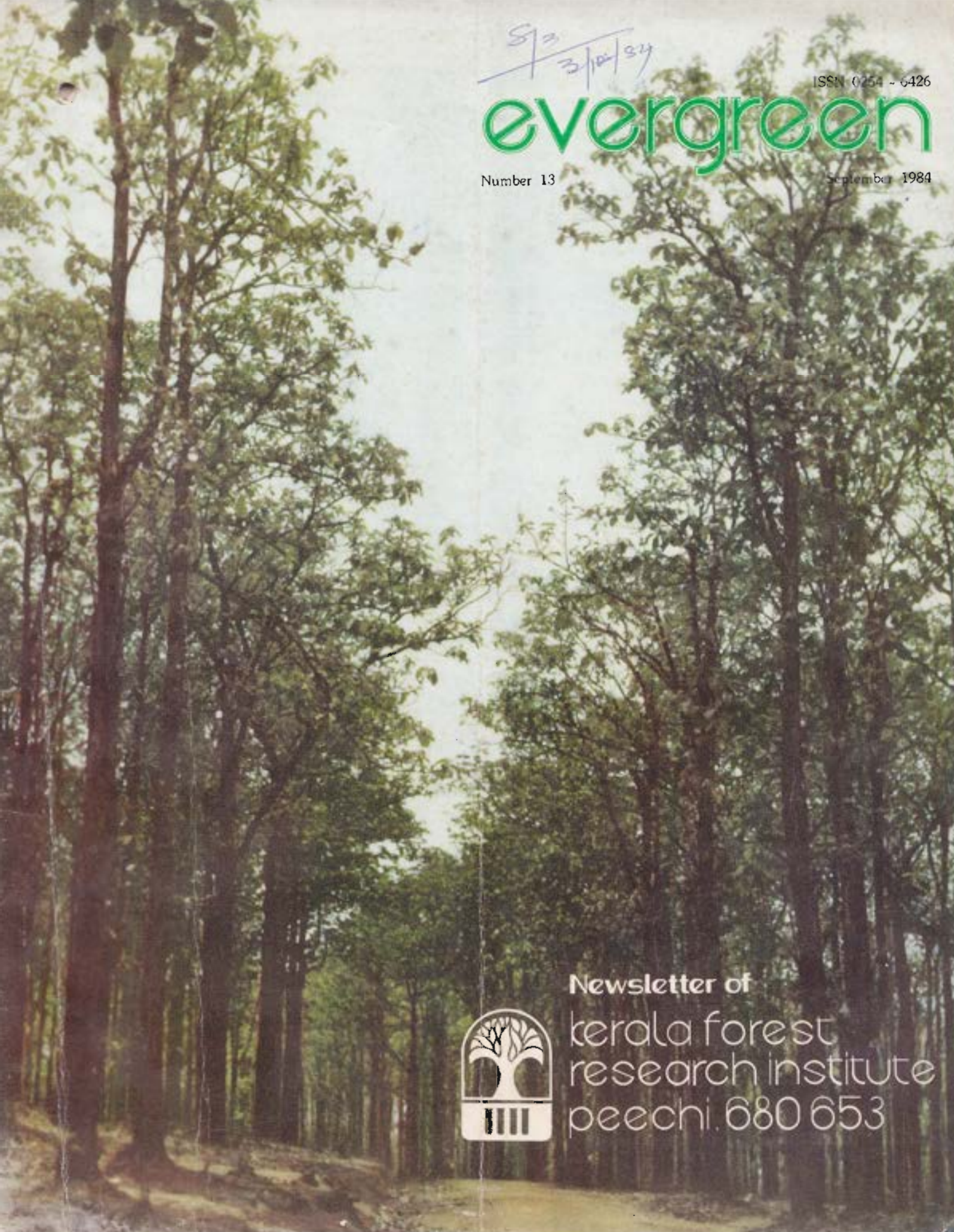

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Cover - Teak Plantation, Wynad.

Printed at Lumiere Trichur.

Editor's column

Western Ghats and Ecodevelopment

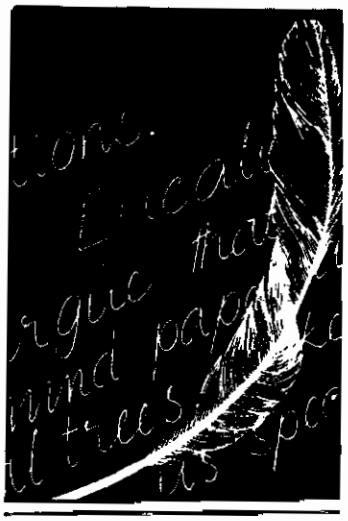
Western Ghats comprise of a series of hills running almost parallel to the West Coast of India from the river Tapti in the north to Kanyakumari in the south. The Ghats descent steeply to coastal plains on the west, but merge rather gently through a series of hills with the Deccan plateau in the east. As the western slopes receive high rainfall of atleast 2000 mm per year they have a natural cover of luxurient evergreen forests. Towards the eastern slopes they change to moist and dry deciduous types as the area comes under rain shadow zone. The Western Ghats are rich not only in their unique diverse plant and animal life but also in mineral resources.

The fragility of the complex tropical ecosystem, like the one in Western Ghats, to ecological disturbances is well known. Such disturbances together with lack of human appreciation and concern for conservation and communication gaps between biologists, industrialists, policy makers and people in general, have resulted in reduction and degradation of forest wealth of Western Ghats. Encroachments of large tracts of forest areas and indiscriminate lopping of trees due to accelerated population growth have contributed to the destruction of the virgin forests, which now survive only in some of the inaccessible areas. Introduction of plantation crops like tea, coffee, rubber and extensive cultivation of teak and *Eucalyptus* in Western Ghats is another factor which has resulted in destruction of forests. The establishment of a number of hydroelectric and irrigation projects which have submerged large areas rich in vegetation has further accelerated the regressive changes in the flora and fauna of this region. During the last three decades several developmental projects, especially forest based industries have been started, which have also contributed in the ecological deterioration of Western Ghats.

This certainly gives a gloomy picture about the Western Ghats. But it is fortunate that now we have realized the impact of this unplanned development on the ecology of Western Ghats Liberal grants are made available for the proper development of the area on the concept of ecodevelopment which is described as "Development of the people, by the people and for the people". This certainly holds promise for improving the economic well being of people without impairment of the ecological systems on which they depend for the forseable future. In other words the advantage of ecodevelopment is that it builds on local knowledge and aims at meeting the needs of the local people. Ideas are not imposed on the people but rather help is provided such that they reach their goals in an ecologically sustainable way. This approach should work more easily with the people than with policy makers. In order to implement ecodevelopment in India we have to first overcome several obstacles. Significantly some of them are inadequate awareness of environmental and ecological limitations by politicians, planners, industrialists, the media and the public, absence of social conscience, prevalence of corruption, bureaucracy and economic constraints. In view of this when it is difficult for the ecologist to convince the policy makers, it would be more difficult with the people whom the ecologist seek to involve in ecodevelopment. Ecological understanding is not necessarily more widespread among the proponents of ecodevelopment than it is among the advocates of "big is better" approaches to development. Therefore ecodevelopment along with conventional development should be viewed with caution by ecologists. An ecodevelopment approach could do much to avoid the mistakes that have been made in the past, when the welfare of people has been made to appear secondary to protection of nature.

Taking a positive approach that things will possibly work out in the desired direction, this timely attention on Western Ghats is well deserved and long over due. Considerable amount of money has already been spent in the name of Western Ghats development. In this regard the most crucial aspect is whether it is being utilized in the right earnest to achieve specific goals or not. But the fact that large stretches of forest have been cleared to plant rubber, cocoa, sugarcane, oil palm, etc. under the development projects makes one wonder whether this will improve the ecology of the area or help the local people ? In fact such projects which bear the labels associated with ecodevelopment may prove to be disruptive on the environment.

[Cont. Page 2]



OPINION PAGE

Editor
Evergreen

Sir,

I have just received a copy of Evergreen No. 12, March 1984 and wish to congratulate your team for the quality of the magazine. I have found it very informative. Your editorial comments about *Eucalyptus* and the *Eucalyptus* seminar special with brief scripts were very interesting and thought provoking. I find that in Focus, germination technique of *Albizia procera* seeds does not seem to differ very much from the one I have used for *A. molucana*. Interview with Dr. Ashton was of special interest which proves that even the forests have erosion problems. I feel disappointed that I did not get EVERGREEN earlier. If possible, please send me available back numbers of EVERGREEN.

Thanking you,

T. J. Mathew
Thumpassery,
Areeplacy P. O.,
Punalur, Kerala.

6 July 1984

[Since Sri. Mathew's letter was very lengthy only excerpts are given here - Ed]

(from page 1)

In the recent past a number of seminars and workshops have been organised on Western Ghats. Definitely it is a good sign that we have become conscious of our surroundings and also a good beginning has been made to focus the attention on the specific issues relating to planned development of Western Ghats. But this "drawing attention" and "focussing" should not go indefinitely as we cannot afford to see denudation of forests of Western Ghats before us. If we do not realize the gravity of the situation it will be our shear negligence and ignorance. Now the time is ripe for the actions to be translated into practice. Ecologists know that to understand ecosystem requires long patient study in the field. However, intensive they may be, short-term compartmentalized investigations on different aspects of Western Ghats cannot be meaningful in giving insight into the complex system. It is disheartening to admit that we do not have yet even a comprehensive document on the flora and fauna of Western Ghats, which is the basic requirement of any study of this magnitude. For translating the theory of ecodevelopment into reality, all the research and educational institutions, policy-makers and above all the people have to make a concerted effort. It is hoped that the National Seminar on Ecodevelopment of Western Ghats being organised at K F R I during October will act as a stepping stone in this direction.

WELCOME TO DELEGATES

Seminar on Ecodevelopment of Western Ghats

Venue - Kerala Forest Research Institute, Peechi
17 & 18th October 1984

Divisional highlights - 4

Forest Economics

Any decision pertaining to allocation of resources between competing uses involves a careful analysis of the different costs and benefits and forestry is no exception to this. Population growth and consequent increase in demand for various products and technological changes have increased the forest land use conflicts. Especially in the case of public sector management arriving at appropriate social values is difficult. Economists are called upon not only to provide values for marketed benefits and costs, but also to assign values to those which were hitherto regarded as intangibles, imponderables, invaluables, etc. The overall objective of the work in the forest economics division is to provide a better socio-economic insight into the different aspects of forestry.

Considerable attention is being paid to social forestry in the country as a solution to the rural energy crisis and environmental degradation. Kerala has also launched an ambitious social forestry programme, in which the main thrust is on growing trees in farmlands. Interestingly people in Kerala have been practitioners of agroforestry long before the term agroforestry was coined by 'experts'. Most of the home-gardens in Kerala contain a large number of tree species which provide timber, firewood, fodder, green manure, fruits, etc. and forms an important component in the farming system. Intensity of tree cropping varies between agroclimatic regions and between households within a given region. The latter is primarily attributable to the socio-economic environment of the household. One of the projects in the division 'A socio-economic study of farm forestry in Kerala' is aimed at identifying the relationship between socio-economic status of the household and tree cropping intensity. A detailed household survey is in progress and findings from the study are expected to give some insight into the factors that influence tree cropping in the home gardens.

Intensive multiple use management of forests seems to be the only option left to foresters to resolve the growing conflicts between alternative land uses. Although much has been said about multiple use management, very little is known on actual practices, especially on the constraints. A study on intensive multiple use forest management in the evergreen forests and teak plantations in Kerala was undertaken at the request of the Food and Agriculture Organisation. The study has clearly brought out the contradictions between theory and practice. To a large extent most of the constraints have their origin from the complexities in society. Especially in a state like Kerala, what happens in forestry will primarily depend upon what happens in the agricultural and industrial sectors. Nevertheless, there is considerable scope for improvement by removing institutional and technical bottlenecks.

Forest management in Kerala had a chequered history, and understanding of changes over time will give valuable insight into the trend in utilisation of an important natural resource. A project for writing up the history of forest management has been commenced. Rather than merely recording the changes chronologically, an attempt is being made to identify the factors/forces underlying major changes and how silviculture and management have responded to these.

As a prelude to a detailed study on demand and supply of wood in Kerala, a preliminary investigation was done on the pattern of wood consumption in the State. Total consumption in the State during 1981 - 82 is estimated as 11.20 million m^3 of which 9.91 million m^3 is utilised as firewood. What is interesting is that recorded removals from forests account for only 5 percent of the total wood consumption. When timber in round form alone is considered, recorded removals from forests account for about 20 percent of the consumption in the State. Even if an allowance is given for unrecorded removals from forests, it is evident that a major portion of the wood used is obtained from house compounds and estates. Considering the importance of non-forest sources, a detailed survey is necessary to assess wood availability from areas outside the forests. This will be an important area for further study.

— Division of Forest Economics

FOCUS

The rainfall in the Amazon, once thought to be purely oceanic in origin, is now found to be also due to transpiration and evaporation from trees which return to the atmosphere more than half the moisture received through rainfall, according to studies led by Dr. Eneas Salati. Land covered with grasses and plants other than trees is only half as effective in returning moisture to the atmosphere, while bare ground is 10 times less effective. Deforestation would cause fewer clouds to form, and less rainfall would be transported across the continent. This would affect the hydrological cycle and fisheries and cause floods in the flood-plains due to increased run-off. *(Focus 5(6) : 7,1983).*

An improved darting system for immobilizing smaller mammals in the Wild is described with full instructions for its construction. It can be used accurately at a range of 10 m and is suitable for small and medium - sized animals. *(S. Afr. Tydskr, Natuurnav 13(2) : 51-54, 1983).*

Determination of the optimal rotational age is done using the land expectation value model, which shows that at the optimal rotation age, the marginal revenue product of letting the stand grow one more year must equal the marginal input cost of doing so. The relationships between regeneration cost, interest rate, stumpage price level and the optimal rotation age are then analysed graphically. The relationships between the land expectation value model, the present net worth model, the forest rent model and the traditional biological model are also examined. It is shown that the last three models are special cases of the land expectation value model. *(Forest Ecol. Manage. 8: 137 - 147, 1984).*

The immediate effect of burning and ash fertilization was studied in a recently cleared forest, before 24 hour and 40 days after the burning of the vegetation of known biomass and chemical composition. The immediate increase of K and the delayed increase of P in the upper 50 cm - although equal to the content of the above - ground vegetation before burning - is not to be explained by the ash fertilization. The immediate increase of K after burning was not observed after 40 days at any depth, and less Ca and Mg were found at the topsoil immediately after the burning and after 40 days, than before. Apparently mobilization and/diffusion due to heat are important factors, even in the deep horizons. *(Plant and Soil 80 : 307 - 320, 1984).*

Mahoganies : Candidates for the red data book. These valuable hardwoods are used for ship building to cabinet making. *Swietenia* spp. *(Meliaceae)* are found from Mexico, through Central America to Amazonia, Peru and Bolivia; similar timber from *Khaya* spp. of Africa. With their depletion, *Shorea* and *Parashorea* spp. from the Philippines, cultivation tried in Trinidad, Honduras, and India, but hampered by shoot boring insects. If the trade is not controlled mahoganies might disappear by 1990; *Swietenia humilis* is already in Appendix II. *(Oryx 17 (2) : 88 - 92, 1983)*

"Indian forestry journals certainly need improvement"

Mr. W. Finlayson, Director, Commonwealth Forestry Bureau, Oxford, U. K. was interviewed on 23 March, 1984 by Evergreen - Ed.

* * *

Evergreen : We realize that it is a gigantic task to collect information from so many agricultural journals. Would you please tell us something about functioning of CAB-how it is done and how many staff you require to handle the work ?

W. F. : I have not got the statistics of the whole of CAB but I can tell you about the forestry side only where we have subordinate staff to help me and eight other scientific staff, secretary and two computer inputters. We are one of the 15 information units of CAB and there are others. Upto now it is done in 14 different units each of which is attached to a specialist library. We have a sort of production line to see all the journals as they come in and scan them. We select the articles, write up abstracts, and make a manuscript of the bibliographic data which are all input to the computers. The computer print out is corrected and finally the list goes to the central computer of CAB.

Evergreen : Do you select the journals or all journals published are covered in your abstracting journals ?

W. F. : We certainly select journals. With the idea of covering all the journals in forestry we probably see nearly all the journals which are specifically connected with forestry and a lot more general scientific journals, general biological journals and many more which have occasional articles about either forestry or forest products.

Evergreen : Among the articles themselves, do you make selections within them ?

W. F. : Yes, we certainly select out the articles. First of all we see whether it has something to do with forestry or forest products. Then we select according to the criteria of quality; it must be something either new or original science, original experimental report with detailed survey of the literature, reliable references and generally published in reputedly scientific way. We have nothing to do with trade. For example we do not take things like extension literature. Ofcourse we do try to cover literature which is about production of extension materials.

Indian forestry journals, certainly need an improvement, not so much the content but probably the presentation. Standard of printing and and publishing could certainly be improved. Particularly it is very necessary to get a good tropical forestry journal at the moment.

Evergreen : What is your opinion about the Indian journals as a whole and especially the forestry journals. Would you be able to tell us how often Indian publications are referred to internationally.

W. F. : We have some journals which are of fairly low standard, meant for the very general audience and we have others which have more reputable scientific standard and you have the same situation in India. We are particularly impressed with C S I R journals which are fully upto any international standard and you have got quite a lot of useful material from publications like Current Science. Indian forestry journals, certainly need an improvement, not so much the content but probably the presentation. Standard of printing and publishing could certainly be improved. Particularly it is very necessary to get a good tropical forestry journal at the moment. There used to be several around and they dropped one by one and one left is Malayan Forester, which is of very high standard. We think that India should perhaps take a lead to a bigger effort to produce a really first class scientific forestry journal.

We haven't any separate statistics about how often any particular country's journals are referred to. We certainly do get some requests for reprints/ photocopies from Indian journals. Obviously people get access to Indian publications in all sorts of ways not necessarily through CAB. So we won't be able to tell exactly how far Indian works are referred abroad.

Evergreen : *As we gather from the CAB list it is publishing mainly Abstract Journals in the field of agriculture, which ofcourse includes forestry also. Are you not planning to publish a multidisciplinary journal in forestry as we badly need one of this kind.*

W. F. : CAB's main function is as a publisher of secondary journals. It does actually help to have one or two primary journals. But at the moment there are no plans to take up any primary journals in forestry. I think it is rather a difficult business to set up a completely new forestry journal. There has been one or two recently published which seem to have succeeded fairly well and it includes some multidisciplinary ones. I do not think that CAB is likely to compete in this field.

Evergreen : Would you think with the secondary abstracting services available now, the circulation of primary journals will go down ?

W. F. : I do not think so. Abstracting services give them more publicity and make people aware of the existence and the circulation tends to go up. And on the other hand in terms of money shortage many libraries when they are reviewing their subscriptions they do tend to see whether they can do without such primary journals because it is covered by the Abstract services.But I think in balance the effective abstracting services increase the circulation of primary journals.

Evergreen: When retrieval system is very good, do you think that one would subscribe the primary journals ?

W. F. : The whole business of primary journals is a rather peculiar one. The journal may be circulated to anywhere from one to four or more thousand people. It is a very long tradition of scientific publishing. People do publish and it is very difficult to break the tradition. Many advanced ideas on totally electronic publishing or publishing summaries are there. Many ideas have been tried, many of them have been successful as far as I know. But the tradition of primary journal publishing still holds strong.

Many advanced ideas on totally electronic publishing or publishing summaries are there. Many ideas have been tried, many of them have been successful as far as I know. But the tradition of primary journal publishing still holds strong.

Evergreen : On an average how many individuals of various institutions make use of the facility of online service,magnetic tapes andCAB search services from developed andunderdeveloped countries ?

W F. : Once again I do not have any statistics. Infact I do not think that such a statistics really exists. Strictly speaking the online usage to say for scientists or the librarian is almost limited to U S A, Western Europe, probably Australia, New Zealand, Japan and a few other parts of the world have access to the service as yet. Magnetic tapes are very well distributed by CAB around the world and some of them certainly go to developing and developed countries.

Evergreen : Could you please give details of some of your programmes like ESA, QUEST, DIALOG, DIMDI services ? and how it works?

W. F : Of the four that you mentioned the best one is DIALOG which is the far biggest. This belongs to Lockheed Corporation in California. Lockheeds take the tapes of all the journals, which are originally produced for printing the journals by computerised printing services. The same tape is put into a very big computer in California and as it is each word is separately indexed so that access is extremely easy and quick. In Europe they use mainly DIALOG. In UK now they are beginning to use more and more the QUEST services of the European Space Agency (ESA), which is located in Rome. DIMDI is a German medical service which was started by CAB by taking the animal sciences journals. The one that most likely to be in contact in India is probably DIALOG and could also be QUEST. In principle any one who has access to international telephone service has access to DIALOG. You have to open an account with DIALOG and there is no charge for devoirs so long as you do not use it. You are only charged for actual use. Some of the other services do have standing charges. Unfortunately it is quite expensive even in Europe, slightly less expensive in the U S A and undoubtedly very expensive in India. At the moment large part of the charge is for the telephone connection and in Europe this is greatly reduced by being in the international network of telecommunication for the transmission of the data. Probably sometime in the quite near future it would be possible to get easy access to DIALOG or QUEST in India. But it would be fairly expensive. The relative expense of using online retrieval, manual retrieval or using an intermediary, depends partly on local salaries. As salaries remain low in India, it must be cheaper to use card indexes and other similar old fashioned services. But the efficiency in retrieval with the computers is much better than manual searching. So at the moment in India it is possible to use online service through an intermediary. Probably the most useful thing to do is online bibliographic searches covering fairly a wide range of subject, in which case you can get extensive bibliography prepared, perhaps 200 to 300 references, for something like £60-70 and usually very efficient. Also it should be made clear that these services are not limited to CAB files. Once you get on to DIALOG, for example you have access to Biological Abstracts, Chemical Abstracts, Life Science Abstracts, Agrex and many more.

Probably sometime in the quite near future it would be possible to get easy access to DIALOG or QUEST in India. But it would be fairly expensive.

Evergreen: What is your assessment of the information retrieval systems available in India. Do you have any suggestions for the improvement of the facilities?

W. F. : I think one of the best answer to this if I quote here is of Dr. C. T. S. Nair who spent 3 years in Bangor. When we asked him what was the thing he most appreciated in Bangor, he said, the easy access to information. On the other hand almost every one whom we asked in S. India, in Bangalore, Coimbatore, Trichur said that they are more or less satisfied with the information retrieval which is available here. I think the difference between the two situations is that information is available more quickly and probably more reliably in Bangor than in India. If you ask for certain things you are likely to get it quickly. If you ask from Trichur you may not get it at all. After having talks with the Librarians or the Library Assistants, I am convinced that probably you do get it but it will take long time and quite a lot of trouble. But what we would like to do is to see that people are able to get information they really want as easily as possible. We have not entirely worked out the details but as what has to be done,it is clear. We think that probably the ideal system would be to include a good deal use of microforms, which can be easily sent through the post. There are other systems and the one functioning in Kathmandu is put the original documents on the masterfisch. If someone wants it, it is easy to supply a copy. There are all sorts of systems of work that can be suggested. I think, perhaps the key to it all would be compilation of one centralized computer record where all the information is available and some method of supply of document on demand as quickly as possible. Certainly we want to try to improve the relations between India and the international information services.

Forest Land Evaluation

"Foresters in India fear that those (evaluation - auth) methods may classify some areas out of the forest lands as fit for agriculture" - Pandey, 1981.

Land comprises of all elements of the physical environment including climate, relief, geological material, soils, water bodies and vegetation to the extent that these influence potential for land use. Land is a dynamic concept; it carries ecosystems, but is itself a part of the ecosystem. Land being the carrier of ecosystem which provides most benefits to mankind is the over-all natural resource.

Most of the developed and developing countries have gone ahead with the task of land evaluation so as to ensure continued rational use of land without severe or permanent deterioration. It is quite unfortunate that we in India are yet to provide the decision makers more useful knowledge about our forest land resources in terms of inventory and dynamic responses under various human uses and natural perturbations.

Land evaluation - potentials and processes:

The potentials of land evaluation are still ill understood both at the decision making and at the managerial levels. It can help planners and managers to avoid misuse of forest land resource for attractive but short term goals. The fundamental purpose of land evaluation is to predict the consequences of the changes brought to land due to different uses.

The various processes involved in land evaluation are illustrated below:

Land capability classification ← Societal demands
↓
Land suitability assessment
↓
Land value ← Socio-economic factors
↓ ← Political factors
Optimum landuse

Capability classification is the description of a land unit in terms of its inherent capacity to produce a combination of plants and animals. For identifying, describing and evaluating the inherent capability of a given tract of forest land, information on biological and physical resources has to be gathered to produce the end product - a land capability map. Information needed to establish forest land units relates to the following ecosystem components: i. productive capacity of soils, ii. natural regeneration, iii. choice of species for planting, iv. possibilities for site - melioration, and v. engineering possibilities on the land. Land capability classification is presented in the form of maps, models or profile diagrames.

After completion of the capability classification when distinct land units are delineated on the map and for each of items the appropriate biophysical information has been obtained, comes the task of analysing the ability of each unit to sustain without significant degradation an assay of uses. **Suitability assessment** is the subsequent rating of the response of a given tract of land under a certain use. Suitability assessment is made by comparison of land use with land or more precisely comparison of the requirement of each defined kind of landuse with the quality of each mapped area of land. There are four steps to such comparison, i. matching, ii environmental impact, iii. economic and social analysis, and iv. field check.

Suitability assessment translates ecological information into a form more useful to planners and decision makers. This exercise does not attempt to indicate a single best use for the land considered. Rather it indicates which of a variety of use are suitable and which are not under the prevailing management practices and demands. The basic idea behind suitability assessment in tropical forest lands is that of sustainable use. Allocation of forest lands to different uses on a techno-ecological basis can minimise the constraints arising from soil erosion, soil fertility, decline in productivity, degradation of water sheds, etc.

Optimal land use will be a product of the techno-ecological land evaluation and the prevailing socio-economic and political factors. Having at hand a land evaluation map the planner and the manager are in a better position to identify suitable areas for proposed goals.

Pandey, J. N. 1981. Problems of forest land classification for sustainable uses in India. In: Carpentar R.A. (ed.) *Assessing tropical forest lands, their suitability for sustainable uses.* Tycooly International, Dublin pp 159-162.

S. Sankar
Division of Soil Science

The Western Ghats of Kerala Region : an appraisal

The Western Ghats of Kerala lies between the parallels of long. 8-14°N and lat. 75-77°E extending to about 500 Km in length from South Canara to Cape Coumarine. This forms an unique piece of vegetation comprising of various forest types.

Geology, Rock and Soil

A remnant of the Gondwana Land, the geological formation of Western Ghats belongs to the pre-cambrian metamorphic complex with a narrow belt of sedimentaries along the coastal region. The major geological sequences are i. gneisses, ii. laterite and iii. recent deposits. The various rock types, *viz* granite/pegmatite, schists, unclassified crystaline rocks, khondalite, lime stone, charnokite and laterite, are scattered throughout (Fig 1A). The unclassified crystaline rocks and charnokite occupies the ghats in general. The trees and bushes cover almost the whole of the gneissic area; but cannot gain foot on older laterite. Fresh laterite, found in the valleys is favourable to the growth of the vegetation.

The mountain systems have got gaps resulting from faulting and river erosion. There are thus discontinuous ranges providing easy passage for the migration of flora and fauna (Puri 1960).

Soils: Red loamy and red sandy soils cover the major portion of the area (Fig. 1B). They are formed by the decomposition of granitic and gneissic rock types.Laterite are found along the west coast region. These laterite soils bear a distinctive type of vegetation with *Xylia xylocarpa* as the predominant tree species. Alluvia occur in the deltaic area and along the coast line. Black soils are formed from traps, granites, gneissic, etc. and are not common.

The climate

The climate exhibits a strong seasonality on account of monsoon activity. The South West and North East monsoons bring rains all over the region with varying intensity. The western side of the ghats get an average rainfall ranging between 2000-4000 mm whereas on the eastern slopes it is only between 400-800 mm. Depending upon the intensity there are four major rainfall zones (Fig 2A).

The temperature does not fluctuate much though four major temperature zones can be roughly identified, ranging between 20-27.5°C (Fig. 2B). The coastal areas and adjacent places record an average annual temperature of 22.5-27°C, which with the heavy rainfall creates a moist humid climate (rh 50-90%), favouring the luxuriant vegetation.

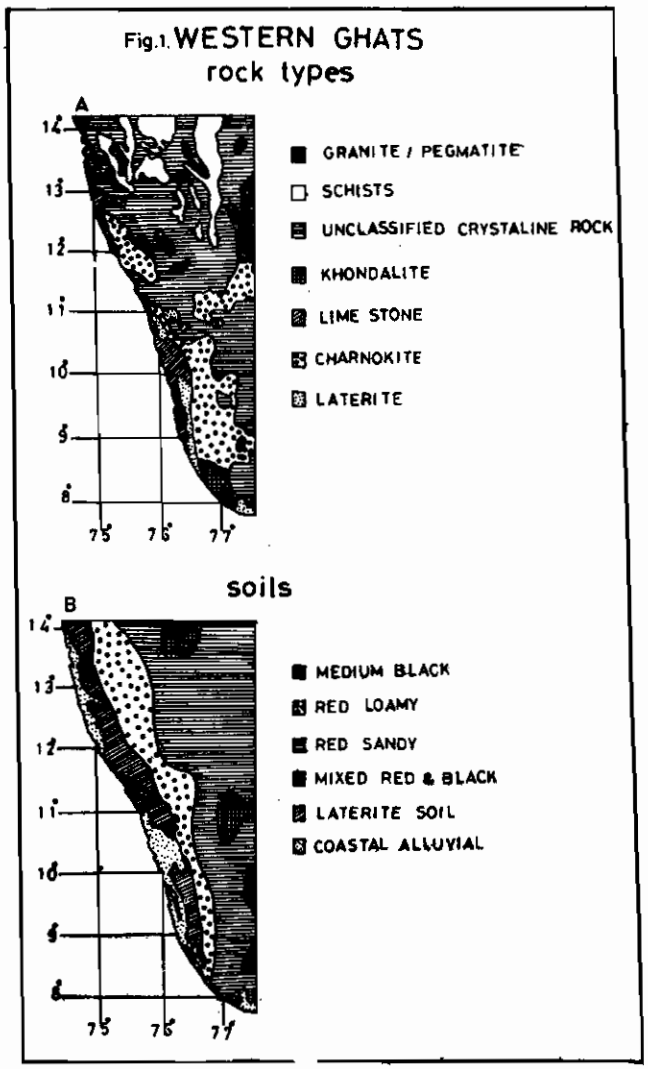


Fig. 1.

Topography

Topographically the terrain is undulating with hills and ridges arranged in cris-cross fashion (Fig. 3) and are of different altitudinal zonations.

Drainage

The area is well drained by a number of rivers and rivulets. With respect to the drainage pattern the remarkably straight alignment of t streams immediately to the south of the and with associated waterfalls is strickin Narayana Swamy 1954). In this conn interesting to note the wet-land/dry-lan in the area (Fig 4). The coastal area of is under wet lands which play some key climatic regulation of western ghats.

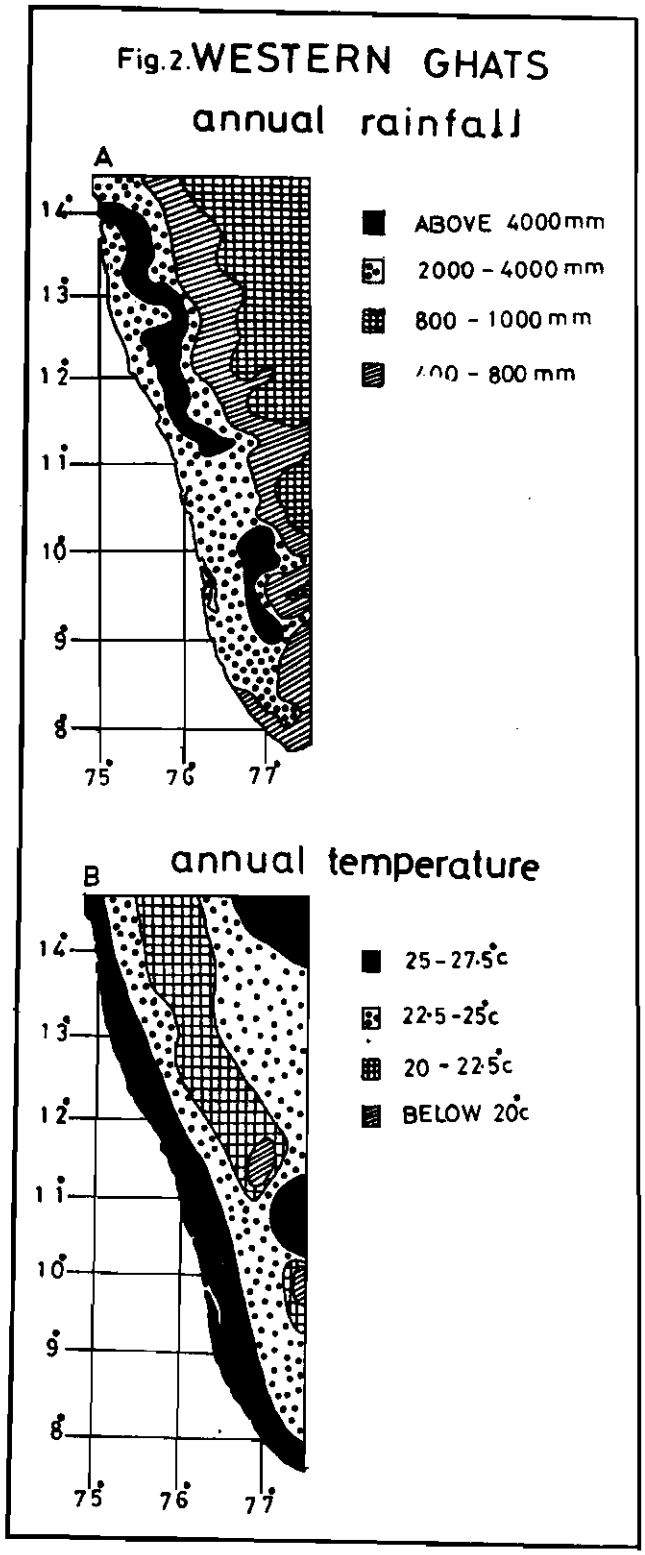


Fig. 2.

Roads

The area, is well connected with a net work of roads and most of the area is accessible (Fig. 5). In fact this road system itself is one of the factors for forest denudation. It is expected that the rate of forest denudation will increase with the establishment of the proposed 'high range high way'.

Forest types

There are six major forest types indentified from the region as, i. tropical wet evergreen, ii. tropical semievergreen, iii. tropical moist deciduous, iv. subtropical broadleaved, v. montane wet temperate and vi. tropical dry deciduous (Fig. 6). Of these the first three types occupy maximum. The tropical dry deciduous forests are in patches and located mostly towards the eastern side of the country where annual rainfall becomes very low with corresponding increase in temperature. The montane and subtropical broad leaved forests (Sholas) are confined to patches at higher elevations in Nilgiris and Anamalais.

Species composition

The species composition varies depending on the forest types. The luxurient tropical wet evergreen vegetation has several strata of trees of varying heights. The tall trees are often buttressed at the base. The top storey comprises of different species like *Artocarpus hirsuta, Acrocarpus fraxinifolius, Calophyllum elatum, Dipterocarpus indicus, Dysoxylum malabaricum, Poeciloneuron indicum, Hopea parviflora* and *Vateria indica.* The middle storey is characterised by species like *Aglaia roxburghiana, Artocarpus heterophyllus, Bschofia javanica, Canarium strictum, Cinnamomum* spp., *Diospyros* sp., *Elaeocarpus tuberculatus, Garcinia indica, Holigarna arnottiana, Hydnocarpus laurifolia,* and *Lophopetalum wightianum,* etc. The understorey comprises of mainly *Baccaurea courtallensis, Memecylon angustifolia, Nephelium stipulatum* and *Scolopia crenata,* etc.

The semievergreen forests, an interesting stage between tropical evergeen and tropical moist deciduous forest are characterised by the presence of species of *Xylia* and *Terminalia* along with species of *Dipterocarpus*, *Balanocarpus* and *Hopea* in the upper storey. Many evergreen species of Myrtaceae, and species like *Scliechera oleosa*, *Mallotus philippensis*, etc. constitute the middle storey. Shrubs of Rubiaceae and Acanthaceae are common in the ground layer.

The next dominant forest type in western ghats is the moist deciduous, where in the species remain leafless during December-June. Two major strata can be recognised here. The upper canopy consists of species like *Albizia lebbeck*, *Bombax cieba*, *Dalbergia latifolia*, *Erythrina* spp., *Grewia tiliaefolia*, *Lagerstromia lanceolata*, *Pterocarpus marsupium*, *Scliechera oleosa*, *Spondias pinnata*, *Terminalia paniculata* and *Terminalia bellerica*. In the understorey *Bridelia retusa*, *Careya arborea*, *Emblica officinalis*, *Mallotus philippensis*, *Trema orientalis*, etc. are common.

The subtropical forests, commonly called 'Sholas' occur in Palni, Anamalai and Nilgiri hills above the altitude of 5000 ft. The shola species are of tropical stock having very low ecologicai amplitude. They are composed of *Eurya japonica*, *Gordonia obtusa*, *Michelia nilagirica*, *Ternstroemia japonica*, *Eugenia* spp., *Ilex* spp., etc. Common grasses in the area belong to the genera like *Aristida*, *Apluda*, *Cymbopogon*, *Andropogon*, *Heteropogon* and *Themeda*.

The tropical dry deciduous forests are characterised by species of *Zizyphus*, fleshy Euphorbias, *Albizia amara*, *Capparis decidua*, *Capparis zeylanica* and *Acacia chundra*.

The montane wet temperate forests, though not of common occurrence, are composed of species like *Rhododendron arboreum*, *Myristica laurifolia*, *Litsea sebifera*, *Sideroxylon tomentosum*, *Lasiosiphon eriocephalus* and *Elaeagnus latifolia*.

The degradation and destruction of forests accelarated the process of 'savannization', as the more vulnerable trees and shrub species succumbed to grazing, lopping, felling, fire and other abuses by man. The thorny bushes and hardy grasses, however, withstand these because of their high tolerance capacity and very often provide a live hedge to some tree seedlings which ultimately characterize the savanna (Misra 1983). The species of Savanna are highly plastic to climatic changes and biotic pressures. A mixture of these species are found in the lower storeys in all forest types. The thorny bushes like *Acacia catechu*, *Mimosa rubicaulis*, *Zizyphus* spp. the fleshy Euphorbias, low deciduous trees like *Anogeissus latifolia*, and *Soymidia febrifuga*

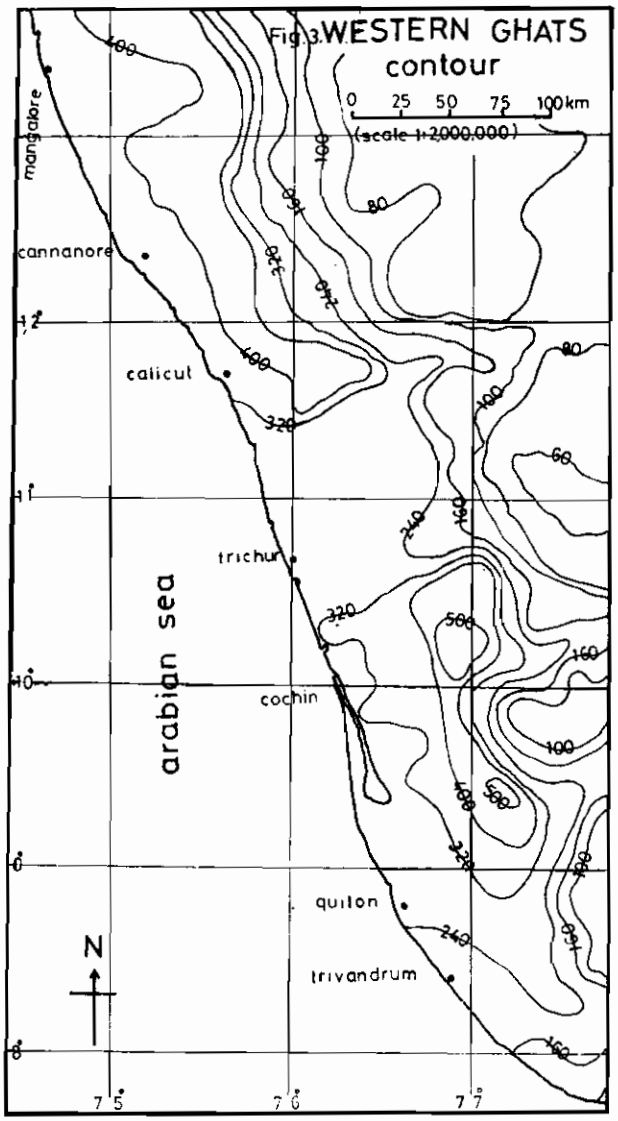


Fig. 3.

are prevalent in the savannas. The *Schima - Dicanthium* association of grasses prevalent in dry sub-humid zones, predominate the area.

Species association

The *Poeciloneuron - Palaquium - Mesua* association prevails in Western Ghats and its composition varies depending upon slope, drainage, moisture and soil conditions. According to Arrora (1968),

there are 12 major sub groups of the above dominant association *viz. Poeciloneuron - Mesua* (Palghat), *Poeciloneuron - Cullinia* (Kallar valley), *Palaquium-Mesua* (Wynad, Malayattur, Kallar valley, Palghat, Nilambur, Nelliampathy), *Palaquium - Gluta* (Shendurini, Ponmudi, Kulathupuzha), *Palaquium-Dipterocarpus* (Nelliampathy, Chandanathodu, Shencotah), *Palaquium - Mangifera* (Tirunelvelli, Kanyakumari), *Palaquium - Hopea* (Karianshola, Anamalai, Kanyakumari), *Mesua - Calophyllum* (Palghat), *Mesua - Cullinia* (Ranni, Attappadi), and *Mesua - Hopea* (Anamalai).

Phytogeographical distribution of species

With respect to the distributional aspects of Western Ghat flora, the tree species are grouped into various categories as i. species of uniform distribution in Western Ghats and throughout India (species of *Diospyros, Albizia, Acacia, Gmelina arborea, Adina cordifolia* and *Eugenia jambolana);* ii. species of discontinuous distribution in India over larger parts *(Lannea coromandeliea, Tectona grandis, Ougeenia dalbergioides, Bombax malabaricum, Careya arborea, Anogeissus latifolia, Hymenodictyon exelsum*); iii. species of continuous distribution along Western Ghats, Eastern Ghats, Assam and Burma *(Mesua ferrea, Xylia xylocarpa, Michelia champaka, Lagerstroemia flos-reginae);* iv. species of discontinuous distribution in Western Ghats, Burma, Cylon, Assam, Andamans and Eastern Ghats *(Chukrasia tabularis, Calophyllum* spp., *Artocarpus* spp., *Dipterocarpus* spp., etc.); and v. species of discontinuous distribution in Western Ghats, Eastern Ghats, Ceylon and parts of western Himalayas *(Grewia tiliaefolia, Dellinia pentagyna, Cedrela toona).*

Floristic affinities

The temperate forests of Nilgiris have affinities with the flora of the Naga hills, Manipur and eastern Himalayas. Some of the common species to eastern Himalayas are *Hypericum hookerianum, H. nepalense, Ternstroemia japonica, Eurya japonica, Rubus ellipticus, Rhododendron arborium,* species of *Elaeocarpus, Euonimus, Miliosma,* etc. The species of *Thalictrum, Ranunculus, Cardamine, Geranium, Scutellaria, Pottentilla, Gentiana,* etc., a number of *Cyperus* and grasses are common in the ground flora.

The Malabar flora has a number of Malayan elements belonging to Guttiferae, Dipterocarpaceae, Myristicaceae, etc. Among various families Sterculiaceae, Tiliaceae, Anacardiaceae, Meliaceae, Myrtaceae, Piperaceae, and Orchidaceae, are the main Malayan groups occurring in Malabar.

The flora of Travancore side of Western Ghats has affinities with that of Ceylon and Malaya. The Burmese genera such as *Dipterocarpus, Grewia, Dioscorea, Gaultheria,* etc. are also found in this

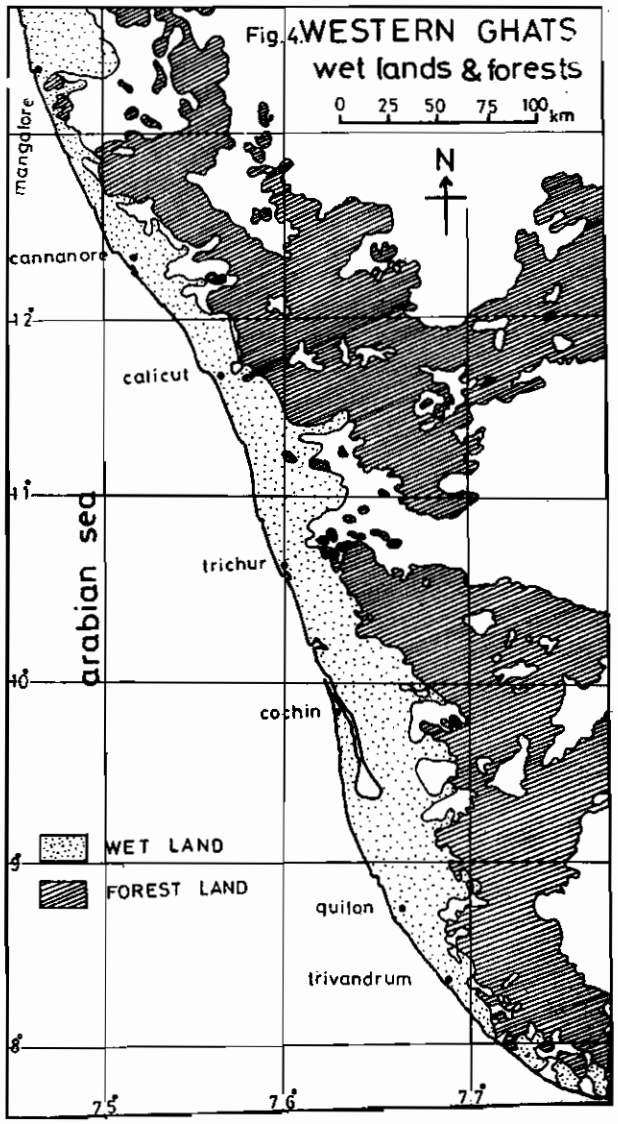


Fig. 4.

region. According to Narayana Swamy and Seshagiri Rao (1950), the common genus *Grewia* in the moist deciduous forests of Western Ghats is of African origin.

Wildlife

There are are a number of sanctuaries and two national parks in Western Ghats (Fig 7). About 20

species of wild animals including the endangered species like Pangolin *(Manis-crassicaudata)*, Cheetah *(Acinonyx jubatus)*, Tiger *(Panthera tigris)* and Crocodiles occupy this area. The typical representatives of the tropical forests of Western Ghats are the spotted deer, the Nilgai, the Barking deer and the Sloth bear. Other species are Gaur, Sambar and Elephant. In the dry regions where small trees and grasses predominate Antilope and Gazelle occur. In the dense forests occur Spotted deer, Sambar and Wild pigs along with Indian Pangolin. Tiger inhabits almost all the region whereever the pigs, barking deer, etc., are found. In some parts of Western Ghats the Lion tailed monkey and the Nilgiri langur are found. In the higher levels of Nilgiris and the Anamalais such Himalayan animals like Tahr, European otter, etc. are found. All these wild animals along with a number of birds play an important role in preserving the delicate balance of this unique ecosystem. Sound wildlife management and habitat conservation are unknown in this area except that of the Project Tiger.

Deforestation and vegetation change

As a general rule some species are difficult to be protected than others, because they are forced by their unique behaviour and physiology occupying some inflexible niche particularly vulnerable to biotic activities. This is true with both flora and fauna. The deforestation in Western Ghats, not only reduces the quality and quantity of natural resources, but it may even affect the climatic rhythm triggering a number of successional activities in nature. The climatic instability, especially the rainfall in Western Ghat region, caused by the extreme deforestation, may be one of the reasons for the dry evergreen thickets of the Coramandel area (Meher-Homji 1977). It is an accepted fact that the higher the deforested area, larger is the climatic criteria showing diminishing trend of rainfall-rainy days, except the coastal regions (Meher-Homji 1980). The evergreen forest belt is more prone to the diminishing trend of precipitation than the dry deciduous one. This point is important in the management of Western Ghats because most of the areas under this ghat section are under evergreen and semievergreen forests. A wet evergreen stand may change entirely into a moist deciduous forest, depending on the intensity of human interference. Similarly a potential moist deciduous type may get converted into a dry deciduous type and later to thorny thickets (Meher-Homji 1979). Again over-grazing of these savannas leads to their destruction through desertification and aridization. Eckholm (1976) recorded 43% of Indian subcontinent as undergoing such erosion and aridization. According to Meher-Homji (1974), the maximum elevation of Western Ghats in the late Tertiary, cutting off the influence of the

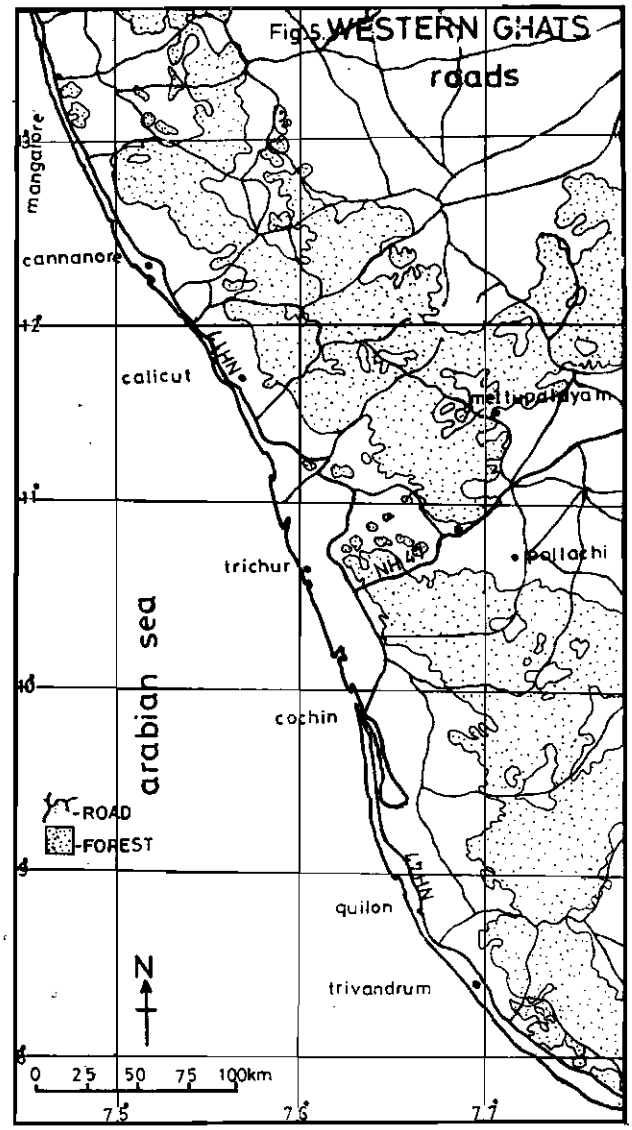


Fig. 5.

early south-west monsoon rains from Coramandal coast, probably led to the replacement of deciduous forest by dry evergreen scrub wood lands and thickets. Misra (1983) is of the opinion that much of the savanna land has changed from 'mesic' to 'xeric' during the past four centuries.

The vegetation type even under wet conditions are unstable due to anthropogenic influence and the substitution of one type by another one of lower status is a general rule. It is true that under strict

protection the once disturbed vegetation tries to reach the original forest type. But this phenomenon requires some specific conditions like seed source, species tolerance to adverse conditions, accessibility factors, ecological efficiency of seeds, etc., along with the optimum time requirements. But this normally does not prevail, and the habitat condition deteriorates day by day. Likewise during the period of recuperation to the original state, some irrevertible changes may occur to edaphic and microclimatic

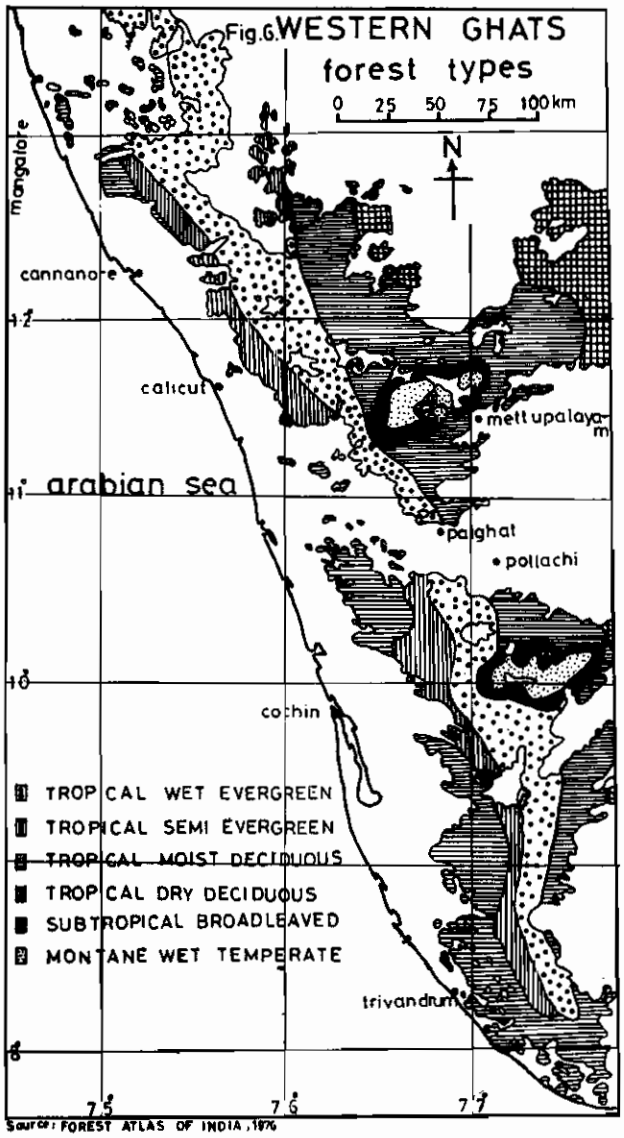


Fig. 6.

factors, thus preventing the return to the original. Thus, a wet evergreen forest once degraded to moist deciduous and later to dry deciduous or even to thorny thickets, will never go back to the original wet evergreen condition. The maximum of which

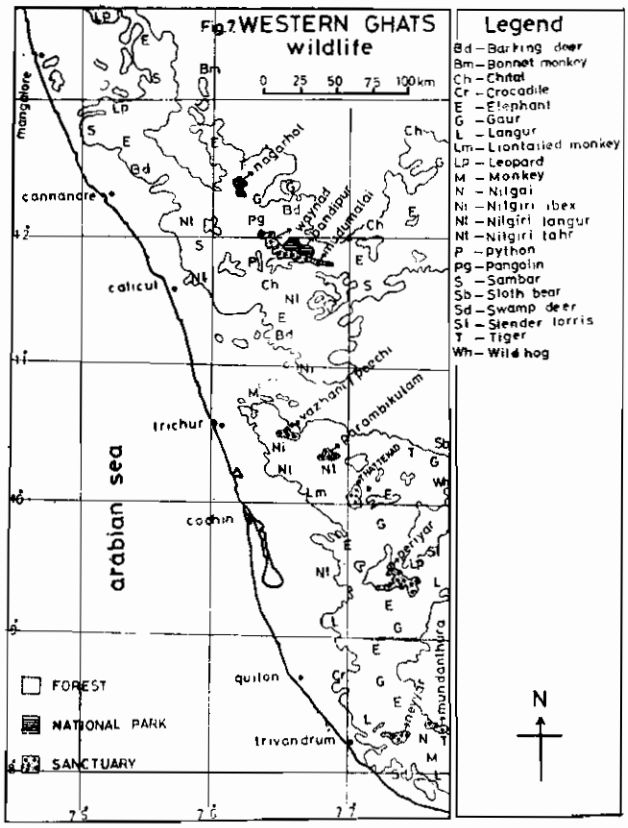


Fig. 7.

one degraded type can attain is only to the next higher, not the original one. The ultimate result is the loss of that particular piece of vegetation for ever. This is expressed in a Gaussen's (1959) "Plesio - climax" concept.

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A. R. R. Menon
Division of Ecology.

Albizia bagworm noticed at Arippa and Punalur

The bagworm, *Pteroma plagiophleps* (see Evergreen No, 12, March 1984) has recently been found to cause defoliation in some K F D C plantations of *Albizia falcatoria* at Arippa and Punalur. Although now widespread in Kerala along roadside trees of *Delonix regia*, this is the first time this insect has been recorded in *Albizia* plantations outside Vazhachal area, where it was first noticed in April 1977 (see Evergreen No. 3, June 1977). Be on the look out for this pest in other *Albizia* plantations elsewhere and inform the Entomologist, K F R I for suitable suggestions on control.

- Division of Entomology

When you have any disease probelms in your forest nurseries or plantations

Please contact

The Pathologist,
Kerala Forest Research Institute,
Peechi, 680653, Kerala.

THE K F R I Library

Since improved access to relevant information is the basic requirement for research, work towards organization of the Library was started simultaneously with the establishment of the Institute in 1975. Over the years the library has been growing steadily in terms of acquisition, physical organisation and services without any hurdles.

ACQUISITION

Books, Journals, Conference proceedings, Annual Reviews, Annual Reports, Current technical reports, Reprints, National and International Standards, Maps, etc. which are relevant to our research programmes have been acquired from wherever they were available either in the conventional format or as microforms. After acquiring a basic collection of books relevant to our interest, more emphasis was laid in acquiring nascent information embodied in current journals, reprints and reports which are helpful in keeping abreast of the current developments in forestry research throughout the world. Consequently there has been a gradual decline in the acquisition of monographic publications and a corresponding reverse trend in the acquisition of current journals, reprints, reports, etc. The details of our acquisitions for the past years are presented below:

ACQUISITIONS

Year	Books	Current Journals	Back volumes	Reprints including photostats and translations	Microforms	Cost Rs.	Ps
1975 - 76	2249	72	38	247	...	2,29,550	00
1976 - 77	1426	120	82	423	40	1,59,045	00
1977 - 78	1040	138	108	620	52	1,49,761	00
1978 - 79	988	151	122	460	78	2,04,016	00
1979 - 80	906	157	251	478	103	2,26,691	00
1980 - 81	633	202	74	335	...	1,84,940	00
1981 - 82	672	212	80	652	8	2,15,135	00
1982 - 83	666	232	192	496	...	2,14,081	00
1983 - 84	558	244	320	966	43	2,48,978	00
Total	9138	244	1267	4677	324	18,32,197	00

We have been successfully meeting the requirements of our scientists mostly from our collection. Some stray institutional publications which are not available through local sources are purchased direct from the publisher. We have also entered into publications exchange agreement with most of the Forestry Resarch Institutions throughout the world.

As a result of ihe steady growth of acquisition during the last 9 years it has become possible, although not exhaustively, to build up a core collection on Forestry and a representative collection on all the allied disciplines such as Botany, Zoology, Agriculture, Economics, Statistics, etc. The policy of acquisition we have been following is capable to provide access to world literature on forestry and related disciplines.

Inspite of the resourcefulness of the library, there have been demands from our Scientists for journal articles and reports which are not available in the library. Such demands are met by obtaining photostat copies from available sources mainly from INSDOC and British Library Lending Division.

One of the most valuable acquisitions in the library is the World Catalogue of Forestry Literature, 1822-1977. This is a very exhaustive compilation of the Commonwealth Forestry Institute and brought up-to-date once in every 5 years. This enables us to compile bibliographies on any specific topic in forestry.

ORGANIZATION

Classification and cataloguing

All the books so far acquired have been classified according to Universal Decimal Classification (UDC). But Forestry books are classified using a special classification schedule entitled 'Oxford Decimal Classification for Forestry' (ODC). This is an expansion of the U.D.C. number for forestry. For cataloguing, we have been following the Anglo-American Cataloguing Rules (AACR). The catalogue entries are prepared in cards and filed in two sequences. The alphabetical sequence comprising of author, title and subject entries and the classified sequence by the call numbers (the number alloted to each book according to the scheme of classification). Books are arranged on the racks in classificatory sequence.

Reprints are kept in pamphlet holders by accession numbers and their easy retrieval is facilitated by preparing author, title and subject indexes. A printed catalogue enlisting all the available volumes of each journal held by the library is available. This catalogue is brought up-to-date by issuing revised editions after every two years.

Microforms

Theses, reports and other publications which are not available as hardcopies are obtained in microforms, microfilms and microfisches.

SERVICES

In addition to providing the lending and reference services, the library issues a fortnightly newsrelease enlisting new acquisitions. Each issue of journals received is scanned and relevant articles and book reviews are included in the newsrelease.

The library makes comprehensive literature searches and compile subject bibliographies on demand. Some such bibliographies are: Dipterocarps of South Asia, Social Forestry, Elephant, Tiger, Forest Fire Control, Rattan, Medicinal Plants of India, Eucalypts in India and Forestry for Food.

Although the library is intended as the source of information for the research programmes carried out in the Institute, it provides free access to information to all those who seek it. Apart from the Scientists of the Institute, membership to the library is open to all forestry officials and Scientists and scholars of Universities and research institutions in Kerala.

K. Ravindran
KFRI Library

A Promising Type of 'NELLI' *(Phyllanthus emblica* Linn*)*

'Nelli', scientifically known as *Phyllanthus emblica*, is one of the richest known natural sources of vitamin C. It is a minor fruit tree species commonly found in the deciduous forests of the Western Ghats of Kerala. A detailed survey was conducted in the dry deciduous forests of Chambakad area, Marayoor Forest Range, Idukki district, to study the variability in this species, and the existence of superior types, if any, for further improvement in *P. emblica*. Phenotypic characters like area of leaflets, shape and colour of the fruits, weight and diameter of the fruits, test weight of the seeds and qualitative aspects like total soluble salts, acidity, vitamin C, fibre content, etc. were studied for locating the genetic variability in this species.

During the survey, the interior forests were explored and three types of *P. emblica* were located. The characters of these three types are summarised

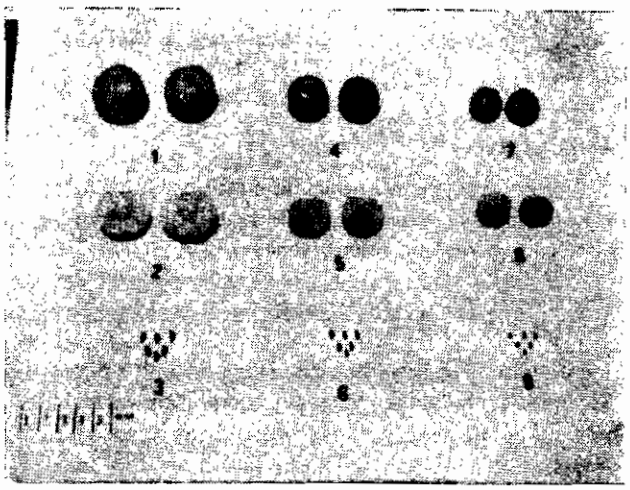

Fig. 1. Fruit and seed characters of Types I, II and III (1, 4, 7 fruit, 2, 5, 8 cross section, 3, 6, 9, seeds respectively).

Fig. 2. Variation in leaf and leaflet size in Types I, II and III (1, 2, 3 and 4, 5, 6 respectively).

in Table I and Figs. 1 & 2. This variation found within the species might be due to the ploidy difference

TABLE 1. Phenotypic characters of the three types of *P. emblica* located at Chambakad.

Type	Mean area of the leaflets (mm^2)	Shape of the fruit	Colour of the fruit	Diameter of the fruit (mm)	Weight of the fruit (g)	Weight of 100 seeds (g)	Germination % of seeds: Sun-drying method	Germination % of seeds: Mechanical isolation	Total soluble salts (%)	Acidity (%)	Vitamin C mg/100 g	Fibre (%)
I.	111.7	Globose	Yellow	31.5	16.5	1.764	86.3	38.3	12.3	0.42	371	2.01
II.	40.8	Depressed globose	Greenish yellow	24.7	8.8	1.354	82.7	35.3	12.0	0.39	316	2.21
III.	24.2	Depressed globose	Greenish yellow	19.8	4.3	0.805	68.0	8.7	10.1	0.40	191	3.12

Fig. 3. A fruiting branch of 'Chambakad large' *P. emblica.*

of the trees. Since these three types are found in the same locality in sufficient numbers, the possibility of environmental variation is ruled out. Janaki Ammal *et al.* (1958) have reported polyploidy in *P. emblica.* They also found that the vitamin C content had a positive correlation with the chromosome number. Subsequently Khosla *et al.* (1978) reported the level of ploidy in this species as 2n=14, 49 and 52. Further cytogenetical studies are needed to establish this finding. The located superior *P. emblica* (type I) is named as "Chambakad large" (Fig 3).

Janaki Ammal, E. K. and R. S. Raghavan, 1958. Polyploidy and Vitamin C in *Emblica officinalis* Geartn. *Proc. Indian Acad. Sci.*, Sect. B 47: 312-314.

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Seed Germination Technique in *Phyllanthus emblica* Linn

One of the difficulties encountered in the multiplication of the selected types of *Phyllanthus emblica* Linn. is the absence of a suitable method of vegetative propagation. Although success has been reported with cuttings or budding these methods were not found successful. Therefore seed propagation appears to be necessary till suitable vegetative propagation methods are standardized.

The seeds of *P. emblica* are enclosed in a hardseed coat which renders the seed germination difficult. Treating the 'stones' with growth regulators are recommended for early germination. But the tribal people adopt the method of drying the fully ripe fruits in the open and collecting the seeds after the fruits split open for raising seedlings.

Fully ripe fruits were collected and the stones broken for releasing the seeds. Alternatively the fruits were left in the sun on a flat rock for about 2-3 days till they got dried up completely. Such fruits were found to split within 48 to 60 hours. When the fruits were split open, the delicate seeds within the stones got released. The seeds thus extracted dried up in open, where the temperature varied from 20-32°C. Seeds collected by these two methods were tested for germination with three replications. One hundred seeds were placed on moistened fitter paper in Petri plates and the germinated seeds counted periodically. In the third method the stones were directly sown in the polythene pots.

Depending upon the types of Nellika the sun-drying method gave 68 to 85% germination while mechanical isolation yielded only 8 to 38%. Direct sowing of stones was completely unsuccessful.

Mechanical isolation by breaking the stones could cause injury to the embryo which would have affected the germination. Drying the seeds in open under alternate hot and cold temperature as experienced in Chambakad would have helped to break the dormancy of the seeds and fasten the germination. The method of sun drying to split open the stones and collecting the seeds and sowing immediately after collection appears to be a promising method for raising seedlings of *Phyllanthus emblica.*

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'Loranthus' – a menace to trees

Parasitic plants, mistletoes as they are commonly called, have attracted naturalists and poets for centuries. The aura of fascination surrounding them is mainly due to a feeling of apprehension and intuitive fear of all things parasitic. For a botanist, parasites are superbly successful organisms in the great mosaic of living things. Though parasitic plants are generally very destructive they are utilised in a variety of ways as food, fodder, medicine, in religious ceremonies and even for witchcraft throughout the world. Often they pose major problems for foresters and horticulturists, by infesting trees, which in turn affect the productivity of the crop severely.

Mistletoes include any aerial parasite belonging to the families Viscaceae, Loranthaceae, Santalaceae. Members of the family Loranthaceae. are popularly known as "Loranthus". Usually these autotrophic plants flourish on the trunk, branches or aerial roots of the trees. The parasites make contact with their host plants by a complex organ called haustorium by which they draw their nutrients and water.

Fig. 1. Teak tree infested with 'Loranthus'.

Nearly all mistletoe genera are exclusively tropical or subtropical and only a few species have successfully established in temperate regions of the world. A conservative estimate shows that there are more than seven hundred species outside the temperate zone. Species of mistletoes attacking various trees,such as teak, *Bombax*, mango, cashew, *Terminalia* are not the same; sometimes more than one species attack a single tree species. However, some host preference has been observed in various mistletoes. Usually in a particular locality or a plantation one species of host been found to be prefered by a particular species of a mistletoe. The common mistletoe attacking teak throughout Kerala is *Dendrophthoe falcata* var. *pubescens* This mistletoe with yellowish white flowers and pink ripe fruits parasitizes on *Bombax ceiba*, *Alstonia scholaris*, rose wood, etc. However, on jackfruit trees the variety of this species, has been found to be different. The common species found on mango, cashew, rubber, etc. are *Helicanthes elastica*. Clumps of *D. falcata* var. *pubescens* usually hang from the branches. But *H. elastica* clumps with greenish white flowers are bushy and usually encircle the host branches, sometimes covering them entirely. These two parasites can be easily distinguished by their leaves and flowers which are longer in size in the former than in the latter. *Macrosolon parasiticus*, common on *Terminalia* spp, has reddish flowers and medium sized elongated leaves.

Seed dispersal

Flowering and fruiting seasons in mistletoes vary from species to species. Profuse flowering and fruiting occur in *D. falcata* var *pubescens* during December to April; the parasite may bear a few flowers and fruits throughout the year. Large number of pink coloured fruits attract birds which feed on the fruits. The seeds which are sticky are usually dispersed by birds in the process of dislodging them from their beack. Well known ornithologist Dr. Salim Ali has observed a few ripe fruits of the mistletoe being swallowed one after another by the Tickell's flower-pecker and within a few minutes the seeds are excreted out. The seeds stick to the branches and germinate.

In temperate regions, *Arceuthobium* spp. (family Viscaceae), commonly known as dwarf mistletoe are the most serious parasites of pines. In India *Arceuthobium* infests pines in the Himalayas. The mechanism of seed dispersal in dwarf mistletoes is different from that of common parasites of tropics. In dwarf mistletoes seed dispersal is through violent ejection of ripe fruits from a weak base and the sticky seeds are dispersed to a distance of 5 to 15 metres. Hence infestation by dwarf mistletoes tends to occur in foci which expand slowly leaving behind a ravaged area of broomed and malformed trees. Mistletoes which depend on birds for dispersal of seeds do not show advancing frontiers of this sort

Fig. 2. Infusion device attached to the tree.

and occur erratically or in patterns determined by the habit of birds.

Economic loss

Infestation by phanerogamic parasites has serious impact on the productivity of susceptible trees. Dwarf mistletoes have long been recognised as one of the most damaging diseases of conifers in USA and Canada. In USA alone the estimated annual loss of timber due to mistletoes is 7.5 million m^3. The economic impact of mistletoes on trees is both qualitative and quantitative, including reduction in tree vigour and growth increment, deterioration of timber quality, poor fruit and seed setting, drying of branches and ultimately death of the trees. Among the different tree species used in afforestation programmes in India, sal and teak are the ones most affected by mistletoes and pines by dwarf mistletoes.

Studies conducted at K F R I indicate that *D. falcata* var. *pubescens* which attacks teak is more prevalent in plantations situated in central and northern areas of the State (Fig. 1). The parasite generally affects the trees after the age of seven years. A survey in teak plantations of Nilambur Forest Division, has shown that 46 to 86 percent of trees are attacked depending upon the age of trees. Often severe attack on young teak trees have resulted in near total failure of plantations because of high mortality. Such plantations are clearfelled much before they attained rotation period. The average number of parasite clumps per tree range from one in 16 years old plantations to four in 46 years old plantations in Nilambur Forest Division. In an 8 years old plantation in Karulai Range 27 percent mortality was recorded during three years (1980 - 1983) of observation whereas in a 30 years old plantation in Nilambur Range it was only two percent. The growth (increment as GBH) of teak trees infested with mistletoes was retarded by 42 percent and 37 percent in the young and old plantations respectively as compared to healthy trees. When the parasites were removed from the trees by lopping off infested host branches, the improvement in increment was 39 and 7 percent, respectively in the young and old plantations. The strength properties of teak wood are adversely affected when infestation is severe.

Parasite Control

Though mistletoes are known to cause significant loss in horticulture and forestry, unfortunately very little attention has been paid to conrol them systematically. The various approaches to control like mechanical, biological or chemical are all possibilities. In 1867 Dr. Cleghorn a British Forest Conservator had initiated the removal of the parasites by lopping off the infested branches of teak at Nilambur. Thereafter parasite removal was done periodically just before profuse flowering and fruiting period of the parasite. Though sufficient lopping schedule had been prescribed in several Working Plans, 'Loranthus' removal became erratic because of the increasing cost of labour and risk involved in climbing up the trees.

Possible biological control of mistletoes by managing vector or pollinator birds has been discussed but it has never been practised because of ecological reasons. Potential agents like caterpillars of a butterfly, *Delias eucharis* and a hyperparasitic mistletoe, *Viscum capitellatum* have been reported. But their practical feasibility in mistletoe control has not been exploited.

However, chemical control of teak mistletoe using weedicides is promising. The weedicides can be applied to mistletoes either directly by spraying or indirectly by spraying or indirectly through infusion into the host plant system which is targeted to the parasite. Such weedicides should be harmless to the host but destroy the parasite selectively. Whenever possible the latter method has been prefered over the former. Weedicides are harmful to animals, human beings and nontarget plants. Since the chemicals are directly introduced into the conducting tissues of trees, environmental pollution is prevented and no wastage of chemical occurs. Limited control of eucalypt mistletoes was brought about by infusing 2,4-D formulations in Australia. In India, copper sulphate and Ferroxone (a 2,4-D formulation) had been tried for the control of parasites attacking rose wood. However, our investigations reveal that copper sulphate and all 2,4-D formulations are unsuitable for teak as they are highly phytotoxic to the host.

Fig. 3. Teak tree with dried clumps after infusion of weedicide.

Tree injection technique has been used for infusing the chemicals into the trees but most of them require external pressure. At KFRI we have developed a cheap infusion device which can be locally fabricated for infusion of water soluble weedicides (Fig 2). It works on the principle of ascent of sap. The injected weedicide is taken up by the tree through transpiration pull hence requiring no external pressure. It consists of metalic nozzles which can be screwed in holes, 2-3 cm deep, hand-drilled in the sapwood of the tree trunk at a height of one metre above the ground. Nozzles are connected to a distributor through pressurised polythene tubes, which in turn are connected to a disposable glucose-saline infusion set collected from hospitals. Nineteen weedicides were screened using this tree injection method and five of them gave encouraging results. Metribuzin (Sencor) gave the best result at 0.05 percent (a. i.) as the parasite clumps were selectively killed, without harming the host (Fig 3). These chemicals are to be further evaluated for standardization of dose and time of application. The technique of tree infusion should be adopted with caution in trees yielding edible fruits and nuts because of the possible chemical residues in them, which may pose health problems.

The parasites can also be controlled by direct application of the weedicides on their leaves and other plant parts. *H. elastica*, parasitising cashew trees at Wadakkanchery has been controlled successfully by application of 0.1% (a. i.) solution of Gramoxone on the foliage. As this chemical is not selective against the parasite proper care should be taken at the time of application, so that the spray drops do not fall on the cashew leaves. To check the residues of the chemical getting into the fruits, it is advisable to treat the trees only after the crop is harvested. Gramoxone, can also be sprayed against *H. elastica* parasitizing mango trees, taking all the precautions mentioned above.

It may be noted that since the normal contrasting features between a crop and weed, attributed to the selectivity of a weedicide is lacking in the relationship of a host tree and parasite, such weedicides may not be generally useful for parasite control. However, it is possible to capitalise upon certain contrasting characters of host and parasite like natural defoliation of host for adopting tree infusion technique or relative position of the parasite on host branches for resorting to direct spray.

M. BALASUNDARAM
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(Non-Fungal Diseases)

Where do our endemic trees go ?

The cultural characteristics of Kerala are linked traditionally with our plants. A century ago, our native species were predominating the scene but at present it is being totally monopolised by aliens. With a host of exotics to compete like rubber, coffee, tea, eucalypts, pines, cocoa, etc., we have only very few native trees cultivated like teak and *Bombax* in the forestry sector and the jack, mango and coconut trees in non-forestry sector. Though the need to domesticate fast growing native species for afforestation, enrichment planting and social forestry is a much discussed matter of the day, our knowledge on them is very scant.

Among our native trees the endemics (species confined naturally to a particular and usually very restricted geographic region) deserve special attention, for they survive at present in a fast changing environment, totally susceptible to biotic pressures. These trees with restricted distribution are considered either as those which evolved gradually under peculiar ecological conditions or as the surviving remnants of once wide spreading stocks. The distribution of endemics can give important clues to the process of geological and climatic events in the past and can speak on the evolutionary trends better than any other life form.

Of the six endemic tree genera, *Blepharistemma* (1sp.), *Erinocarpus* (1sp), *Meteoromyrtus* (1sp.) *Ontonephelium* (1 sp.), *Poeciloneuron* (2 spp.) and *Pseudoglochidion* (1 sp.), *Poeciloneuron* alone is put into proper use in forestry. *Blepharistemma*, observed scattered in all the principal forest types (evergreen, semievergreen and moist deciduous), is a handsome straight stemmed tree with moderately hard wood. Though more than a hundred medium to large-sized endemic trees are reported from Kerala (including endemic species with wider distribution within Western Ghats), proper attention has not been given to them in forestry. The biological significance of endemic trees are practically unkown to the practising foresters even though species like *Hopea parviflora*, *Gluta travancorica*, *Poeciloneuron indicum*, *Vateria indica*, etc. are much exploited for their wood. It is observed that most of our endemics are included along with the miscellaneous species in the forest records with no seperate identities given to them; but they do possess potentials of economic and aesthetic value.

Endemic species having wider distribution in the Western Ghats like *Canarium strictum*, *Dysoxylum malabaricum*, *Lophopetalum wightianum*, *Palaquium ellipticum*, *Vateria indica*, etc. are better known in forestry than species like *Aglaia bourdillonii*, *Dysoxylum beddomei*, *Humboldtia laurifolia*, *Palaquium bourdillonii*, etc. which are restricted to Kerala only.

Botanical notes on many endemic trees with suggestions for domestication are available in the classical works of Beddome (Flora Sylvatica) and Gamble (Manual of Indian Timbers) and in Wealth of India. For example, denoting *Ormosia travancorica* Beddome says "the timber appears to be remarkably good, but at present is almost unknown", and Bourdillon, "the rate of growth is fast, nothing is known of the timber or its uses". On *Parinarium travancoricum*, Wealth of India notes "furnishes a wood which is bright pink, close and even grained, smooth, hard and heavy. The seed kernal yields a fatty oil. It would be worthwhile to investigate the utility of its wood and seeds". But these valuable documents are rarely taken into account in the present day forestry practices, the major reasons being the mad race for short term economic gains and the blind acceptance of exotics. In these circumstances the question asked is, "will our endemic trees survive long enough to catch our proper attention?". It is suggested that for saving our endemic trees we have to make proper evaluation of them and link conservation strategies with domestication trials. Growing as many endemic trees as possible, with an eye to study their performance is to be taken up as an urgent step, before they disappear for ever, into oblivion.

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Division of Botany (Taxonomy)

Vegetative propagation of Forest Trees

Vegetative propagation by rooted stem cuttings is practised in forestry and horticulture to obtain planting material of genetic uniformity. By early 20th century it was established that phytohormone plays a vital role in the regulation of growth and reproduction of plants. This led to immediate use of natural and synthetic growth regulating substances for artificial propagation of plants using vegetative parts, which revolutionised the fields of agriculture and horticulture. Although the technique of vegetative propagation by exogenous application of growth regulating substances was widely practised in forestry in many countries, very little work was done in tropical species, in this aspect. The method of clonal propagation is useful in propagating species that produce few or no seeds, species having inherent superior qualities such as vigour, resistance to disease, faster rate of growth, etc.

In general it appears that cuttings taken from young trees root more readily than those from old trees. Better rooting ability is observed in cuttings collected from lower branches of the crown. The physiological reason may be the differential distribution of natural root-inducing auxins among the branches. Seasonal changes occurring in stem cuttings as well as the physiological conditions of the cuttings are significant in natural rooting ability.

Preliminary treatments, treatments with phytohormones and with substances other than phytohormones, and propagating conditions are some of the artificial factors influencing rooting of cuttings. Length and size of cuttings, presence or absence of leaves and buds also influence the propagation. Hardwood cuttings without intact leaves respond much lesser to hormone treatments than with leaves. Hormone treatments may be given most judiciously to cuttings in order to induce and increase the rooting ability of many species. The identity or suitability, concentration and method of application are very important. There is no single hormone to induce rooting in all species and specific method is to be developed for each species. Indole acetic acid (IAA), indole butyric acid (IBA), naphthalene acetic acid (NAA), etc. are some of the widely used hormones. Usually hormones are applied to cuttings in dilute aqueous solutions. The optimum concentration varies with species, the rooting medium, age and nature of cutting and method of treatment. According to the responses shown in rooting, species are catagorised as follows:

(1) Easy to-root species : which can be rooted without any hormone application.

(2) Shy-to-root species : which can be induced to root with exogenous application of proper growth regulating substances.

(3) Difficult-to-root species: which do not root even with the application of root inducing substances.

The range of concentration of aqueous solutions vary from about 10 ppm to 200 ppm or more for dip method. Higher concentrations are usually applied for 'quick-dip-method' in which lower part of the cuttings are dipped in hormone solutions only for a few seconds. Various other materials like talc powder,

Root System of Some Common Trees

Generally the criteria followed for recommending a species for afforesting a site or planting under social or agroforestry programmes are economic benefits, its rate of growth (shoot), habit and to some extent the locality factors. We hardly care to attach any significance to the root system of the species, if satisfied otherwise. A clear understanding of the root system is also equally important. If the root system of the tree species selected is quite extensive it will certainly compete for nutrition and water against the cultivated crop. There are instances reported where a particular species fairly popular or ideal for social / agroforestry practices has become subject of severe criticism by progressive cultivators who ventured to grow them in their farm lands in

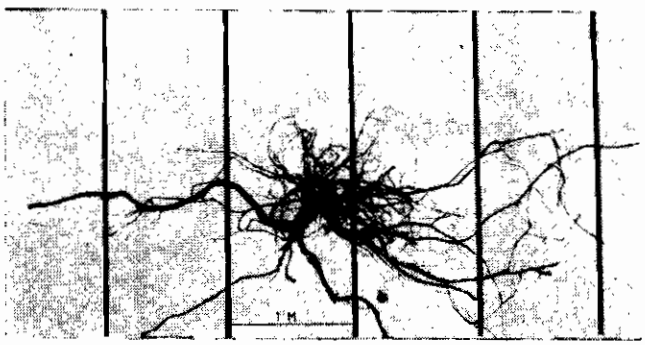

Fig. 1. *Leucaena leucocephala* var. K 28
Age ; 3½ years; Growth: Very good.
Shoot height: 310 cm (clear bole)
GBH:46.3 cm.

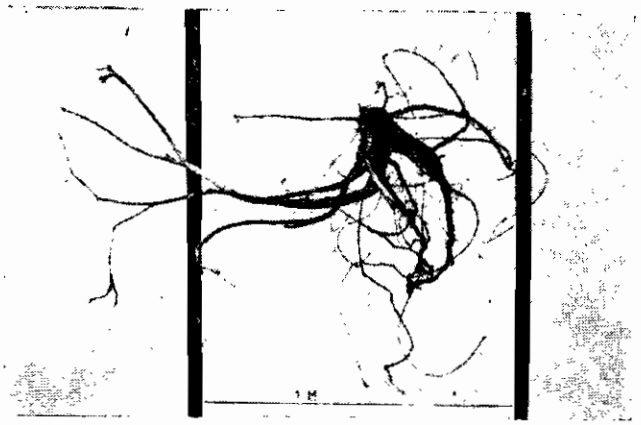

Fig. 2. *L. leucocephala* var. K 28
Age 3½ years; Growth: Good

conjunction with their crops like coconut, arecanut, etc. Their observation that the tree species adversely affected the nut yield compelled them to cut them away and extract even the roots. The observation, though may not be conclusive for want of proper scientific data, cannot be completely disregarded. Study of root system of tree species of different diameter classes (and ages) will help in providing adequate data in this regard. As a probing study roots of five species of trees commonly grown in Kerala under social agroforestry programmes have been extracted. The figures and descriptions explain the details of their root growth. (Fig. 1 - 6).

(From Page 24)

lanolin paste, agricultural clay, charcoal, etc. are used as carriers of chemicals.

Warm water, dilute acetic acid solution, aqueous solution of glucose and sucrose, vitamins, honey, paraphenylinediamine, boric acid, etc. are reported to stimulate rooting in cuttings.

Control of propagation conditions

Differences in rooting media are found to make variations in rooting responses. Aeration, pH, moisture, heat and availability of essential chemical elements are some of the important requirements in the rooting medium for good responses. Sand and peat moss (1:1, 3:2 and 2:1), sand and soil (1:1), etc. are proved to be good rooting media. It appears that a relatively high atmospheric humidity (90-95%) and a temperature of 28±2°C are favourable for rooting of a number of evergreen species. It is usually found necessary to reduce natural light intensity in the propagation beds.

Proper understanding of various factors involved in rooting of cuttings and their interactions with auxins and other growth regulating substances is necessary for studying the physiology of rooting in cuttings, which enable judicious and intelligent application of growth regulating substances for the vegetative propagation of forest trees.

T. Surendran
Division of Plant Physiology

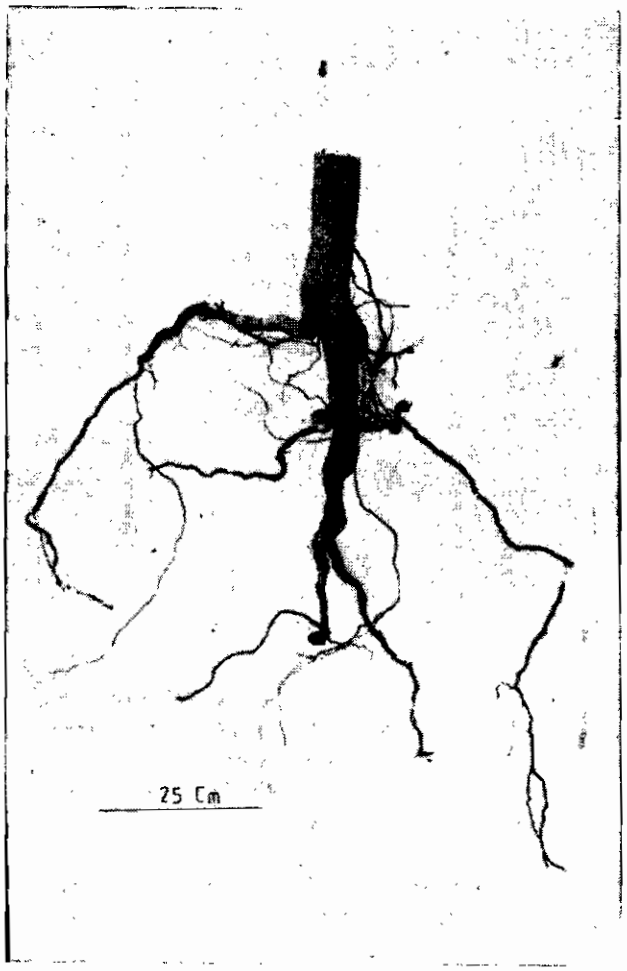

Fig 3. *Ailanthus triphysa*
Age: 7½ year; Growth: Average
Shoot height: 338 cm; GBH. 5.8 cm

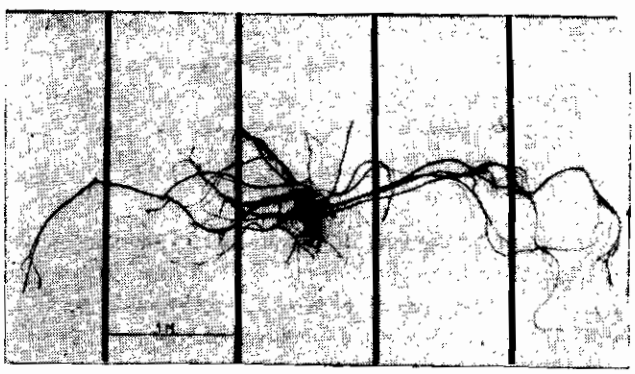

Fig. 4. *Pongamia pinnata*
Age: 7½ years; Growth: Good
Shoot height: 505 cm, GBH; 18.9 cm

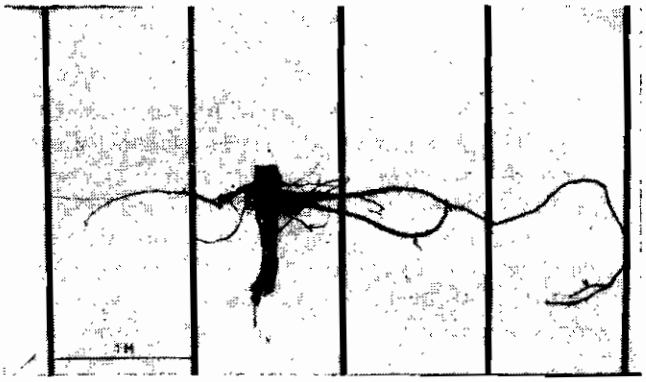

Fig. 5. *Ceiba pentandra*
Age: 4½ years; Growth: Very good
Shoot height: 711 cm: GBH: 45.2 cm

Fig. 6. *Delonix regia*
Age: 7½ years; Growth : Poor
Shoot height: 780 cm; GBH; 28.7cm

K. C. Chacko, Division of Silviculture

Trees absorbing pollutants from air

Species	*Pollutant*
Leucaena leucocephala, *Albizia falcataria*, *Caesalpinia pulcherrima*, *Aleurites moluccana*, *Spathodia campanulata*, *Gmelina arborea*	Nitrogen dioxide and Sulphur dioxide.
Mangifera indica	Chlorine
Alpine Fig	Sulphur dioxide
Almond, Mulberry, *Ficus elastica*	Hydrogen fluoride
Fan Palm	

(Source: Conopy, The Hindu)

Wood - Some Common Queries

Many queries come to the Division of Wood Science regarding various aspects of wood and timber. Answers to some of the commonly asked questions are reproduced here for the benefit of readers. If you have any question, please write to the Scientist-in-charge, Division of Wood Science, K F R I.

1. How can we distinguish different timbers?

Firstly, we need to understand that the trees are divided into two broad categories - 'softwood' (Gymnosperms or coniferous trees) and 'hardwood' (Angiosperms or broadleaved). Examples of softwood trees are pine, spruce, fir, cypress, deodar, etc. Generally they grow in temperate climate and in India, they occur naturally mostly in the Himalayas. Examples of hardwood trees are teak, irul, mango, cheeni, etc. Some hardwoods are softer than some of the softwoods and some softwoods are harder than some of the hardwoods. In commercial circles, light density hardwoods are generally referred to as softwood, but it is a wrong usage.

A major difference between hardwoods and softwoods is that they have different types of cells. Hardwoods contain vessels (pores, fibres and parenchyma cells. Hardwoods contain mostly tracheids. Also, each species differs from one another in the way these cells are arranged (anatomical structure). Gross physical characteristics like colour, grain appearance,odour,weight,hardness, etc. help in identifying some of the timbers. A 10 x hand lens provides basic information on the anatomical structure which helps in identification of timbers. Additional minute anatomical features can be examined under a microscope from thin sections This can be compared with authentic slides and the identity of the species confirmed.

2. How can we judge the age of a felled tree?

In regions where seasons are distinct there is sufficient difference between the wood grown in the early part of the growing season (spring) and later part of the growing season (summer) and this will produce well-marked annual growth rings. In the tropics where seasons are less marked, only a few trees (teak, for example) will show growth rings. The age of trees can often be determined by counting growth rings, but it is not always true that one ring occurs each year. If a tree loses its leaves by fire or insect attack early during the growing season the renewal of growth period after interruption can show up as a false ring. In contrast, long periods of drought can lead to the absence of a growth ring for that year.

3. White ant attack is seen on painted wood. How does it happen? Is there any remedy?

Termites (white ants) are able to attack painted wood also. A thin coating of paint is not the answer for protection from termite attack. Sapwood portion of any timber species, including, that of highly durable timbers like teak, rosewood, is easily attacked by termites, even if they are painted. To prevent termite attack it is advisable to use heartwood portion of a durable species or even better to use preservative treated wood. Sapwood, if treated with preservative chemicals is usually resistant to termites. To protect the painted wood from further attack, as a remedy, it should be surface-coated with aldrex emulsion or in the pentachlorophenol containing insecticide/fungicide in an organic solvent.

4. Is it advantageous to treat the wood with preservative chemicals?

There are many advantages for treating the naturally non-durable timbers with preservative chemicals. In view of the limited availability of naturally durable species, it is imperative that timber of lesser durability are used which, when suitably treated would give increased life under service conditions.

Making wood last longer decreases the demand on the forests and plays an important part in their conservation. Putting this in perspective, suppose there are 100,000 untreated transmission poles, they would normally require replacing after five years, but when preserved, would last about six times as long. Over a period of 30 years this means a saving of 500,000 poles, or about 16,500 poles each year.

Some timbers have ideal physical properties for particular applications, but since they are not naturally durable, they can only be used if preserved. Till recently, for example, most of the textile shuttle blocks were made of imported hornbeam (*Carpinus* spp.), but with preservation even rubber wood has been successfully used.

If untreated structural timber deteriorates, the expense incurred is not only confined to the cost of its replacement and the additional labour cost but also to the higher cost arising through structural failures.

Though preservative treatment involves additional cost, it is clearly justified. So even the initial investment on treated wood may be high, the long term benefits are much higher.

5. What makes some timbers more durable?

No timber species is immune to decay. Some species like teak and rosewood are highly durable while others like cheeni *(Tetrameles nudiflora)*, mullilavu *(Bombax ceiba)* are perishable. However, the life-time of wood depends principally on the conditions to which it is exposed. In a dry condition, even a perishable timber may last for a longer time.

It has been shown that when extractives are removed from heartwood, decay occurs rapidly, The perishable nature of sapwood is therefore mainly attributed to lack of these substances. Generally, the higher the proporation of extractives, the greater the durability and the darker the colour. Light coloured heartwood, however, does not necessarily denote lack of durability, as seen in kumbil *(Gmelina arborea)*, myla *(Vitex altissima)*, etc.

6. Can you increase the durability of timber by injecting preservative chemicals in the standing trees ?

In a standing tree, only sapwood contains living cells. If preservative chemical is injected, it will be conducted mostly through the cells in the outer sapwood and it will not cover the entire sapwood portion. Some of the preservative chemicals may interfere with the physiology of the tree and their growth may be affected. Also, some preservative chemicals like copper sulphate are injurious and cause slow death of the tree.

7. Will high density timbers be more durable?

Contrary to a popular belief, density of wood is not correlated with durability. For example, teak, though a medium density wood (650 kg/m^3), is highly durable. Whereas, malampunna *(Dillenia pentagyna)*, pantapayin *(Canarium strictum)*, though have a density of about 650 kg/m^3, similar to teak, are perishable. Heavy density timbers like kurangu-manjal *(Mallotus philippensis)*, villunni *(Miliusa velutina)*, pongu *(Pongamia pinnata)*, having a density of about 750 kg/m^3, are perishable. Generally, durable timbers have higher density, but all high density timbers are not durable.

8. The grain of wood from trees killed with mercury (mercuric chloride) is seen very clear. Will such Wood have lower Strength ?

May be, the colour of the sapwood is enhanced because of the introduced chemical and it may contribute to the figure of the wood. The wood of such trees will have normal strength properties. However, it is advised not to kill trees with mercuric chloride.

The terms 'grain', 'texture' and 'figure' are generally used interchangeably but they mean different. Grain refers to the direction of fibres, such as straight grain, spiral grain, curly grain and interlocked grain. Texture refers to the size of the cells and their arrangement. Species like manja-kadambu *(Haldina cordifolia)* in which the cells have a very small diameter is said to be fine-textured; murukku *(Erythrina stricta)* on the other hand, has a considerable percentage of large-diameter cells and it is referred to as coarse-textured. Figure refers to the pattern produced by annular growth rings, rays, knots, and irregular colouration due to the presence of extractives in pockets.

9. Which is the best way of using the grain for strength ?

Wood is anisotropic in nature. i. e., strength of wood is directionally dependent. Strength along the grain is the highest and across the grain lowest. This strength difference is due to the cellular nature of wood and the structure and orientation of the microfibrils in the cell wall layers. Bonding along the direction of the microfibrils is stronger than between the microfibrils. It will be easier to rupture the cell wall if the load is applied perpendicular than parallel to the fibre axis (grain).

10. What is ISI Standard on wood ?

Indian Standards Institution (ISI) has, among many sectional committees, a Timber Sectional Committee (BDC 9). It includes a number of subcommittees dealing with different aspects of timber like Seasoning and Treatment, Timber Testing, Timber Grading, etc. Specifications have been brought out by I S I on different wood based products. Those who are interested to know more about the activities and the standards brought out by the I S I on wood, may contact I S I, Manak Bhavan, 9, Bahadur Shah Zafar Marg, New Delhi - 110 002.

R. Gnanaharan
Division of Wood Science

Books of Interest

The Global 2000 Report to the President of the U. S., Entering the 21st Century, 3 vols. United States Council on Environmental Quality. Study Director: Gerald O. Barney. First published 1980, 2nd printing 1981, Pergamon Press, 1527 pp. Price US $ 75.

This Report in 3 volumes totalling over 1500 pages is the result of a directive by the U. S. President in 1977 to make a study of probable changes in the world's population, natural resources, and environment by the end of the present century, to serve as the foundation of long-term planning. The study was conducted by the U. S. Council on Environmental Quality and the Department of State in co-operation with other appropriate U S. Agencies under the Directorship of Gerald O. Barney. Although undertaken primarily for and by the U. S. Government Agencies, this comprehensive study will serve as a guide for long-term planning in the whole world. It tells us what important problems we must face while entering into the 21st century, which is now only 15 years away, although the study was initiated 7 years earlier.

The study brings out projections on what changes will occur in different areas such as population, GNP, Climate, Technology, Food and Agriculture, Fisheries, Forestry, Water, Fuel, Minerals, Non-fuel minerals, Energy and Environment (Chapters 1 to 13 of Technical Report) if the present trends continue. It is important to reiterate the 'if'. It means that the projections are developed assuming that there will be no change in the present public policy; in other words, the present trends in technological progress, in population planning programmes, deforestation rate, etc., will continue. It has been stressed rightly in the introduction that the results of the study are projections, not forecasts. Forecasts are attempts to predict the future. What actually happens in future will be influenced by changes made in public policies. In projections, on the other hand attempts are made to project the trends under specified assumptions; in this case it has been assumed that the present policies will continue without major change. This limitation of the study must be borne in mind while using the data presented; the projections are not an adequate basis for detailed policy recommendations, although by pointing out what will happen if the present trends continue, they imply ways in which the future might be improved by making adequate changes in policies.

The study is unique for its comprehensiveness in the coverage of subjects and their integration, and provides a valuable data base. Unlike many other studies, the limitations of the studies are clearly brought out and discussed in detail for future improvements. Also of great value is the detailed information presented on the source of base line data used for the projections, and discussion of the methods and models used in this as well as previous projections. Volume 1 is the 'Summary Report' which assembles the important findings of the study and includes some of the chapters of the full Technical Report. It contains a summary of the major findings and conclusions running through 4½ pages. Here are some excerpts : "The worlds' population will grow from 4 billion in 1975 to 6.35 billion in 2000, an increase of more than 50 percent ....." The world's forests are now disappearing at the rate of 18-20 million hectares a year, with most of the loss occurring in the humid tropical forests of Africa, Asia, and South America. The projections indicate that by 2000 some 40 percent of the remaining forest cover in LDCs will be gone .....Hundreds of thousands of species-perhaps as many as 20 percent of all species on earth-will be irretrievably lost as their habitats vanish, especially in tropical forests... Prompt and vigorous changes in public policy around the world are needed.....If decisions are delayed until the problems become worse, options for effective action will be severely reduced".

Volume 2 is the 'Technical Report' and Volume 3 presents basic information on the models used for making the projections. Authors responsible for each projection area or chapter are identified.

Under Forestry Projection, there is a section on "The special problem of Tropical Moist Forests", considered to be the most complex ecosystem in nature. Among other problems, the lack of control that the Governments of less developed countries (LDC) have over operations of commercial loggers is listed as one of the constraints to preservation of tropical moist forests. Such analysis of the problems shows good insight of the study team into problems of all areas.

The Global 2000 Report is a very valuable basic document for resource managers, planners and researchers. As the Study Dicrector comments, it is not a prediction of doom, but a projection of world condition that could develop by the end of this century if very real problems are ignored. Let us hope that this report will reach the hands of all policymakers and get transformed into innumerable action plans.

K. S. S. Nair
Division of Entomology

Management and Utilization of Mangroves in Asia and the Pacific. FAO Environmental Paper 3. pp. I-XXI + 1 - 60. 1980. Rome.

In India mangrove areas are now confined to Cutch, Saurashtra and Bombay regions in the West Coast, certain patches in the East Coast of Tamilnadu, Andhra Pradesh and Orissa, Sunderbans in West Bengal and along the coasts of Andaman and Nicobar Islands in the Bay of Bengal. The largest mangrove forest of the Indian subcontinent is the Sunderbans, a major portion of which is now in Bangaladesh. Botanical history of the West Coast of India also points out that there were large streches of mangrove formations in Kerala also and even now relicts of it may be seen at Quilon, Alleppy, Chavakkad near Trichur and at Bakel near Kasaragod. This report prepared by B. Christensen during his assignment as Forestry Officer in the FAO regional office for Asia and Far East Bangkok deals with the mangrove resources of Asian and Pacific countries with emphasis on aspects like their utilization and management. India with about 355,500 hectares of mangrove swamps is the third largest country in this region as far as the area under mangrove is concerned. Hence this book dealing with the forestry practices and details on the development of mangrove areas no doubt is a valuable document for our country.

The book is in two parts. The first part deals with the utilization and management of the mangrove forests where emphasis is given to mangroves as promising areas for food production, forestry, agriculture, and certain other specific land-use operations. In the second part, country-wise summaries on the average yield from such resources are provided including employment potential. Each such country-wise summary covers aspects like area and distribution of the mangroves, floristic and faunistic composition, useful products, forestry practices, yield, regeneration potential, etc. Details of a case-study conducted by the author in the mangrove formations of Thailand are also given which includes quantitative description of the multiple uses of mangroves. This data is of much practical value and in India where there is no effective system for the management of mangroves, it can rightly be used for evolving such economically viable management systems. From the case study it is also quite evident that shrimp and oyster farming are two very promising fields for the better utilization of mangrove habitats without causing environmental hazards. Thus, while protecting the available mangrove swamps as a valuable heritage, similar programmes can be initiated in Kerala too with reasonable economic returns and scope for employment.

This paper-bound volume is almost free from mistakes. The bibliography compiled as its last part is quite exhaustive. Likewise, the large number of photographs included in the book give sufficient coverage of the mangrove habitats in different countries, their important floristic components, details of forestry operations and also the extraction procedures of the typical mangrove products. Incidentally, it is worth mentioning here that in recent terminology 'Mangel' is the term used to designate this vegetation type and the term 'mangrove' is applied only in a restricted sense for individual species which constitute the vegetation type.

K. K. N. Nair
Botany (Taxonomy) Division

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Recent Publications

Articles published in journals

i. **Mathew, G and K. S. S. Nair 1983.** *The bagworm, Pteroma plagiophleps Mamp. (Lepidoptera, Psychidae) spreads to the ornamental tree, Delonix regia (Boj.) Rafin in Kerala, India. Indian J. For. 6 (3): 240-241.*

The bagworm, *Pteroma plagiophleps* Mamp., an insect which was recently recorded as a pest of *Albizia falcataria* in Kerala was found to damage the shade tree, *Delonix regia*, planted along the roadside. It has now acquired a wide distribution in Kerala.

ii. **Varma, R. V. 1984.** *New records of insects damaging Eucalyptus in the nursery in Kerala, India. Indian J. Forestry 7(2): 160-161.*

Two species of insects, *Lymantria ampla* (Walk.) (Dymantri dae) and *Archips micacaenus* Walk. (Tortricidae) were found to damage eucalypt seedlings in nurseries. These insects are recorded for the first time on eucalypt.

iii. **Sharma, J. K., C. Mohanan and E. J. Maria Florence. 1984.** *Nursery diseases of Eucalyptus in Kerala. Eur. J. For. Path. 14(2): 77-87.*

Survey of *Eucalyptus* (*E. grandis* and *E. tereticornis*) nurseries in Kerala State indicate that the most prevalent diseases are damping-off, web blight and seedling blight in seedbeds and stem canker, leaf and shoot blights and *Phaeoseptoria* leaf spot in container plants. *Cylindrocladium* spp., *Rhizoctonia solani* and *Pythium* spp. are the main serious Pathogens. *P. deliens, R. solani, Cylindrocladium camelliae, C. clavatum* and *Sclerotium rolfsii* are recorded for the first time on *Eucalyptus*.

iv. **Ghosh, S. K., M. I. Mohamed Ali and M. Balasundaram. 1984.** *Light and fluorescent microscopic studies on little leaf disease of eucalypts. Phytopathol. Z. 110:207-212.*

Histopathological and cytopathological abberations detected by anatomy and staining reactions indicated the association of mycoplasma - like organisms with the little leaf disease of eucalypts in Kerala. These light and fluorescent microscopic techniques can be used routinely to distinguish between little leaf disease caused by mycoplasma - like organisms and little leaf induced by some other factor.

v. **Bhat, K.M., K.V. Bhat and P. Rugmini. 1983.** *Variation in wood and bark properties of cashew. J. Ind. Acad. Wood. Sci. 14(1):12-17.*

With a view to evaluate the timber quality of cashew (*Anacardium occidentale L.*) some of the important properties such as basic density of wood and bark, thickness and percentage of bark, fibre length and cellular proportions were studied in five selected trees. The average values for basic density, fibre length and fibre percentage were low compared with other common timbers. The variation patterns of these properties from stump to crown and pith to bark were indicated. Wood basic density mostly decreased with increasing age (distance from the pith) while fibres increased initially up to a certain distance from the pith and then decreased towards the bark in parabolic curves. There were no statistically significant differences between the three height levels (stump 50% and 75% of the tree heights), in the properties studied. It is therefore, suggested that top (crown) logs are not necessarily inferior in quality especially in strength and pulp yield.

vi. **Bhat, K V., and K. M. Bhat. 1984.** *Wavy grain in Grewia tiliifolia Vol.1 A W A Bull. n. s. 5(3):249-252.*

Wavy grain in *Grewia tiliifolia* is found to be associated with patches of abnormal parenchymatous (callus) tissue. Insect injury is evidenced to induce the formation of such wound healing tissue which is overgrown subsequently. This tissue causes deviation of grain around it. Its surface irregularities lead to the formation of grooves and ridges on the tangential surface. During recovery of normal wood structure in successive layers some abnormalities in the morphology of rays are observed. These are found to be the transitional stages which ultimately give rise to normal rays.

vii. Gnanaharan, R., G. Mathew and T. K. Damodharan 1983. *Protection of rubber wood against the insect borer Sinoxylon anale Les. (Coleoptera:Bostrychidae). J. Ind. Acad. Wood Sci. 14(1):9-11.*

Insect borers which attack rubber wood in Kerala have been listed. *Sinoxylon anale* was noted to cause serious economic loss. Treatment of rubber wood with 10% boric acid equivalent (BAE) solution containing 0.5% sodium pentachlorophenoxide by diffusion process to dry salt retention of about 0.4% BAE has been found to give protection against *S. anale* attack.

viii. Gnanaharan, *R. 1984. Evaluation of an alleyl ammonium compound as a fungicide to control sapstain and mould during diffusion storage. Int. Res. Group in wood Pres. Document No. IRG/WP/ 3282. 4p.*

An alleyl ammonium compound ('Akzo' ES 255) was evaluated for its effectiveness against mould and sapstain during diffusion storage of boron-treated rubber wood. Though ES 255 at 1.0% concentration was effective against mould (71%) and sapstain (89%), it is less satisfactory to 0.5% sodium pentachlorophenoxide against mould (92%) and sapstain (98%).

ix. Gnanaharan, R.,.S. K Ghosh and M. Balasundaran 1983. *Effect of mistletoe on the strength properties of Tectona grandis L.f. Mat and Organismen 18 (4) : 313 - 317.*

Teak (*Tectona grandis* L. f.) attacked by mistletoe, *Dendrophthoe falcata* was tested for strength properties. The modulus of rupture (MOR) and work to maximum had (Wmax) are significantly affected by the parasite attack. The wood of apparently non-infested trees had 16 percent higher MOR values and 63 percent higher Wmax values compared to wood of mistletoe-infested trees. Though modulus of elasticity (MOE) and work to proportional limit values of wood of non-infested trees were not significantly different from the wood of infested trees, mistletoe attack caused reduction in these strength properties also.

x. Mohanan,C. and J.K. Sharma 1984. *Calonectria theae Loos and its anamorph Cylindrocladium theae (Petch) Alf.and Sob-a new record on Eucalyptus from India. Curr. Sci. 53(15) : 824-825.*

A severe leaf blight disease of *Eucalyptus grandis* caused by *Calonectria theae* and its anamorph *Cylindrocladium theae* is reported for the first time from Kerala, India. The disease was so severe that within two months it defoliated prematurely the entire 1 - to 3 - year - old plants in various plantations in high elevated areas of Kerala. Severe infections also caused large scale mortality (50%) of *E. grandis* saplings in 1-year-old plantations due to repeated infections on new flushes. Symptomatology of the disease and pathogenicity of the isolate are described in detail.

xi. Chacko, K. C , E. Muhammad and T. G. Alexander 1984. *Effect of farmyard manure, rock phosphate and lime on growth and yield of Leucaena leucocephala var. K 28. Leucaena Research Reports, 5: 20-21.*

Six-month old seedlings raised in polypots were outplanted in the field at a spacing of 2 x 1m during July 1981. The plants were allowed to establish in the field before the inputs were given. *Rhizobium* inoculation was not done. Application of manure, rock phosphate (Mussoorie Phos) and slaked lime was done in September 1981. Different doses were applied in circular furrows 5 cm deep, 20 cm away from the plants and the furrows were covered with soil. Regular measurements of height were taken for 18 months and above ground fresh weight determined 2 years after planting.

xii. Nair, K. K. N. 1984 *Nomenclature corrections in the Indo-Ceylonese Mesua ferrea complex. Indian J. Forest. 7(1): 79-81.*

In India the genus *Mesua* is represented by only one species namely *M. ferrea* auct. *non* L. for which *M. nagassarium* (Burm. f.) Kostermans is the correct name. In Sri Lanka both *M. ferrea* L. and *M. nagassarium* are found. In paper a key to identify these two species is provided, corrections are made to the author citations of the different varieties under *M. nagassarium* and a new combination *M. nagassarium* (Burm. f.) Kosterm. var. *coromandeliana* (Wt.) K. K. N. Nair is proposed.

KFRI Research Reports

Ghosh, S. K., M. Balasundaran and M. I. Mohamed Ali. *Studies on the host - parasite relationship of phanerogamic parasite(s) on teak and their possible control. K F R I Research Report No. 21, Final Report of the project Pathol (NF) 01/79, January 1979 to January 1983, 39 pp.*

Teak is the major hardwood species in Kerala, grown extensively in plantations. The first plantation was established in India in 1842 by Mr. Chathu Menon in Nilambur (Kadambi 1972). Once it establishes after transplanting, teak does not have much pest and disease problem. Mistletoe, *Dendrophthoe falcata* var. *pubescens* is the most damaging parasite of teak in plantations which was noted in Nilambur as early as 1867, by Dr. Cleghorn. Some of the young plantations have been felled in Nilambur due to heavy attack of this parasite.

Though it is a serious problem, it failed to attract the attention of plant pathologists associated with Indian Forestry. Neither any effort had been made to find out the quantitative or qualitative loss of the timber due to the attack of this parasite, nor it was attempted to study the factors responsible for its epidemics. Since the time it was recorded, eradication of the parasite by lopping off the individual infested branches, is being practised by the Forest Department, under the forestry management operation.

The present study shows that in Kerala, teak is attacked by only one species of mistletoe. Parasite infestation is more in the Central and Northern Circles than in the Southern Circle and High Ranges. In Nilambur Division almost all plantations above the age of seven years are being attacked by mistletoes and in some plantations more than 85 percent trees are infested with the parasite.

It was estimated that during the period of 1980-83, in a 12 year plantation there is about 41.64 percent increment loss (GBH in cm) whereas in a 34 year old plantation it is about 37.18 percent. Also the mortality due to the parasite is about 27.27 and 1.52 percent, respectively in the 12 year and 34 year old plantations. Physical removal of the parasite during the study period (1980-83), improved the growth increment by 38.78 and 7.21 percent respectively in the above plantations; but this increment was not statistically significant. Probably the period of three years is too short for teak to gain significant increment after removal of the parasite, It was interesting to note that mortality was nil in both the plantations after lopping off the clumps from the plants, which itself is a considerable quantitative gain specially in the young plantations. On close observation it was noted that clumps of the parasite reappear due to fresh infestation during profuse flowering and fruiting period of the parasite.

Though sufficient prescriptions have been stipulated in the Forest Department Working Plans, it was impossible to eradicate the parasite. The practice remained erratic or discontinued for long periods due to various administrative and economic reasons. It is with these problems in mind management of the parasite using chemicals was planned. Due to various economic problems and lack of sophisticated high power or aerial spray technology in India, it is not possible to spray chemicals in the forest plantations. Moreover, spraying of chemicals is likely to cause serious environmental pollution hazards, specially to the dense human population near the plantations as well as to the wildlife in the plantations. Before taking up the screening of the various selective plant killers, a device for tree-infusion of water soluble chemicals was developed and standardised. Using this cheap tree-injection device, desirable quantity of the chemicals could be introduced into the trees.

Of the several weedicides tested, Afalon, Tolkan, Dalapon, Gramoxone and Sencor selectively affected the parasite. However, in the case of Afalon, Tolkan, Dalapon and Gramoxone, the parasite clumps sprouted after sometime, whereas Sencor killed the clumps even with one treatment. Sencor was effective almost in all concentrations used. During hot season Sencor produced some blotching symptoms on the young leaves and shoots of the host in higher concentration. No drastic harmful effect on the host tree was noted.

Our study shows the potentialities of using selective weedicides for managing the mistletoe problem in teak. Follow up studies on the problem of mistletoe management by chemical control needs

to be taken up in greater depth. Efficacy of more weedicides will be tested at different concentrations in different seasons. Assessment of volume gain due to treatment will be made over a longer period. Retention of the chemical in the plant will be studied using radio-tracer technique, and finally attempt will be made to calculate the cost / benefit ratio of the whole operation.

Nair, C. T S., Mammen Chundamannil and E. Muhammad. *Intensive Multiple Use Forest Management in the Tropics. KFRI Research Report 22, Final report of the project Econ. 04/1982. March 1984. 184 pp.*

Increasing awareness of the multifarious functions of tropical forests has highlighted the need to develop appropriate systems for their management. The burgeoning demands and the high density of population make it necessary to develop intensive multiple use management systems. This, however, requires a good knowledge of the existing practices and their deficiencies in fulfilling different objectives. To gather the necessary background information, the Food and Agriculture Organisation initiated case studies in representative tropical regions. This report on current management practices adopted in the case of evergreen forests and teak plantations in Kerala is the outcome of such a study. It is based on the data collected from Ranni, Konni, Punalur and Thenmala forest divisions of Quilon district. Details of the present system of management and the major drawbacks are explained. Future options as regards. intensive multiple use management are also indicated.

Alexander T. G., and M V. Mary. *Effect of Mussoorie phos on the growth of Eucalyptus tereticornis seedlings. KFRI Research Report No. 23. Report of Project : Soils 07/1981 (July 1981-December 1983), 7 pp.*

Mussoorie Phos (MP) has phosphorus and calcium as major and copper as minor constituents. Consonant with the current stress on increasing productivity in forest plantations, this project was initiated to study the effect of MP on the growth of *Eucalyptus tereticornis* seedlings.

An experiment with 0, 25, 50, 75 and 100 g MP/ kg of soil was done in sextuplicates on strongly to medium acidic surface soils (0-20 cm) from four eucalypt plantations. One-month old eucalypt seedling was grown on 1 kg soil contained in plastic pot for 19 weeks and there was good response to MP inputs as evidenced by the shoot and root dry matter yield. An in-depth experiment was conducted in quintuplicates on a medium acidic surface soil in concrete pots of 35 cm length and 25 cm diameter with control and 50, 100, 150 and 200 g MP/pot at 10, 20, and 30 cm depths. Three-month old eucalypt seedling raised in polypot was planted in each pot at 20 cm and shoot as well as root were harvested after 19 weeks. A pilot field trial in quintuplicates was run on a medium acidic soil with 0,100 and 200 g MP/seedling and after 20 months height and girth at 30 cm of saplings were measured.

Pot trial of eucalypt seedlings in strongly to medium acidic soil indicates good response to MP inputs. Concrete pot experiment on the medium acidic soil shows that 150 g MP placed at 20 cm depth has maximum effect on root growth of seedlings. Pilot field trial on the medium acidic soil discloses significant increase in girth of saplings on addition of 100 g MP/seedling. Hence, 100 - 150 g MP is recommended for application in the pit at planting time 10-20 cm deep and 10 cm away from seedling for better establishment and growth of eucalypt seedlings in medium to strongly acidic soils. As of December 1983 100 g MP costs 6.5 paise.

KFRI Information Bulletins

i. *Nursery diseases of eucalypts in Kerala and their control* (English and Malayalam), Division of Pathology (Fungal Diseases), K F R I Information Bull. No. 6, 16 pp.

ii. *Preservative treatment of rubber wood* (English and Malayalam), Divisions of Wood science and Entomology, K F R I Information Bull. No. 7 pp.

Seminars, Congress, Lectures

INTERNATIONAL

Dr. C. T. S. Nair attended the IUFRO Symposium on Effects of Forest Land Use on Erosion and Slope Stability held during 7 - 11 May 1984 at the Environment and Policy Institute, East-West Center, Honolulu, Hawaii. He presented a paper entitled 'Land Use Conflicts in the Catchment of Idukki Reservoir; their Implications on Erosion and Slope Stability'.

Dr. K. K. N. Nair. Division of Botany (Taxonomy), attended a workshop on 'Ecodevelopment of Western Ghats' at Trivandrum organised by the Department of Environment, Govt. of India and State Committee on Science, Technology & Environment, Govt. of Kerala during 11-13 May. 1984.

Dr. R. V. Varma, *(Entomology)* Sri. P. Vijayakumaran Nair, Sri. P. S. Easa *(Wildlife) and* Sri. C. Mohanan *(Pathology F)* gave lectures in a short training course on social forestry, wildlife and protection of forests. The course was organised by Kerala Forestry Department, Y M C A and Krishi Vijnankendra, Alwaye during 8-10 June, 1984.

Sri. P. S. Easa *and* Sri. E. A. Jayson, Division of Wildlife Biology, attended the All India Symposium on Animal Behaviour organised by Dept. of Zoology, University of Kerala, Trivandrum during 20-23 June 1984. Sri Easa presented a paper entitled 'Habitat preferences of large mammals in the Parambikulam wildlife sanctuary'. Sri Jayson presented a paper entitled 'Studies on the responses of wild animals to moving vehicles'.

Sri. M. S. Muktesh Kumar, Division of Botany (Taxonomy), attended a training course on 'Orchid culture' organised by the Indian Institute of Horticultural Research, Bangalore during 5-12 July, 1984

Dr. K.S. S. Nair *(Entomology)*, Dr. T. G. Alexander *(Soil Science)*, Dr. J. K. Sharma *(Pathology F) and* Dr. A.R.R. Menon *(Ecology)* participated in a seminar on 'Remote sensing techniques and its applications to various fields', organised by the State Land Use Board, Trivandrum on 9 August, 1984.

K F R I Seminars .....

Sri. M. S. Muktesh Kumar	:	Floral evaluation in orchids (12 March' 1984)
Mrs. P. Rugmini	:	Preparation of volume table (26 March, 1984)
Sri. V. N. Nandakumar	.	Application of matrics in Life Sciences (2 April, 1984)
Dr. R Gnanaharan	:	Basic principles of drying wood and application of solar energy(16 April,1984)
Dr. J. K. Sharma	:	Disease resistance in plants (30 April,1984)
Sri. T. Surendran	:	Physiology of rooting in stem cuttings (14 May 1984)
Dr. C. T. S. Nair	:	Evaluation of non-marketed benefits: the economists dilema (11 June, 1984)
Sri. M. Balagopalan	:	Organic matter fractions in soils(18 June, 1984)
Dr. K. S. S. Nair	:	Pest control and balance of nature (16 July. 1984)
Dr. K. M. Bhat	:	Super quality industrial wood from intensive forestry (30 July, 1984)
Sri. C. Mohanan	:	Toxins in plant diseases(13 August,1984)
Sri. N. Sasidharan	:	Biological keys (27 August, 1984)
Sri. P. S. Easa	:	Thermoregulation in elephants (10 Sept., 1984)
Sri. Thomas P. Thomas	:	Soil erosion (24 Sept., 1984)

Forthcoming events of 1984-'86

February 1985. BRAZIL. IUBS Working Group on Significance of Species Diversity in Tropical Forest Ecosystems, Massaus.

Contact : IUBS Secretariat, 15 bd de Mont morency, 75016, Paris, France.

February 21-28, 1985. INDONESIA. 3rd Round Table Conf. on Dipterocarps, Smarinda (East Kalimantan).

Contact : Dr. G. Maury - Lechon, 1 WGN Secretariat, 16 rece Buffon, 75005, Paris, France.

May 1985. AUSTRIA. Symp. on Seed Problems under Stressful Conditions, Vienna.

Contact : J. Nather, Federal Forest Research, A - 1131 Vienna, Austria.

June 1985. INDIA. 2nd Indo-Pacific Symp. on Invertebrate Reproduction, Madras.

Contact : Prof. K. G. Adiyodi, Secretary ISIR, Dept. of Zoology, Calicut University Calicut, Kerala 673 655, India.

August 5-10,1985. BRAZIL. 4th Int. Workshop on Resistance of Trees to Harmful Agents (insects and diseases), Curi tiba.

Contact : K. Von Weissenbery, Finnish Forest Research Institute, 3 F - 77600, Suonenjoki, Finland.

August 12-16, 1985. SWEDEN. 7th Int. Conf. on the Global Impact of Applied Microbiology (GIAM VII) Stockholm.

Contact : Prof. H. G. Gyllenberg, Chairman. Organising Committee (GIAM VIII), Department of Microbiology, Univ. of Helsinki, S F - 00710, Helsinki 71, Finland.

October 14-20, 1985. JAPAN. Meeting on Crown and Canopy structure in Relation to Productivity, Tsukuba.

Contact : T. Fujimori, Forestry & Forest Products Res. Int., P. O. Box 16, Tsukuba Norin Kenkye Danchi - Nai, Ibaraki 305, Japan.

Nov.13 - Dec. 23, 1984. INDIA. Int. Training Workshop on ecotaxonomy and diagnostics of agricultural insects and mite pests in the oriental region, Agra. (in collaboration with Com. Inst. of Entomology)

Contact : Dr. Ipe M. Ipe, Course Coordinator and Administrator, School of Entomology St. John's College, Agra, U. P,, India.

August 24-29, 1986. YUGOSLAVIA, 4th Int. Symp. on Microbial Enology, Ljublijana.
Contact : Prof. France Megusar, Biotechnical Faculty, E. Kardalji Univ. of Ljublijana, Jamnikarjeva 101, 61600, Ljublijana, Yugoslavia.

August 25-29, 1986. THE NETHERLANDS. 3rd. European Cong. of Entomology, Amsterdam.

Contact : Dr. C. Davids, Dept. of Aquatic Ecology, Univ. of Amsterdam, Kreislaan 320, 1098 S M Amsterdam, The Netherlands.

September 7-13, 1986. U. K. 14th Int. Cong. of Microbiology, Manchester.

Contact : S. Glover, Dept. of Genetics , University of Newcastle, Redley Bldg., New Castle upon Tyne, NEI 7RU, U. K.

Campus news * Campus news

Joined K F R I recently

Scientific Staff

K. Jayaraman, Ph. D — Scientist (Statistics)

Technical Staff

P. K. Thulasidas, B. Sc — Laboratory Assistant (Wood Science)

Left K F R I recently

Administrative Staff

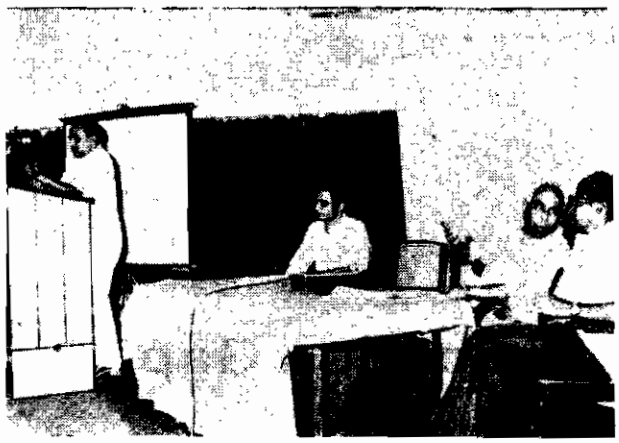
T. G. Ananthanarayanan — Office Assistant (Accounts)

Smt. N. Sarojam, Library Assistant, has proceeded on study leave to join M. L. I. Sc. course at Madurai Kamaraj University, Madras on 28 August, 1984.

The field station of Wildlife Division at Idukki connected with the Multipurpose River Valley Project in Kerala, a project sponsored by the Department of Environment was wound up and the project staff *Sri. K. K. Raveendran* (Research Fellow) and *Sri. James Mathew* (Field Assistant) left the Division.

Sri. P. Vijayakumaran Nair participated in the demarkation of boundary of the proposed Nilgiri Biosphere during 13-16 September, 1984.

Workshop on Nursery diseases and pests of eucalypts in Kerala and their control



The workshop, jointly organized by the Divisions of Pathology (Fungal Diseases) and Entomology, was held at Peechi on 10 April, 1984. The workshop was inaugurated by Sri M. Sivarajan, Chief Conservator of Forests (Development). In the morning Subject session, illustrated lectures were given by Dr. J. K. Sharma (Nursery diseases of eucalypts and their control) and Dr. K. S. S Nair (Pests of eucalypts and their control) and discussions held with the participants.

In the afternoon the participants visited a demonstration nursery raised by the Pathology Division at Pattikad where a comparison was shown of a nursery raised with standard nursery practices and the one in vogue. In the latter occurrence of various diseases and their symptoms besides poor growth of seedlings were shown. Method of assessing germinability of seeds and quantity of seeds required per bed, correct method of sowing, preparation of fungicidal solution and proper way of treating the seedbeds were demonstrated. Entomology Division demonstrated a method of treating the beds and seedlings against ants and caterpillars. Method of treating the container seedlings with insecticide solution for preventing termite attack in the field was also demonstrated.

A total of 97 participants from Kerala Forest Department, Kerala Forest Development Corporation and Forestry School, Walayar attended the workshop.

Bridging the Communication Gap

Forestry practices were primarily based on the knowledge gained by foresters through observation and experience in the field. The complexity of the increasing problems in forestry necessitated the creation of institutions devoted entirely to research. But the lack of proper interaction between the practising foresters and the scientists and the existing functional separation between them brought in a communication gap warrranting concerted efforts to promote better understanding. Seminars, symposia and workshops are helpful for this to some extent. Publications, like Evergreen, KFRI research reports are better means of communication. Though these publications provide an outlet for scientists to communicate, the forest managers seldom get an opportunity or time to respond effectively. The Institute intends to overcome this by organising regular interaction meetings.

The first interaction meeting was held on 11 September 1984. About 40 personnel from the Kerala Forest Department including Chief Conservator of Forests, Conservators, Dy. Conservators, and Asst. Conservators participated. Dr. P. N. Nair, Chief Conservator of Forests (Development) chaired the meeting. In the opening remarks, the Chief Conservator of Forests, Sri. M. Sivarajan, stressed the need for a closer interaction between forestry scientists and practising foresters and highlighted some of the problems confronting forestry in Kerala. An overview of the silvicultural research in Kerala was given by Dr. P. N. Nair. Dr. S. Kedharnath, Director, KFRI gave a general account of the research activities of the Forest Research Institute, Dehra Dun. Developments in the fields of Silviculture, Wildlife, Ecology, Soil Science, Entomology, Pathology, Botany, Genetics. Wood Science, Statistics and Economics were described and there was an open discussion on the relevance of these to forestry in Kerala.

KFRI Research Reports

No. 1 * Easwarankutty K; Sivarajan M. and Asan, R. B. 1977. Study on wood and bark volumes of eucalypt trees in Kerala. Final Rep. Res. Proj. Stat. 03/77, 27 pp.

No.2 (1) * KFRI. 1977. Availability of wood raw-materials for plywood industry-Kerala-Karnataka Region. Final Rep. Res. Proj. (Sponsored by the Federation of Indian Plywood and Panel Industry), Part-1, 117 pp. (Mimeographed).

No.2 (2) * KFRI. 1978. Availability of wood raw-materials for plywood industry-North-Eastern Region. Final Rep. Res. Proj. (Sponsored by the Federation of Indian plywood and Panel Industry), Part-2, 85 pp. (Mimeographed).

No. 3 * KFRI. 1978. Dipterocarps of South Asia. Final Rep. Res. Proj. sponsored by FAO, 637 pp. (Typewritten).

No. 4 Alexandar, T. G; Sobhana, K; Balagopalan, M. and Mary M. V. 1980. Taungya in relation to soil properties, soil erosion and soil management. Final Rep. Res. Proj. Soils 01, 1977, 24 pp.

No. 5 KFRI. 1980. Studies on the changing pattern of man-forest interactions and its implications on ecology and management : A case study of the Reserved and Vested Forests in Attappady, Kerala. Final Rep. Res. Proj. (Sponsored by the Department of Sci. & Tech., Govt. of India), 235 pp. (Mimeographed).

No. 6 Nair, K. S. S. and Varma, R. V. 1981. Termite control in eucalypt plantations. Final Rep. Res. Proj. Entom 01/76, 48 pp.

No. 7 Alexandar, T G; Balagopalan, M; Thomas, P. Thomas and Mary, M. V. 1981. Properties of soils under teak. Final Rep. Res. Proj. Soils 02/1977, 13 pp.

No. 8 Alexander, T. G.; Balagopalan, M.; Mary, M. V. and Thomas, P. Thomas 1981. Properties of soils under eucalypts. Final Rep. Res. Proj. Soils 03/1977, 12 pp.

No. 9 Nazma; Ganapathy, P. M.; Sasidharan, N.; Bhat K. M. and Gnanaharan, R. 1981. A Handbook of Kerala timbers. Final Rep. Res. Proj. Wood 01, 1979, 260 pp.

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