and gender sensitivity. The groundwork has been laid, but realizing the vision of sustainable management, conservation and development of the world's forests will depend on a number of factors.

Finally, the annexure provides updated statistics/ facts and figures for different countries to facilitate the decision-making process easier. In a nut shell, *the State of World's Forests 2001* will prove a useful reference tool for policy-makers, foresters and other readers seeking up-to-date view of the major issues involving the forest sector today.

-Editor

For additional information please contact:
Publications and Information Coordinator
Forestry Department
Food and Agriculture Organization of the United Nations
Viale delle Terme di Caracalla 00100 Rome, Italy
Fax: (39) 06 57055137
Email: forestry-information@fao.org
Website: fao.org/forestry

RECENT PUBLICATIONS

In Books:

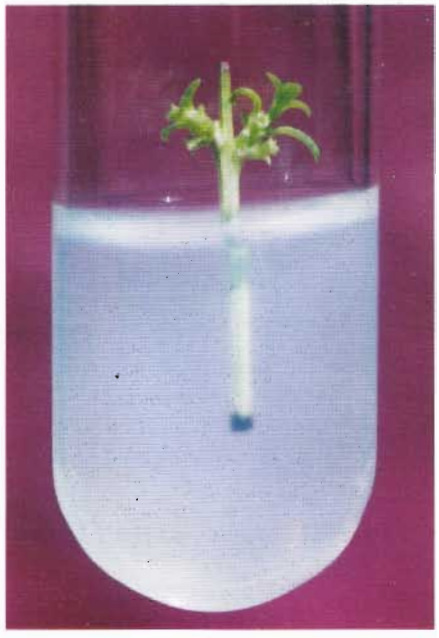
- Abdul Kader , S. and Seethalakshmi, K.K. and Chacko, K. C. 2001. Rapid viability tests for fresh and stored seeds of Mohagany (*Swietenia macrophylla* King.) In: Proceedings, Joint Symposium Tree Seed Technology, Physiology, and Tropical Silviculture. 30 April - 3 May, 2001. University of Philippines. 46-53p.
- Bhat K.M. 2001. Breeding for improved wood quality of teak. In: A. K Mandal and S.A. Ansari (eds.) *Genetics and Silviculture of Teak* . International Book Distributors, Dehra Dun, 147-163p
- Chandrashekara, U.M., .Muraleedha-ran P.K and Sebichen, V. 2001. Disturbed Shola Forests of Kerala and Strategies for its Conservation and Management, *In* K.K.N.Nair, S.K.Khanduri and K.Bala-subrhamanian (eds), *Shola Forests of Kerala, Environment and Bio-diversity*, KFD and KFRI, 395-437p.
- Renuka C. 2001. Palms of India: status threats and conservation strategies. In: R. Uma Shankar, K.N. Ganashaiah & K.S.Bawa (eds.) *Forest Genetic Resources, Status, Threats and Conservation Strategies*. Oxford & IBH publishing Co. Pvt. Ltd., New Delhi.

RESEARCH UPDATE

Micropropagation of rare and endangered trees species of Western Ghats

Syzigium travancoricum Ashramam, Kollam

Using standard tissue culture procedures, micropropagation of four species of rare endemic trees of Western Ghats was attempted. The results based on using both nodal and seed-explants from *Syzigium travancoricum*, *Cinnamomum verum*, *Gluta travancorica* and *Vateria macrocarpa* were published in KFRI Research Report 211. Dr. E. M. Muralidharan cautions that there is a need for additional and concerted efforts to ensure availability of suitable explants in sufficient numbers. The prophylactic treatment of mother plants in both the field and glasshouse and use of systemic antibiotics *in vitro* were recommended to control microbial contamination particularly of endophytes. An understanding of the phenology of the species will also help in collection of immature stages of zygotic embryos that are more suitable explants for establishing cultures.



Multiple shoot formation in *Syzigium travancoricum*

Scientific Papers

- Abdul Kader, S. 2001. Unusual flowering in *Hopea parviflora,* Bedd. *The Indian Forester* 127. (3): 370.
- Abdul Kader, S and Bindu, K.R. 2001. A note on twin seedlings in *Caesalpinia sappan* , Linn. *The Indian Forester* 127 (5): 593-594.
- Abdul Kader, S and Chacko, K.C. 2001. Occurrence of Mono-and Poly-embryonic Albino seedlings in *Madhuca bourdillonii* (Gamble) Raizada. *The Indian Forester* 127 (8): 941-943.
- Abdul Kader , S. Preethi, M. Raveendran, V. P and Seethalakshmi, K.K. 2001. Albino seedlings in bamboo (*Ochlandra travancorica* (Bedd). Benth.ex. Gamble) Short note. *Indian Journal of Genetics and Plant Breeding* 61(2): 194-195 .
- Abdul Kader, S and Seethalakshmi, K.K. 2001. Abnormal Seedlings in *Swietenia macrophylla*, King. *Indian Journal of Forestry* 24 (1): 112-113.
- Dhamodaran, T.K. and R.Gnanaharan 2001. Optimizing the schedule for CCA impregnation treatment of rubber wood *Holz als Roh- und Werkstoff* 59 294-298
- Gigi K. J. and Ramachandran, K.K. 2001. Silent Valley National Park - An undisturbed viable abode for the endangered lion-tailed macaque (*Macaca silenus*). *TigerPaper,* 28(2): 25-30.
- Indira, E.P; Chand Basha, S; Chacko K.C. and Krishnankutty, C.N. 2001. Effect of different sowing methods and seed rates on germination and growth of teak seedlings. *Indian Journal of Forestry.* 24 (1): 93-96.
- Ramachandran, K.K. and Gigi K. J. 2001. Distribution and demography of diurnal primates in Silent Valley National Park and adjacent areas, Kerala, India. *Journal, Bombay nat. Hist. Soc.*, 98(2): 191-196.
- Ramachandran, K.K. and Gigi K. 2001. Feeding ecology of Nilgiri langur (*Trachypithecus johnii*) in Silent Valley National Park, Kerala, India. *Indian Forester,* 127(10): 1155-1164.
- Sankaran, K.V. 2001. *Mimosa invisa* - a growing menace in South India. *Biocontrol News and Information* 22(1): 4-5 .
- Sankaran, K.V. 2001. Mikania management calls for biocontrol. *Biocontrol News and Information* 22(3): 65 .

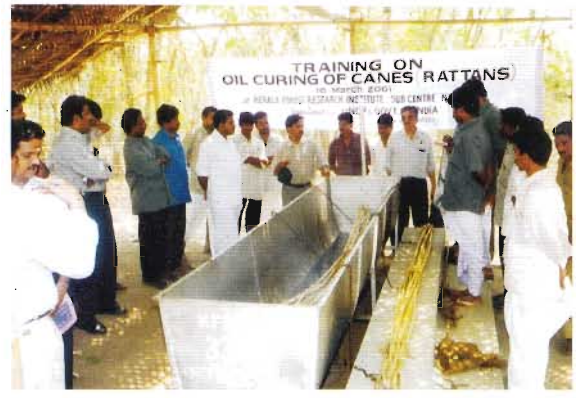
KFRI Research Report

- Muralidharan, E. M. 2001. Micropro-pagation of important rare and endangered trees species of Western Ghats. KFRI Project Report No.211

LATE BREAKING NEWS....

Field Demonstration-cum-Training in Oil-Curing of Canes (Rattan)

The Division of Wood Science, as part of the UNDP-Government of India (Ministry of Textiles – Development Commissioner-Handicrafts) project, organised a one-day field demonstration and training programme on 16 March 2001 at KFRI-Sub centre Nilambur. The development objective of this training programme was to introduce oil-cured high quality cane raw material, which is free from fungal discolouration, in the manufacture of bright/ivory-white coloured furniture and handicraft products of better aesthetic and export values. The target beneficiaries included traders and cane entrepreneurs particularly rural artisans. About 20 trainees from Kerala participated in the programme in addition to a special beneficiary from the Institute of Rain and Moist Deciduous Forests (IRMD) Jorhat, Assam to absorb and adopt the simple rural technology in North-eastern India.



A nomad type of cane curing unit was installed at KFRI sub-centre, Nilambur to provide immediate access for the cost-effective treatment of freshly extracted canes. The design of oil curing device has been modified keeping the fire safety uppermost in mind. The new boiling tank was designed in such a way that either kerosene pressure pump or cooking gas can be used as an alternative source of fuel for three burners concealed in a bracket for heating the oil mixture, instead of fire from the hearth, in order to avoid the fire hazard due to the direct contact of flame with oil mixture. Drs. K. M. Bhat , T. K. Dhamodaran and Mr. P. K. Thulasidas (Wood Science Division) served as the resource persons.

Training imparted

A User Discussion Programme to train the staff of KFRI in LAN and computer use has been initiated under the World Bank funded Information Networking Project at KFRI. Five discussion groups have been held in which Mr. A.R. Rajan, Dr. P. V. Nair, Dr. V.V. Sudheendrakumar, Dr. K. K. Ramachandran, Dr. Jose Kallarackal, Mr. K. H. Hussain and Mr. K. R. Radhakrishnan served as resource persons. The program was organised by Dr. J. Kallarackal and Mr. AR Rajan.

Increasing Eucalypt Productivity through High Yielding Disease Resistant Clones: Method of Vegetative Multiplication

M. Balasundaran, E.J. Maria Florence and J.K. Sharma
Division of Pathology

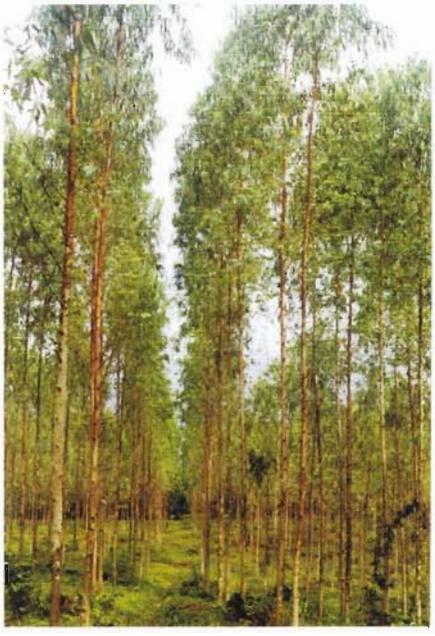
Introduction

Establishment of species trial comprising about seventy five provenances of *Eucalyptus tereticornis, E. camaldulensis, E. urophylla, E. pellitta* and *E. grandis* of Australian origin was the prelude to clonal forestry programme in these species in Kerala. *E. grandis* provenance trials were conducted in high altitude areas >650 m above msl while other species were tried mostly at low altitude sites. Candidate plus trees (CPTs) were identified from the provenances suitable to Kerala conditions such as very high humidity and continuous rain during monsoon season reaching up to an average of 2500 mm of annual rainfall. Fast growing, disease tolerant CPTs were felled to produce true to type clones from coppice shoots, and established Clonal Gene Bank (CGB) and Clonal Multiplication Area (CMA). Now, about 96 clones are established in clonal gene bank, and 24 clones comprising the above species except *E. grandis* are released for raising clonal plantations by the Kerala Forest Department and Hindustan News Print Ltd. The methodology adopted for mass multiplication of the eucalypts clones developed by KFRI is briefly explained here.

Preparation of cuttings

Coppice shoots are collected from 2- to 4-year-old plants raised in CMA every year and from 6-month- to 18-month-old ramets raised in root trainers for making 'micro-cuttings'. Coppice shoots, 40- to 50- days old, give an average of 65-80 per cent success in rooting while micro-cuttings give 80-95 per cent success. During one season, coppice shoots from CMA are cut twice while micro-cuttings are available thrice. Two-leafed-cuttings, avoiding side branches are planted in vermiculite, filled in root trainers of 150 ml capacity cells, after treating the cuttings with 0.1 per cent solution of carbendazim and dipping the lower cut end in 4000 ppm IBA, prepared by mixing with talcum powder. The root trainers with the cuttings are kept on root trainer stands in the mist chamber.

The ramets for taking micro-cuttings are maintained by partially replacing the vermiculite with compost. Foliar spray of DAP (0.3% solution) and subsequently NPK in liquid form followed by micro-nutrient application as foliar spray enhances growth of coppice shoots from ramets maintained in root trainers for taking micro-cuttings.



$1^{1}/_{2}$-year-old clonal eucalypt plantation

Rooting of cuttings

Cuttings are rooted and sprouted in trench-type Field Clonal Propagation Units (FCPU) provided

DISEASE RESISTANT FAST GROWING PROVENANCES OF *EUCALYPTUS*

The following are the disease resistant fast growing Australian provenances of various eucalypt species recommended for planting in Kerala through a provenance trial conducted over 10 years at Kottappara.

Sl. No.	Provenance name	Seed lot Number ex CSIRO, Australia
***Eucalyptus tereticornis* - for low altitudes**		
1.	Kennedy River	14802
2.	Cardwell	13277
3.	Sirinumu Sogeri Plat	13418
4.	Kennedy CK	15827
5.	Palmer River	13847
6.	Ravenshoe	14424
7.	Morehead River	13444
***Eucalyptus camaldulensis* - for low altitudes**		
1.	Catherine	13801
2.	Cape River	13815
3.	W. of Irvine Bank	15234
4.	Petford	16536
***Eucalyptus urophylla* - for low altitudes**		
1.	Mt. Egon Flores Is	13827
2.	N. of Telemar SW Netar	17834
3.	Mandiri Flores	17564
4.	Mount Mutis W. Timor	13828
***Eucalyptus pellita* - for low altitudes**		
1.	14.6 km NE Coen	14339
2.	71-72 Km NE Wenlock	13999
***Eucalyptus grandis* - for high ranges**		
1.	East of Atherton	14698
2.	Paluma Dam	16723
3.	15 Km Cairns	17826
4.	Baroon Pocket Malony	15875
5.	Mount Lewis	13289

DISEASE RESISTANT AND HIGHLY PRODUCTIVE CLONES OF *EUCALYPTUS TERETICORNIS* DEVELOPED BY KFRI

The following KFRI clones of *Eucalyptus tereticornis* are available on payment basis for which the order has to be placed during October/November for field planting.

Eucalypt species and KFRI Clone No. / Name of provenance from which clone developed		Productivity rating[1] 2-year-old KFD plantation	4-year-old KFRI clonal testing area	Disease[2] resistance rating
Eucalyptus tereticornis				
KFRI 14	Kennedy River	*	****	MS
KFRI 15	Morehead River	**	***	MR
KFRI 16	Morehead River	**	***	MS
KFRI 28	80 Km NNW Cook Town	**	****	MS
KFRI 38	East of Kupiano,	**	****	R
KFRI 43	Ravenshoe,	**	****	MS
KFRI 47	Kennedy Creek Pen Dev Road,	*	**	MS
KFRI 49	Morehead River,	**	****	MR
KFRI 56	Ravenshoe,	**	****	MS
KFRI 58	Kennedy River,	**	***	MS
KFRI 62	Palmer River,	*	**	
KFRI 65	Kennedy Creek Pen	**	****	MR
Eucalyptus camaldulensis				
KFRI 10	Katherine,	**	****	MS
KFRI 23	West of Normanton,	**	***	MR
KFRI 25	Katherine,	**	****	R
KFRI 54	Cape River,	*	***	MS
KFRI 68	Cape Rive,	*	***	MS
Eucalyptus urophylla				
KFRI 34	Mt. Egon Flore Is.	*	**	R
Eucalyptus pellitta				
KFRI 26	Between GGOE-Kiriwa	*	**	R

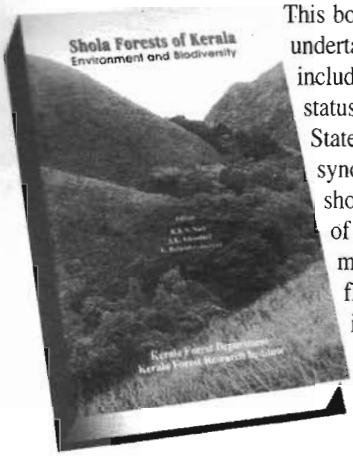
1. *Low (< 10 $m^3ha^{-1}yr^{-1}$), ** Moderate (10-25 $m^3ha^{-1}yr^{-1}$); *** High (25-40 $m^3ha^{-1}yr^{-1}$); **** Very High (> 40$m^3ha^{-1}yr^{-1}$)

2 MS Moderately susceptible, MR Moderately resistant, R Highly resistant

New Release

Shola Forests of Kerala: Environment and Biodiversity

Editors: K. K. N. Nair, S.K. Khanduri and K. Balasubramanyan, 2001, 453p; Price: Indian Rupees 1000.00; overseas US $ 75.00 + postage, Publishers: Kerala Forest Department, Trivandrum and KFRI, Peechi



This book is a compilation of the research findings 16 projects undertaken in the shoal forests of Kerala by various institutions including KFRI. It has an introductory chapter highlighting the status of available knowledge in the shoal ecosystem of the State published earlier besides an executive summary and a synoptic synthesis of the details generated so far. Chapters on shola environment include characterisation and water regime of the formations and the fauna part of the book deals with mainly fish, micro invertebrates, birds and butterflies. The flora part encompasses various aspects plant diversity and its conservation, including groups like fungi, lichens and angiosperms. Detailed analysis of the vegetation includes endemism, phytosociology and litter dynamics are available in the book. Computerised herbarium of shola plant species, mapping shola vegetations by remote sensing and geographical information system are also included. The book is also well illustrated with photographs, charts, maps, histograms and profile diagrams together with indices on authors and subjects dealt with.

Alien Weeds in Moist Tropical Zones: Banes and Benefits

Editors: K. V. Sankaran, S.T. Murphy and H.C. Evans, 2001.172p. Price: Indian Rupees 500; Overseas US $ 50
Publishers : Kerala Forest Research Institute, Peechi & CABI Bioscience, UK

This publication is based on the proceedings of the workshop held at Kerala Forest Research Institute, Peechi, 2-4 November 1999. It deals with the population characteristics, taxonomy and ecology of the major weeds in India and their management aspects. It is intended to provide an insight into the current status of exotic weed invasion in the moist tropical zones and the challenges they offer.

KFRI CD 1: KFRI Research Reports 1-200

K. Sankara Pillai, Jose Kallarackal, N. Sarojam, 2001
Kerala Forest Research Institute, Peechi
Price: Indian Rupees 2000; Overseas: US $150

KFRI undertakes research on all aspects of forestry including wildlife and wood science and technology. The research results are published in the form of research reports. This CD contains full text of 200 research reports brought out up to the year 2000. The CD will be useful to forest managers, planners, NGOs, scientists, teachers and students of forestry and allied fields. It is designed to be user friendly for searching the desired research report with navigating facility through the text. It provides: the list of all reports, reports by major subject grouping, author index, subject index and full text of reports in PDF.

KERALA FOREST RESEARCH INSTITUTE

Peechi 680 653, Trichur, Kerala, India

PRICED PUBLICATIONS - 2001

No.	Title	Price Rs.	Price US$
	BOOKS		
1	Ecodevelopment of Western Ghats (Seminar Proceedings)	200.00	30.00
2	Rattans of the Western Ghats	100.00	10.00
3	Structure and Properties of South Indian Rattans	75.00	8.00
4	Tropical Forest Ecosystem Conservation and Development in South and South East Asia (Seminar Proceedings)	200.00	30.00
5	Rattan Management and Utilization (Seminar Proceedings)	300.00	35.00
6	Litter Dynamics, Microbial Association and Soil Studies in Acacia auriculiformis Plantations in Kerala	75.00	8.00
7	Socio-economic Research in Forestry (Seminar Proceedings)	350.00	40.00
8	History of Forest Management in Kerala	150.00	15.00
9	Teak (Information Bulletin)	15.00	5.00
10	Upgradation of Rubber Wood	75.00	8.00
11	A Manual on the Rattans of Andaman and Nicobar Islands	175.00	20.00
12	Bamboo Researchers and Projects of South and South-East Asia: Directory	125.00	15.00
13	Impact of Diseases and Insect Pests in Tropical Forests (Seminar Proceedings)	500.00	50.00
14	Bamboos of South and South-East Asia: An Annotated Bibliography	300.00	30.00
15	Teak (Seminar Proceedings)	200.00	20.00
16	Field Guide to Animal Signs	40.00	10.00
17	Forest Trees of Kerala	50.00	15.00
18	Bamboos of India: A compendium	1500.00	75.00
19	Basic Readings in Forest Economics	150.00	20.00
20	Palms of Kerala	300.00	30.00
21	Compost for Container Seedling Production in Forest Nurseries	100.00	20.00
22	Manual of Nonwood Forest Produce Plants of Kerala	450.00	50.00
23	Rare and Endangered Mammals of Kerala	50.00	10.00
24	Field Identification Key for Rattans of Kerala	125.00	15.00
25	Vana Vanyajeevi Sampathum Samrakshanavum (Malayalam)	25.00	—
26	A Handbook on Statistical Analysis in Forestry Research	500.00	50.00
27	Integrated Management of the Alien Invasive Weed Mikania micrantha in the Western Ghats	150.00	20.00
28	Shola Forests of Kerala	1000.00	75.00
29	Alien Weeds in Moist Tropical Zones: Banes and Benefits	500.00	50.00
	CD		
30	CD1 KFRI Research Reports 1-200	2000.00	150.00
	POSTER		
31	Poster on Amphibians of Kerlala Part I: Frogs	30.00	—
	SOFTWARE PACKAGES		
32	KFRI Stat Pack (Statistical Analysis Package for Forest Mensuration)	5000.00	250.00
33	DESIGNEX (Exprt System for Designing Experiments in Forestry)	5000.00	250.00
	VIDEO FILMS		
34	Teak Defoliators	500.00	50.00
35	Bamboo - A Crop	500.00	50.00

Postage in India and surface Mail Charge for abroad are free. If required by Air Mail, please add US$ 10.00 each for serial nos. 1, 4, 5, 7, 13, 14, 15, 18 and 22 for the rest US$ 5.00

Send your orders to:

- Book sellers will be given 25% discount
- Educational Institutions will be given 10% discount

Libraian, KFRI, Peechi, Trichur 680 653, Kerala, India

Ph: + 91 487 - 282 037 **e-mail: libkfri@vsnl.com**

Please fill your address

____

____

____

____

with poly tunnel. Intermittent misting and shade net provided above the poly tunnel maintain relative humidity at 60-85 per cent and temperature 30-35C. Hoagland's solution is applied to the cuttings at 12-15th day. Rooting starts after 12-15 days and the polythene sheet of the poly tunnel kept open for two days after 21st day. Rooting experiments carried out with compost, soil, sand and coir pith as rooting medium showed complete failure in compost, and medium containing more than 50 per cent compost; soil and coir pith support 10 – 30 per cent rooting while satisfactory rooting (40-60 per cent) is found in sand. Highest rooting percentage is obtained in medium coarse horticultural grade vermiculite. Cuttings of *E. urophylla* and *E. pellitta* take 3-4 days more for rooting than those of *E. tereticornis* and *E. camaldulensis.*

Hardening

After 23rd day, the cuttings are transferred to hardening unit provided with shade net and sprinklers. Watering is done frequently for the first week and reduced gradually depending upon the ambient temperature. DAP is applied as foliar spray at an interval of 10 days followed by micronutrient application each time. Subsequently, the ramets are transferred to a second hardening unit without any shade net or to open ground. NPK fertilizer, super phosphate and micronutrients are applied once in fifteen days depending upon the growth requirements. The ramets are maintained in the clonal nursery with reduced watering till they were required for field planting.

Prophylactic treatment

Before transporting to the planting site, the ramets are sprayed profusely with carbendazim (0.1 per cent solution) to avoid *Cylindrocladium* infection. Against termite attack, ramets are treated with chlorpyriphos by dipping the root trainers in 0.5 per cent solution and draining the excess solution. The chlorpyriphos treated ramets are out planted as early as possible in order to avoid possible toxicity to plants. Each clone is tested for sensitivity after treatment for at least 10 days as variation in sensitivity to chlorpyriphos has been observed.

Cost of production

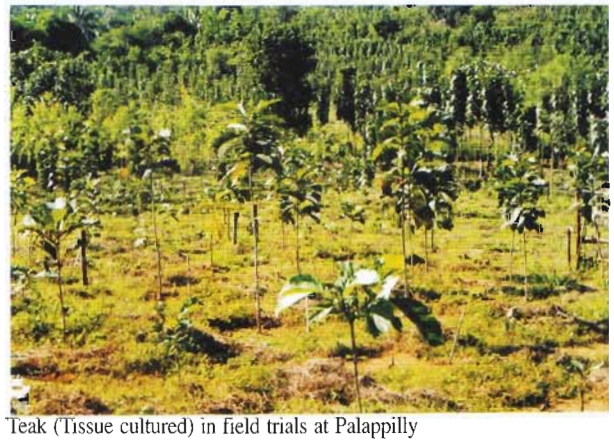
In KFRI, ramets are produced in trench type Field Clonal Propagation units. The initial cost of production for each ramet was Rs.12/- during the first year due to infrastructural costs. However, during the subsequent years, the cost of production came down to Rs.3/- when the recurring expenditure and depreciation on the establishment cost were considered.

For details of clones contact:
Director, KFRI,Peechi, 680 653 Kerala.

Application of Tissue Culture in Indian Forestry : A Case of Overkill?

E. M. Muralidharan
Genetics Division

Judging from the increasing number of enquiries received from private planters and government forest officials, there is a spurt of interest in the use of tissue culture plantlets of tree species for raising plantations. This is obviously the direct consequence of the sudden interest in intensively managed tree plantations in the private sector. It is apparent that tissue culture is perceived to be a means of obtaining improved quality and productivity. Although the readiness to adopt modern technology is a welcome trend, it is evident that most people have a misunderstanding about tissue culture. This communication is intended to increase the awareness of the state-of-the art technology and to point to some of its limitations so as to facilitate the reader to draw his own conclusions.


Teak (Tissue cultured) in field trials at Palappilly

The application of tissue culture techniques to large-scale clonal propagation of plants is known as micropropagation. As indicated by the term itself, small plant parts are used for initiating the cultures for propagation. Plants that are produced by the technique are expected to be exact copies of the plant from which the tissue is taken. Briefly, the technique consists of excising plant parts like the shoot or axillary buds or tissues such as leaf, internode, petiole etc. which are placed on a chemically defined nutrient (culture) medium which will permit growth and proliferation of shoots and in later stages formation of roots and whole plantlets in sufficiently large numbers. The entire procedure is carried out under sterile conditions which is ensured by use of chemicals or high pressure steam (autoclaving) for plant tissues and media respectively. The various components of the media like mineral salts, vitamins, sugar, plant hormones etc. and the physical environment like temperature and illumination are so adjusted depending upon the plant species and the stage of culture that very high rates of multiplication are obtained in as small a period and space as possible. Needless to say this requires a lot of effort in terms of research and development before a particular plant species and variety can be efficiently micropropagated on a commercial scale. The economics of the procedure also needs to be such that cost of the procedure justifies the purpose viz. cloning of the mother plant with unique and desirable characters.

How is the mother plant selected? A fairly good idea of the traits of economic interest is necessary in the first place. In forest trees, it is usually the timber yield and quality that is of great importance. In common practice it is through a visual evaluation of trees growing in a plantation or natural forest that a phenotypically superior tree is selected. What constitutes the genetic makeup of the tree will be apparent only when a long process of genetic evaluation is done by testing of the progeny. On the other hand the tree that appears superior to the eye might turn out to be the result of an accidental combination of good soil, water and environmental conditions in the area and of no real genetic merit. Such a situation is to be avoided at all costs, when seeds or tissue culture propagules are being produced from selected trees. But since the tree life cycle is relatively long it will be a long time before such a collection of elite trees is made available. The temptation is, therefore, to go ahead and use seeds or vegetative propagules originating from phenotypically superior trees or the seeds obtained through their crossing as planting material. Moreover, trees that have reached maturity (when their characteristics become apparent) are much more difficult to micropropagate when compared to seedlings or juvenile trees.

Most of our important tree species are only in the early stages of domestication and genetic improvement. Selection of plus trees and laying out of clonal seed orchards has been carried out in a few states. The process of zeroing in on the select few elite superior trees whose progeny will give a guaranteed performance has not been completed in most tree species of

commercial interest . It follows therefore that any commercial micropropagation of the important forest trees can be based only on uncertified , unproven genetic material. In short rotation tree crops like Eucalypts, Poplar, Acacia and Casuarina the state of the technology permits the micropropagation on large scale of selected high yielding clones that have undergone extensive field trials. Adoption of tissue culture technology for propagation in such cases would depend on whether alternative clonal propagation techniques such a rooting of stem cuttings are successful in the clones. It is known that clones differ a lot in their amenability to rooting as well as tissue culture.

The important message is that micropropagation or tissue culture *per se* does not in any way impart any advantage in the propagules. On the contrary, unless comprehensive field trials establish some amount of confidence, one should expect the risk of genetic variability induced through the phenomenon of somaclonal variation. In the case of long term forestry crops this should be taken seriously before the widespread application of micropropagation is encouraged. There is the additional disadvantage that tissue culture plants hardened in the conventional way do not compare well in field hardiness with teak stumps that are the standard planting material used in forestry. Use of root trainers or intensively managed nurseries and plantations may to some extent make the micropropagated plants acceptable.

As of today there are only a few tree species in India where an acceptable level of tissue culture technology has been achieved. Teak and eucalypts are among such species and the early results of field trials are now available from National Chemical Laboratory, Pune. Several other laboratories have developed the technology but no field trials have been documented. In Sandalwood, the technology is still to be perfected, particularly the hardening and survival of the plantlets. Micropropagation has been reported in other trees like rosewood, *Anogeissus*, neem, *Tecomella*, *Boswellia* etc. by several groups but selection of superior trees has not been carried out on a scientific basis and specific superior clones are probably not yet available.

To conclude, considering the current status of genetic improvement programmes, scaling up of tissue culture technology and progress made in evaluation of field performance, the adoption of micropropagated plantlets of forest trees for planting is fraught with risks. A realistic cost-benefit analysis being difficult at this stage, it will be prudent for aspiring planters to ascertain at least the origin of the tissue cultured plantlets of forest trees being offered by commercial firms and to accept only what has been demonstrated through field trials to be superior.

Three-dimensional Terrain Visualization using Computer

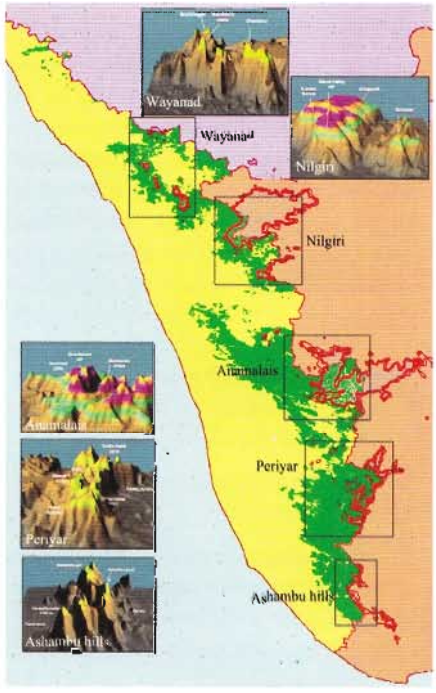
P. Vijayakumaran Nair
FIS Unit

Three-dimensional view of terrain is a modern tool, which can be used in forest and landscape management. There are several methods of constructing three-d views. Almost all of them involve using altitude data or contour data from topo sheets. Three-d views can be generated as raised net diagrams or with hill shading. Images such as those of rivers or vegetation can be overlaid on the generated maps.

Contour lines, hill shading and three-d views are some of the techniques employed for showing topography in maps. Contours are by far the most common and satisfactory means of showing relief. Contours are lines that connect points of equal elevation. Hill shading, or shaded relief, layer or altitude tinting, and special manipulations of contouring are other methods of indicating relief. Shaded relief maps are raster maps based on grid files or Digital Elevation Model (DEM) files. These maps use different colors to indicate surface slope and slope direction relative to a user-defined light source direction. Hill shading requires considerable artistry, as well as the ability to visualize shapes and interpret contours. For a satisfactory result, background contours are necessary to guide the artist. Difficulty in the reproduction process is sometimes a deterrent to the use of treatments involving the manipulation of contours. Widespread availability of computers and maps in digital format has brought about much advancement in three-dimensional portrayal of topography.

In the past, three-dimensional maps were laboriously constructed for studies in military tactics and for many other purposes. They were costly to produce, as contour layers had to be cut and assembled, filled with plaster and painted, after which streams, roads, etc., had to be drawn on the surface. Lettering then was applied, and models of large structures, such as buildings and bridges, were added. In view of the time and cost involved in such productions, they were sparingly used until recent years when better production methods and materials became available. During and after World War I a process using aluminium sheets and plastic moulding was developed for producing raised maps. During and after World War II the production of plastic relief maps was greatly expanded, while the processes and equipment were further improved and refined.

Most relief maps are exaggerated several fold in the vertical scale. The Earth is remarkably smooth, when viewed in actual scale, and many significant features would hardly be distinguishable on a map without some vertical exaggeration. For this reason relief is usually shown at five or even 10 times actual scale, depending upon the nature of the area represented. In the diagram shown below, selected regions from the southern Western Ghats is shown in relief



Three-d view of selected regions of southern western ghats. Some areas have sharply raising hills, the Nilgiri plateau is relatively flat at the top where as the southern regions required a view from the northern side to show the hills properly.

The first stage in construction of a 3-d view is creation of a DEM. This is a matrix containing the altitude data. DEM can be created from the contours digitized into a raster file. The space between contours is filled with interpolated values. This is the approach employed in most GIS programs and terrain visualization programs. DEMs are also readily available from international agencies. If the terrain visualization program accepts the data format, three-d views can be generated using these data. There are several computer programs available for generating three-dimensional views of terrain. 3DEM7 is such a program. (RS Horne, 1999. rshorne@mnsinc.com). It used to be a

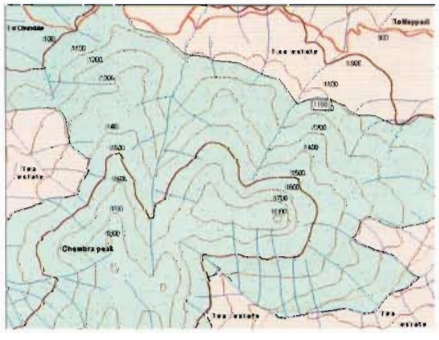
free software, though the later versions have been priced. One feature of this stand-alone program is that it can use USGS 1 degree DEM data, but to use any other data, the user has to prepare his data in text format.

Digitizing contours and interpolating space between contours is a process which involves using a GIS program. In the example shown above the contours were digitized from 1:1,000,000 physical map of south India using *Mapinfo* software, converted to *Idrisi* format and interpolated there. The interpolated data were written in the text format employed in 3DEM program. Other programs such as *Surfer* use a different approach, here digitization can be avoided to some extent. Details are given later.

Once the DEM data are loaded onto 3DEM, they colour the matrix by altitude and selection box appears for choosing the focal area and angle of view. Dragging from corners can change the size of the box. The box can also be moved around. The left and right arrow keys on the keyboard control view direction. Once these settings are made, the 'View scene' option dialogue will appear. Here the user will have to specify the vertical exaggeration factor, angle of view, terrain tilt and illumination angle. The three-d view appears on the screen. Altering the parameters can control the appearance of the generated diagram. Creation of three-dimensional views for some areas and the method employed are described here.

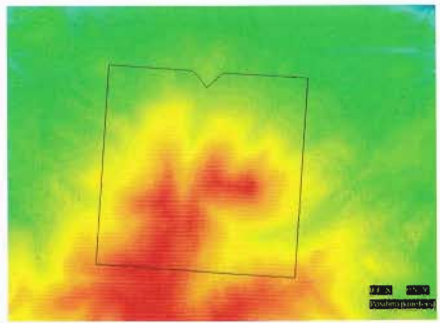
Case study 1: Chembra hills:

At Chembra in Wayanad, two hills and the vegetation had to be shown to illustrate a hydrology study.



Detailed map of Chembra hills showing forest, contour and streams. Better DEM use rivers and spot heights also.

The region was identified in 1:50,000 Survey of India (SOI) topo sheet. The contours at 100 m intervals were traced as a vector layer in *Mapinfo* program. Rivers and roads were digitized in separate layers. Forest area and tea estates were digitized as polygons in separate layers. The contour lines were converted to intermediate *ASCII* format for conversion to raster image in *Idrisi* program. *Mapinfo* is a



The DEM data brought into 3-d visualization software. The altitude is colour coded, The angle and area of view can be adjusted.

popular vector GIS mapping program and *Idrisi* a raster based image processing and GIS program. The gaps in contours were filled by interpolation using a module of *Idrisi*. The matrix of smoothed contour values thus obtained was converted to *ASCII* format of the three-d viewing program.

The *ASCII* file was loaded in the *3DEM7* program. The altitude values get suitably colour coded and the image is displayed. An adjustable box appears for selecting the area of interest. Since the area of interest in the present case is sloping to the north, the angle of view is rotated from that direction.

Once these settings are made, the view scene option dialogue will appear. Vertical exaggeration factor, angle of view, terrain tilt and illumination angle can be specified. The three-d view appears on the screen. Altering the parameters can control the appearance of the generated diagram.

Computer generated 3D view of the Chembra hills. Two hills and a valley can be seen.

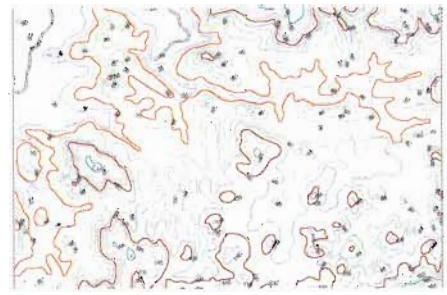
RGB draped over 3D view. Red is ever green forest, and savannah. It can be seen that evergreen forests (red colour) are situated in the valleys and grassland (green colour) on the hill tops.

Maps of land use, rivers or satellite images can be wrapped on the image generated. In the present case a Red Blue Green (RGB) image generated from satellite data was placed over the three-d view generated. Many programs have an option for smoothing contours further so that the stair case effect can be reduced.

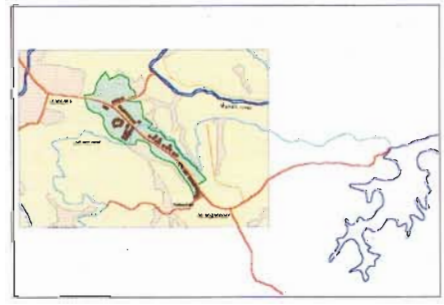
Case study 2: KFRI Campus:

A three-d image was generated for depicting topography in preparing a site plan for proposed KFRI building. In this work, since the area was smaller, topo sheet of 1:25,000 scale was digitized at 20 m interval. The remaining steps were the same as the one described above.

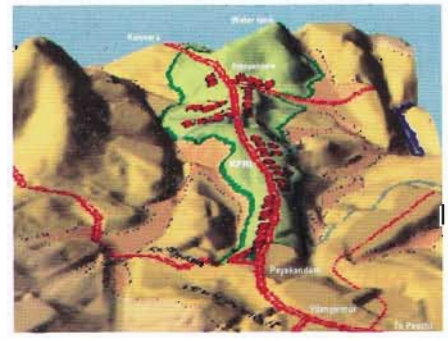
The DEM prepared was processed in the program 3DEM7 and a bitmap of forest, land use, road and existing buildings were overlaid



The contour lines digitized at 20 m interval is colour coded for clarity.

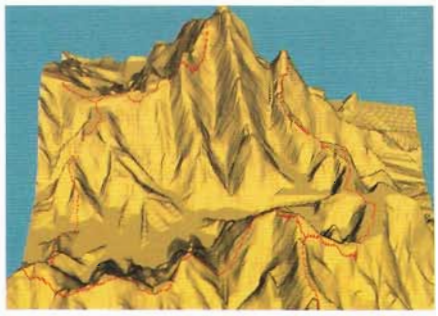


Bit map prepared for the purpose of overlaying on the three-d map. The map of exactly same coordinates as the area digitized for contours was made in Mapinfo as vector lines and polygons and converted to bitmap.

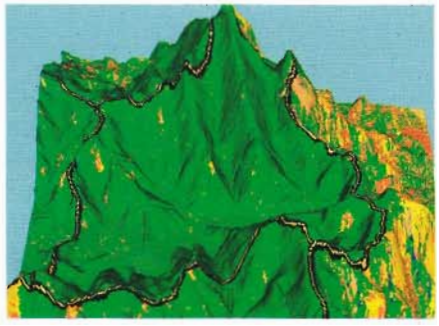


Three-d view of KFRI campus, with forest area, roads and buildings wrapped over three-d image generated.

on the three-d view. The view from Kannara direction offered a better perspective. The resulting picture was placed as an inset over the site plan.



Section boundary was added to the three-d iamge generated. The area relatively flat in the foreground and Mulalyar river flows along this.

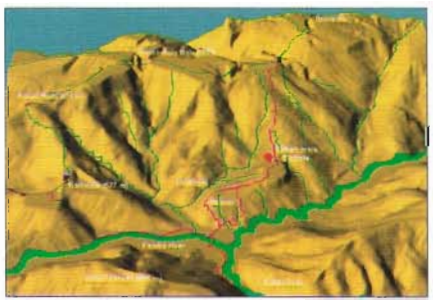


Overlaying of classified image depicting evergreen forest (green), deciduous forest(red) and grass lands (yellow) of exactly same area bring out the importance of the area clearly.

Case study 3: Periyar Tiger Reserve:

In other situations, terrain can be more complex. In the base line mapping of Periyar Tiger Reserve, each of the 31 sections had to be described with the help of a three-d image. The altitude here ranges from few hundred meters to over 2000 meters. The highly inaccessible rugged valleys with evergreen forest come out well in three-d views. In this case, topo-sheet at 1:50,000 scale was digitized at 100 m interval in *Mapinfo*, taken to *Idrisi* and interpolation carried out as raster file. The data were converted to text file suitable for three-d viewing software and satellite images overlaid on the picture generated.

Topo-sheet of Sabarimala region at 1:50,000 scale was digitized at 100 m interval in *Mapinfo*, taken to *Idrisi* and interpolation carried out as raster file for producing three-d image.

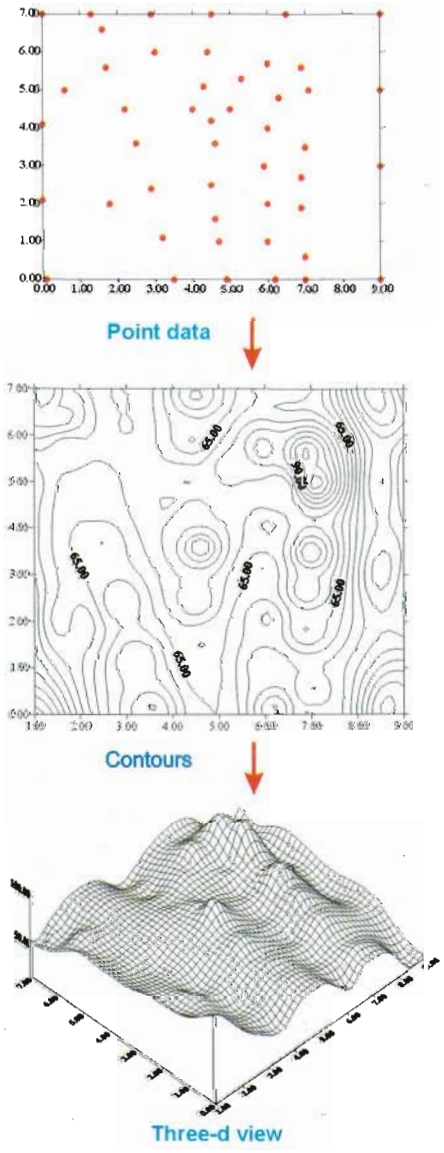


Three-d image of Sabarimala region. Rivers and trek paths were overlaid on the iamge. The trek path pass through steep terrain.

Other approaches:

There are other approaches to preparation of three-dimensional views. The *Surfer* program is an example of this. In this case, x,y,z data in the form of a table can be used. Z is the altitude value, and x and y the coordinate values in east and north directions. The program generates contour lines and interpolates the lines using one of several methods. The interval of contour lines and granularity of grid can be controlled. Three-d views can be generated and the viewing parameters changed interactively. Details are illustrated below. The data points, when plotted look like a scatter plot. Three-dimensional plots generated can be saved to a file and overlaid with other maps.

The surfer program has other options such as hill shading and colour coding of altitude values.



Programs such as surfer can generate contours from point data and then display the contours in three-d format.

From points: Advantage is that only a few points are sufficient. These can be the hilltops from topo sheets. The data are fed as x, y and z values, x and y can be distance in cm from map's lower left corner and z, the altitude vales. In this case programs such as *Surfer* generate contour lines from these data and then proceed with contour and view generation.

Equations to surface: Many equations have characteristic surfaces when plotted. Programs such as *Surfer* has facilities for dealing with this type of data.

Matrix of x, y and z values: Some times bit maps can be used for generating views.

Global DEM data: DEM data at 1:1,000,000 scale are available free of cost for almost the entire world. These can be used as starting material.

Programming: Two dimensional and three-dimensional data are connected through algebraic relation. Entire cells can be run through this equation and the two-dimensional image obtained can be displayed. One problem we will have to deal with is that of hidden line removal. There are various algorithms for this purpose.

General considerations:

It is interesting to examine the process of generating three-d views. Throughout this discussion three-dimensional data were generated and displayed in two-dimensions. This means that we are using only two dimensions for displaying the data. The fact is that three-d images can be viewed from many angles and azimuth. Most suitable region is used after examining different outputs. Even though the views generated are three-dimensional, they have to be displayed on two-dimensional computer screen or paper. For this, the three-dimensional coordinates are transformed into two-dimensional coordinates at particular view angle and other parameters. Often several trials will have to be made to generate good quality image

Irrespective of the shape of the study area, a larger area will have to be digitized. It is also important to digitize all the area inside the bounding rectangle. Using value range 1 to 255 for heights has many advantages. For Most of south India altitude in meters divided by 20 can be used. Digitizing contours from topo sheets need much care. Care should be taken to make sure line join back, in case of looping contours. In the ridges where there won't be continuous lines, care should be taken to trace the lines and join them to the line after the ridge.

CAMPUS NEWS

Visits abroad

Dr. K. M. Bhat was invited as a Visiting Fellow to the International Cooperation Centre for Agriculture Education (ICCAE), Nagoya University, Japan for developing an effective training programme for specialists of developing countries in the field of Wood Science and Technology during April 20-July 19, 2001.

Dr J. Kallarackal visited the People's Republic of China from 16-28 March 2001 on an ACIAR funded project to understand the hydrological studies done in eucalypt plantations. He also attended a Two - day Training Workshop on "3PG Plant Growth Modelling", 27-28 March 2001, Tropical Forestry Research Institute, Guangzhou, Peoples Republic of China.

Dr. C. Monahan participated in international conference on "Nursery Production and Stand Establishment of Broad Leaves to Promote Sustainable Forest Management" 7-10 May, 2001 Rome, Italy and presented a paper on "Modernization of forest tree seedling production systems in India and its impact on seedling health, stand establishment and productivity".

Dr. K.V. Sankaran participated in the Fourth Workshop on "Site management and Productivity in Tropical Plantation Forests", 9-12 July 2001, Pointe Noire, Congo. He also presented a paper on " Improving eucalypt plantation productivity through site management practices in the monsoonal tropics-Kerala, India".

Course attended

Dr. U.N. Nandakumar (Silviculture) re-joined KFRI in July 2001 after attending a 10 months' P.G. Diploma course in "Forest/ecosystem management" at Indian Institute of Remote Sensing, Dehra Dun .

Seminars/Symposia/Workshops

Dr. C. Mohanan (Pathology) participated in national seminar on "Recent trends in plant diseases and management" 16-17 March, 2001 Kuvempu University, Jnana, Sahyadri, and presented a paper on "recent trends in disease management in forest nurseries".

Dr. E.M. Muralidharan (Genetics) attended the workshop on "Forestry outlook for Kerala: Vision 2020 - options and implications", 22 June, 2001 Thiruvananthapuram. He also attended SBSAP Workshop and Public Hearing organized by KFRI at Velappara, Idukki on 9 April, 2001 and a training programme on environmental economics for practicing scientists and ecologists, 16-20, October, 2001, G.B.Pant Institute of Himalayan Environment and Development, Almora .

Dr. P.K. Muraleedharan (Economics) attended a training programme on "Environmental economics for practicing scientists and ecologists" Under the World Bank aided 'India: environmental management capacity building Technical Assistance project', 16-20, October, 2001, G.B.Pant Institute of Himalayan Environment and Development, Almora

Dr.K.K.Ramachandran (Wildlife Biology) participated in the Public hearing on Animal Biodiversity convened at Cochin University along with Dr. R.V.Varma and Dr. George Mathew.

He also participated in the Training Workshop on the "Behaviour, ecology and conservation of sloth bear" 24-27 September 2001 , Panna Tiger Reserve, Madhya Pradesh

Dr. C. Renuka (Botany) attended the District level workshop on "State Biodiversity Strategy and Action Plan" 9 April 2001, Idukki and moderated a session on domesticated biodiversity.

Dr. N. Sasidharan (Non-wood Forest Products) participated in the following workshops:

- Validation of Threatened Plants of India, BSI, Coimbatore 15-16 May, 2001.

- Strategy Formulations of Management Plan for Peechi-Vazhani and Chimmini Wildlife - Sanctuaries at Peechi on 19/06/2001.

- State Biodiversity Strategy and Action Plan at Vellapara, Idukki on 09/04/2001

Dr. Sasidharan was also a resource person for two interaction meetings with tribes on collection of NWFPs organised by the Wildlife Warden, Peechi-Vazhani Sanctuary on 4 and 18 March 2001.

KFRI Seminars

Dr Saul Cunningham, CSIRO Division of Entomology, Canberra, Australia, gave a talk on red cedar (*Toona ciliata*: Meliaceae) and the tip moth (*Hypsipyla robusta*) on 19 July 2001.

National Technology Day (11 May 2001) was celebrated at KFRI with a talk by Dr C.C. Menon, Former R&D Manager, Western India Plywoods Ltd. on "Chemical Modification of Wood".

World Environment Day (5 June 2001) was celebrated at KFRI with a talk by Professor Ross McMurtrie, University of New South Wales, Australia on "Global warming and carbon sequestration by forests". He planted a tree in KFRI campus.

Guest Lectures:

Dr Jose Kallarackal gave a series of 6 lectures and practicals to the M.Sc. Forestry students of KAU as part of their course on Tree Physiology during 29-31 May 2001.
He also gave a talk on the application of physiology in forestry to the visiting students of Calicut University on 10 August 2001.

Distinguished visitors

Professor Ross McMurtrie, University of New South Wales, Australia visited the Institute as part of the ACIAR funded project on eucalypts.

Professor Dr. Reto Strasser, Director, Université de Genève, Laboratoire de Bioénergétique, Switzerland visited the Plant Physiology Division on a collaborative research programme during 25-29 July 2001

Nominations to Professional bodies

Dr. K. M. Bhat (Wood Science) was nominated as Member of the Conference Scientific Committee (CSC) of IUFRO All-Division 5 Conference (*Forest products research – Providing for sustainable choices*), 11-15 March 2003, Rotorua New Zealand.

Dr. K. V. Sankaran (Plant Pathology) was nominated as Member of Board of Studies (Forestry and Wood Technology) of Kannur University.

Not all areas come out well in three-d views. Showing a closer view involving few hills can reduce complexity of terrain. Resolution of raster matrix is another consideration. It is surprising that relatively coarse matrix of about 1000 x 1000 cells or even fewer produce best results. Angle of view, light source, vertical exaggeration can alter the image very much and correct parameter has to be specified by trial and error. Selected values in contours can be coloured distinctly.

Use of sky, sea, snow line, and colour schemes judicially can improve the appearance of images. Bringing vector layers over them can augment the view generated. This way rivers, streams, vegetation types, etc can be added. Most programs generating 3-d program have facility for storing images generated. These can be cropped and used.

EVERGREEN

A newsletter of
Kerala Forest Research Institute
Peechi 680 653, Thrissur, Kerala, India

ISSN 0254-6426
No. 47 September 2001

Editor
Dr. K.M. Bhat

Associates
Dr. E.J. Maria Florence
Dr. T.K. Dhamodaran
Dr. C.N. Krishnankutty
Mr. Subhash Kuriakose

Evergreen, the **KFRI** Newsletter is currently brought out in March and September each year and is intended for free private distribution within the Institution and the Kerala Forest Department. Free copies will also be sent upon request to other individuals or institutions connected with forestry activities. The views expressed in the Newsletter are those of the authors and do not necessarily reflect views of the Institute. All interested persons are invited to send comments and opinions. The newsletter committee reserves the right to choose among contributions and edit wherever necessary.

Address all communications to :
The Editor, Evergreen
Kerala Forest Research Institute,
Peechi - 680 653, Thrissur, Kerala, India.
Ph. : 0487-282037, 282061
Fax : 0487-282249
E.mail : kmbhat@kfri.org
Web site : http://www.kfri.org

Designed & Printed at
Lumiere Printing Works, Thrissur

Coming Events

- 6-11 May 2002, Entomological Research in Mediterranean Forest Ecosystems, Rabat, Morocco, Francois Lieutier, Laboratoire de Biologie des Ligneus, Univesite D'orleans, B.P. 6759, 45067 Orleans Cedex 02 France E-mail:francois.lieutier@univ-orleans.fr
- 15-17 May 2002 Kick-Off-Meeting PR Professional for Forest Sciences, Central Europe, Max Krott, Institute of Forest Policy and Nature Conservation, Busgenweg 3, 37077 Gottingen, Germany, Tel:+49-551-393418/Fax:+49-551-393415, E-mail:dkrumla@gwdg.de
- 2-5 Jun 2002 Workshop on the Interface between Reality, Modelling and Parameter Estimation Processes, Sesimbra Portugal, David reed, Michigan technological University, Department of Forestry, Houghton Michigan 49931, United States Tel:+1-906-4872454; Fax:+1-906-4872311, E-mail: ddreed@mtu.edu, Web site: http://www.isg.pt/sesimbra 2002/W-Home.html
- Jun 2002, Joint 3.04.00/3.06.00 meeting, Turkey, Masami Shiba, Kyoto University, Faculty of Forestry, Forest Information and Resource Management Science, Kitashirakawa, Oiwake-cyo, Sakyo-ku, Kyoto 606-01, Japan E-mail:mshiba@kais.Kyoto-u.ac.jp, Esko Mikkonen: Esko.Mikkonen@helsinki.fi
- 10-14 Jun 2002, Tree Resistance to Insects, Flagstaff, Arizona, USA, Francois Lieutier, Laboratoire de Biologie des Ligneux, Universite d'Orleans B.P. 6759, 45067 Orleans Cedex 02, France E-mail:francois.lieutier@univ-orleans.fr,
- 10-12 July ACCURACY 2002: 5th Int'l Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences, Melbourne, Australia, The Conference Organiser, Accuracy 2002 Symposium, PO Box 214 East Brunswick, Victoria 3057, Australia Tel.+61-3-9380-1429, Fax: +61-3-9380-2722, E-mail: conorg@ozemail.com.au http:// www.geom.unimelb.edu.au/ hunter/conferences/accuracy 2002.html
- 16-19 July 2002 Forest Science and Forest Policy in the Asia-pacific Region: Building Bridges to a Sustainable Future-An international workshop, Chennai, Madras, India, John Parrotta, USDA Forest Service, Research & Development-SPPII, PO Box 96090, Washington, DC 20090-6090 Fax:+1-703-605-5131, E-mail: jparrotta@fs.fed.us
- 28 July-Aug-1 2002, Int'l Symposium in the Black Forest 2002 on Contributions of Family-Farm-Enterprises to Sustainable Rural Development, Gengenbach Germany, Forstliche Versuchs-und Forschungsanstalt Badan.wurttemberg.c/o. prof.Dr.H.Branddl,see under Division 3
- 25-29 Aug 2002 IUFRO Symposium: Population and Evolutionary Genetics of Forest Tree Species, Stara Lesna, Slovakia, Ladislav Paule, Faculty of Forestry, Technical University, SK-96053 Zvolen, Slovakia Tel: +421-855-5332654 or 5350608 E-mail: paule@vsld.tuzvo.sk web: http//alpha.tuzvo.sk-paule/conference/
- 26-29 Aug 2002 International Poplar Symposium III, Uppsala Sweden, Urban Gullberg, Department of Plant Niology, Swedish University of Agricultural Sciences, P.O. Box 7080, S-75007 Uppsala, Sweden Tel: +4618671525 Fax: +4618673279, E-mail:Urban.Gullberg@vbiol.slu.se
- 30 Aug 1 Sep-2002, Long Term Air Pollution Effect on Forest Ecosystems, Zvolen, Slovakia, Blanka Mankovska, Forest Research Institute, T.G.Masaryka street 22,960 92 Zvolen, Slovakia, Tel:00 421 045 5314169, Fax: 00 421 045 5321883, E-mail: mankov@fris.sk, Web site: http//:friisweb.fris.sk/iufro
- 1-3 September 2002 SYMPOSIUM Wood Structure and Properties 2002, Bystra, The Low Tatras, Slovakia, Marian Babiak, Department of Wood Science, The Technical University in Zvolen, Masaryk's street 24, 960 53 Zvolen, Slovak Republik, Tel:+421 855 5206350, Fax:+421 855 5321811, Email: babiak @vsld.tuzvo.sk.
- 3-4 September 2002, Forest Information Technology, International Congress and Exhibition, Helsinki Finland, Esko Mikkonen, Department of Forest Resource Management, Unioninkatu 40 B/PO Box 24, FIN-00014 University of Helsinki, Finland, Tel:+358-9-1917650; Fax:+358-9-1917755, E-mail: Esko.Mikkonen@helsinki.fi.
- 8-15 September 2002, 4th Workshop "Connection between silviculture and wood quality through modelling approaches and simulation software" Harrison Hot Spring Resort British Columbia, Canada, Gerard Nepveu, National Institute for Agricultural Research (INRA), Research Team on Wood Quality, F-54280 Champenous, France Tel(org):+33-3-83394041, Fax:+33-3-83394069, E-mail (pers): nepveu@nancy.inra.fr.
- 2 weeks September 2002, Genomics and Forest Tree Stress Tolerance Short Course, Chania Greece, Andreas Doulis, Mediterranean Agronomic Institute of Chania, P.O. Box 85, GR-73100 Chania, Greece, Tel:+30-821-81151, Fax:+30-821-81154, E-mail : adoulis@zorbas.maich.gr Web site: http://www.maich.gr/environment/news/genomics.html
- 19-23 September 2002, Conference on GIS and RS in Mountain Environment Research, Zakopane Poland, Tomasz Zawila-Niedzwiecki, Insititute of Geodesy and Cartography, Department of Cartography, 2/4 jasna St:00-950 Warsaw-Poland tel.+48 22 828 0269 ext.105 Tel./Fax:+48 22 827 0328 E-mail:tzawila@igik.edu.pl
- 23-24 September, 2002, 3rd World Symposium on Logistics in Forest Sector: "Design Logistics for Wood Product and Paper Industries", Halkida Greece, Timber Logistics- Econpap, postal: Anjas 3 A 33, 02230 Espoo, Finland E-mail: econpap@yahoo.com Web site: http://members.surfeu.fi/otaniemi/sympgrec.htm Also see Division 5.
- 29-September-5 October, 2002 International seminar on new roles of plantation forestry requiring appropriate tending and harvesting operations, The Japan Forest Engineering Society Office c/o Laboratory of Forest Utilization, Graduate School of Agricultural and Life Scieces, The University of Tokyo, 1-1-1 Yayoi, Bunkyo-ku,Tokyo 113-8657, Japan Fax:+81-3-5841-7553, E-mail:JFES-office@fra.a.u.Tokyo-ac.jp, www. http://jfes.ac.affrc.go.jp/iufro2002.html
- 4 November - 29 October 2002 Ecology, Conservation and Use of Austocedrus Chilenis Forests, Esquel, Argentina, CIEFAP,CC.C.14, 9200 Esquel Chubut Argentina; Fax:+54-2945-450175 e-mail:info@ciefap.cyt.eduar Web site:http://www/ciefap.org.ar
- 11-15 March 2003, IUFRO All Division 5 Conference : Forest Products Research Providing for Sustainable Choices, Rotorua, New Zealand, Lesley Caudwell, Forest Research, Sala Stree, Private Bag 3020, Rotorua, New Zealand Tel+64-7-343-5846: Fax+64-7-343-5507 Email: alldiv5iufronz@forestresearch.co.nz Web site : http://www.forestresearch.con.nz/site.cfm/alldiv5iufronz.
- Planned for November, 2003 International Teak Conference, Peechi, India, K.M. Bhat, Wood Science Division Kerala Forest Research Institute, Peechi 680 653, Trichur District, Kerala , India Tel:+91 487 282037/Fax:+91 487 282249, Email: kmbhat@kfri.org URL: http://www.kfri.org