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# Evergreen

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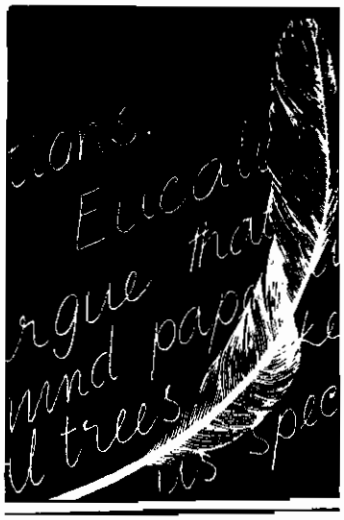

**OPINION PAGE**

The Editor,

Had the March issue of 'Evergreen' and happy to read the perspectives on the application of modern debarking tools and techniques. However, the conclusion that our present system of debarking is uneconomical due to the use of primitive types of tools and disregard of training workers for the purpose, seems to be erroneous. As far as our experience goes, in Kerala debarking never becomes a problem of economics, since it does not come in the picture of logging operation at all. Owing to the fire-wood scarcity, the local fire-wood hungry people, with the consent of concerned, debark the logs either at the transportation stage or at the timber depots and mill-sites. Hundreds of people eagerly waiting for the truck-loads to come for collecting the bark is a common sight everywhere near the timber depots and mill-sites. These people although untrained for debarking are very efficient in that process with the help of locally made tool called 'uli' (in northern Kerala) which certainly is similar to the 'newly designed debarking spud' illustrated in the article.

**– C. Mohan**
Division of Pathology (Fungal Diseases)

*The following reply has been received from Dr. K. M Bhat in response to Shri C. Mohan's letter - Ed.*

The Editor,

This is in response to Shri C. Mohan's comments on my article entitled "Some alternative tools and improved techniques in logging: 1. Debarking". (EVERGREEN No. 10 (1983). I appreciate the point he brought out in his letter that bark is increasingly becoming important among the rural sector as a source of fuel for cooking. However, his statement "in Kerala debarking never becomes a problem of economics as it does not come in the picture of logging operation at all", in my opinion, does not qualify for Timber Harvesting Technology. It is surprising to note that he was not convinced with my description that debarking is a part of logging operations, no matter it is done at the felling site, during transportation or in the mill. There is no reason why we should not go for appropriate technology for extracting bark with more intelligence and adequate planning particularly when it is the concern of not only timber contractors, mill owners but also of foresters. It may be worth mentioning here that debarking in *Eucalyptus* is done at the felling site itself. Further, he argues that rural people, although untrained, are very efficient in debarking with the help of locally made tool "uli" which is, according to him, similar to 'debarking spud'. One regrets, however, in his argument of the absence of mention of technical details, design for productivity, safety of forest worker and ergonomics, which are the salient features of debarking tools recommended in the article.

**- K. M. Bhat**
Wood Science Divison.

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hope, will contribute a great deal in making people cognisant of forest conservation. It is encouraging to note that the State Committee on Science and Technology has decided to make a conscious effort in creating environmental awareness among the citizens and as a first step in this direction successfully organised a seminar. In the seminar a paper entitled "A blue-print for environmental education in India" by Shri K. Ravi of Centre for Environment Planning and Technology, Ahmedabad, which outlines in detail the need and structure of environment education at primary and secondary level is worth mentioning here. It indicates that clear and effective provisions for public participation and involvement should be there and unless this is achieved mere environment consciousness will have no meaning. We do hope unlike other seminars where action seldom ensues afterwards, necessary steps will be taken towards achieving our goal in environment consciousness. It may not be out of place if I quote the words of Richard St. Barbe Baker "If a man loses one third of his skin, he dies. If a tree loses one third of its bark it dies. If the earth loses one third of its trees it will die".

❑

As in the past our readers are reminded to send their opinion, comments, suggestions or queries on the material published in EVERGREEN or otherwise for the 'Opinion Page' as this is one way of generating interaction. With this issue of Evergreen we are introducing another feature- an up-to-date list of KFRI Research Reports and Information Bulletins. It will be updated and included in the coming issues of the Newsletter.

# Division of Botany (Plant Taxonomy)

Studies related to identity, nomenclature, classification and distribution of plants of Kerala forests come under the perview of the Division of Botany (Taxonomy). These aspects are of paramount importance for research not only in Botany but also in various disciplines of Forestry.

The division is actively involved in six research projects apart from the extension work rendered to various institutions in and outside Kerala and to the State Forest Department. Among these projects the establishment of a herbarium covering flora of Kerala finds the first place. So far over 3000 plant specimens representing most of the tree species of Kerala forests have been collected, identified and stored. Valuable materials exchanged from Botanical Survey of India and French Institute, Pondicherry are also included in the collection. This herbarium collection will be of immense value in the preparation of flora of Kerala state.

Along with the study on species diversity of our forests and their proper taxonomic identity, their distribution is also being studied. In this regard a detailed study on distribution of important tree species in the forests of the central circle of Kerala has been taken up. This work will bring out detailed distribution maps of the important tree species which will be highly useful in the management and exploitation of the forest. Preliminary investigation has revealed endemic trees, such as *Parinarium travancoricum and Ormosia travancorica,* which are yet to catch the eye of the forester, as useful timber species. On completion of the study a list of lesser known species will be suggested for domestication trials.

As the flora of Kerala forest is immensely rich in medicinal plants it provides the raw material to several pharmaceutical industries and Ayurvedic pharmacies in our State. Work on exploration of our forests to make a first hand study on the medicinal plant wealth and its documentation is in progress. A separate herbarium for the medicinal plants of Kerala forests is under preparation. The most useful part of this project is the live collection of commercially important medicinal plants of Kerala forests, which is being established at the KFRI Campus, Peechi. So far 225 plants have been established in the garden. Propagation trials of some of the medicinal plants, eg. *Hemidesmus indicus, Ipomea mauritiana, Plumbago indica, Indigofera tinctoria, Alpinia galanga* which are in great demand, have yielded encouraging results.

Fig. 1. Mounted herbarium specimen of a medicinal plant, *Gloriosa superba.*

Apart from these studies of general nature, the Division is also carrying out research on specific groups of plants. A project on the orchids, which are becoming rare in our forests as a result of extensive deforestation, envisages their collection, identification and maintenance. Already about 70 species have been collected, including a few endangered ones, such as *Oberonia brachyphylla* Blatt. McC., *Pecteiles sussanae*(L.) Rafin, and *Vanilla wightiana* Lindl. This study will not only help in taxonomical studies but also for future breeding work with commercial objectives.

Another study on the canes of Kerala forests is of current importance, in the context of great demand

Fig. 2. The famous medicinal plant - *Tylophora indica*.

and their dwindling stock in our forests. Investigations related to taxonomy, distribution, phenology and anatomy of the nine reported species of *Calamus* are in progress. Promising results have been obtained on seed germination studies. The seedlings of various species of canes are being raised for a live collection in the campus.

Recently the Division has initiated work on the preservation of *Dalbergia* spp. in Kerala by establishment of a germplasm bank, under a project sponsored by the Department of Environment. Except for *D.*

Ffg. 3. *Dendrobium crepidatum* - a beautiful epiphytic orchid.

*latifolia*, the rosewood yielding species, our knowledge on the identity and distribution of rest of the 15 species in the State is scanty. This project is intended to prepare a detailed taxonomic account of all the available species of *Dalbergia* with distribution maps. A germplasm collection of all the species will also be maintained in the Institute.

**- Division of Botany (Plant Taxonomy)**

# Tropical Forestry - India to Play the Key Role

*Mr. R. H. Kemp, Forestry Adviser, Overseas Development Agency, U. K. was interviewed on 4 February 1983 by Dr. C. T. S. Nair, Dr. S. K. Ghosh, Dr. R. Gnanaharan, and Dr. J. K. Sharma on behalf of Evergreen. Excerpts form the interview are given here-Ed.*

* * *

*Evergreen:* Mr. Kemp, based on your experience in the tropics, what should be the priorities in forestry in India?

*R. H. K.* : The priorities have already been well identified by India itself. I think a lot of emphasis need be put on social forestry and community forestry to meet the needs of people for fuel, fodder and other products. There is an unquestionably great excess of demand over supply and the highest priority should be to achieve a balance.

*Evergreen:* Production can be enhanced by converting more of the natural forests into plantations as well as by enhancing the productivity of existing plantations. Which one should be given priority?

*R. H. K.* : I think intensification of production is the key to get the quantity of material needed. The main emphasis should be to raise efficient and highly productive forests on degraded land, deforested land and on land which is now under very open scrub forest rather than clearing good natural forests to make way for plantations. I consider the introduction of high yielding species into deforested lands as the best and probably the only safeguard for the remaining natural forests

*Evergreen*: In 1960's forestry planners were advocating a forest based industrialization strategy. Currently there is more emphasis on forestry for people. What way the shift has affected the emphasis on practice of forestry?

*R. H. K.* : I suppose it is affecting the thinking about forestry. It is a little early to affect the practice. This is coming very strongly. I think in particular of aspects in my own field of tree breeding where until very recently virtually no thought was given to breeding trees for use by people other than through the industries. All the effort has gone to the improvement of trees for industrial purposes. This was very evident during 3rd World Consultation on Forest Tree Breeding, the last major consultation attended by all the world tree breeders. Until the third or fourth day no one mentioned fuel wood.

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But when the table showing the uses of wood was put out, unquestionably the major use was as fuel; yet no breeding has ever gone into their selection and improvement. Although the amount of scientific effort one can put into it is limited by the end value of the product, nevertheless, effort has to be made for this. I hope the genetics conference to be held in Delhi at the end of the year will be looking into the breeding of multi-purpose species. Necessarily this switch in emphasis is required to meet the needs of people more efficiently.

*Evergreen:* In the case of extensive man made forests, tree breeding is no doubt economical. Demand for fuelwood is widely dispersed and the species involved are very large. Will enough funds be available to invest in breeding under such conditions?

*R. H. K.*: The key word here is investment, which has been lacking in Indian forestry. It is not lack of technical knowhow or lack of trained people. To meet the problems which have already been recognised, investment in social forestry and in research and training should be increased. Use of trees in relation to agricultural crops as single trees is different from their use as population of trees, and all these needs to be studied, to find out their exact role in social forestry.

*Evergreen:* Experience in the agriculture sector indicates that, despite the existence of a large number of species, most of the investment in breeding is directed towards a handful of species. Considering that foresters have to deal with a large number of species, can we expect that the amount of investment required to examine the potentialities of each and every species will be really forthcoming?

*R. H. K.:* Yes. I think potential number of species is very large when compared with the few which have so far been raised under forestry for intensive use. As a production system, forestry has a very long future; before the energy crisis there was a general proposition that forestry as a producer of industrial raw material has only a limited life. Now there is every reason to believe that as long as forestry is efficient, it will be valued for its low energy input and high productivity of useful material. The investment can come over a period of time and we can undertake the work step by step, with a few, species at a time. This, I think, will happen now with the new interest in forestry as a whole.

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*Evergreen:* Agroforestry has been suggested as an appropriate form of land use in many situations in tropics. Do you anticipate any problems in implementing agroforestry?

*R. H. K. :* Agroforestry is a broad term covering a number of land use systems and each system may have specific problems. This will be of two kinds. The first category is concerned with the technical aspects associated with these land uses. Until very recently this has not been studied in detail. This need to be tackled on a pantropical or even a wider basis. Ways of managing combined crops of trees and agricultural crops either simultaneously or successively and their net benefits, individually and in combination, need to be studied. This is something which has never been done sufficiently although there is a long tradition and many claims are made for the productivity of the combined crops. The major problem will therefore be to sort out how the system is working, how efficient it is and how it could be improved. The other problem, namely social acceptability, is something very much local and can be tackled with proper communication, education and persuasion.

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*Evergreen:* Coming to research in tropical forestry could you please indicate the priorities?

*R. H. K. :* This is a very difficult question to answer honestly, because everyone has his own specialization and preference. Equally everyone has his own large areas of ignorance. From my experience, silviculture and tree breeding should be an area where the priorities should lie. Another important aspect will be utilization of wood and unquestionably vast benefit can be gained by more efficient utilization of wood at every stage, in the industry, in harvesting and in the use of wood by people for their own immediate needs. Even simple methods of preservation could prolong the life of building materials. These aspects of utilisation must be given prominence in the immediate future so that resources are made go farther and to reduce pressure on the remaining forests. This must go hand in hand with intensification of production through better silviculture and tree breeding.

*Evergreen:* What is the involvement of O. D. A. in forestry activities?

*R. H. K.:* O. D. A. is involved in forestry mostly in tropical countries in Africa, Asia, Latin America and the Pacific. Our role, I think, is very much in the field of technical co-operation where through training or through provision of people with right experience and right specialization we can assist countries

# Public Awareness for Forest Conservation

The famous Tamil Poet, Thiruvalluvar said "Forest with cool shades also form part of the defence of a country". But now the existence of these very forests, which took several million years of evolution to stabilize and form important part of our environment, are in danger. In Kerala the reserve forests occupy just about one fourth of the geographical area; area under natural forests fell from 100,000 ha. in 1961 to 93,000 ha. in 1981. Statistics shows that in the period 1901 to 1971 about 26% of the forest cover has been removed. Large stretches of land covered with trees are still being cleared under various deforestation programmes for growing commercially important species. Now the situation is that our country has 22.2 per cent of geographical area under forests against the optimal 33.7 per cent. But it is perhaps not erroneous to assume a still smaller figure for the existing forest cover because of indiscriminate illegal felling for timber and encroachment which must have also contributed to deforestation. Though the factors leading to this kind of destruction of forest are numerous, population pressure, scarcity of fuelwood and ignorance of people are the few important ones. Of these, the first two factors have already drawn attention at the national level. In this column the attention is focussed on the last one. Deforestation is not a matter of concern to very many people as it does not affect them directly. They are completely unaware of what exactly is happening to our natural system that supports us.

Ecology consciousness relates to man's awareness of his relation to the nature of which he is a part. In this world no creature, animal, man or plant lives alone; everything and everybody depend. on others for survival. The existence of forests depends upon people and their healthy interaction with them. In this regard it will be essential for an individual to know clearly what part he should play in it. Though we could foresee future industrial demands and raise plantations on large scale we failed to envisage the great thrust of the people on the forests due to various factors. The forestry education and training given to the forest department personnel, who are responsible for protection and care of forests, has not been very adequate in achieving their goal because it does not involve people. Time has proved that without involving common people, we can not save our forests with force; it has to be dealt with philosophically.

In the wake of ever-receding forest cover in our country and its adverse impact on our environment, India needs a massive programme of public education to help the entire nation become conscious of the magnitude of deforestation and to focus attention on conserving our forest wealth. Along with scientific planning for protection and better utilization of our forests we have to develop suitable methods to make people, young and old, rich and poor, aware of environmental conservation. An awareness about forests has to be created among people, whether living in or around or away from the forests, similar to agriculture, if not more. As it now stands people consider forests are only for timber, firewood and wild animal. Now those times have gone when children were told stories like "there was a woodcutter who used to fetch firewood from a nearby forest....." or "there lived a lion in a dense forest.....", certainly they have to be told something more than this. Forest conservation has to be taught from childhood itself to make them understand and realize its significance. Schemes such as envisaged by Society for Wasteland Development in Tamil Nadu for the integration of nutritional meal programme for children with school forestry schemes to achieve the twin objectives of providing education in ecology to children and meeting the fuel needs for the meal programme should be encouraged. Besides school education, role of parents and other family members in inculcating an awareness towards nature, environment / ecology should also not to be overlooked. This way it will not only be a real beginning of environmental education in an individual but also will remain as the foundation throughout his life and we can be assured of a long life for our forests.

In Kerala, environmental concern rose in a big way only after nationwide attention was focussed on Silent Valley. Now in many parts of the State, forestry clubs organised by Sastra Sahitya Parishad and other organizations are coming up which, we

to make efficient use of their own forest and human resources. This has been the main field and probably this may be the reason why O. D. A. has not been very active in forestry in India because India has a very large body of trained foresters and the need for outside assistance and technical services are much less than many other countries.

*Evergreen:* What is the proportion of aid that goes to support forestry compared with the total aid budget?

*R. H. K.:* It is very very small, about 1% of the bilateral aid programme. I think this has to be qualified by saying that other areas of aid, say in the field of engineering involves much higher cost. If you are constructing a dam or building a power station or steel mill obviously in monetary terms it is very much more than if you are providing some training programme and technical co-operation in forestry. But nevertheless, there are applications for larger amount of funds and at the moment I am in India in connection with the appraisal of projects, jointly with the Indian Government, on social forestry in Karnataka and also its receptacle provision of material to industries. But most of our inputs are in technical co-operation.

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*Evergreen:* How much of the amount goes for research activities in forestry?

*R. H. K.:* I can't answer that exactly, I am afraid. There are two ways in which we finance research. One is by Central funds which are aimed at particular problems of importance to, probably, several countries. And this we directly allocate to forestry. There is also some research done at the request of individual countries and that is more difficult to quantify. I think our expenditure on research could be quite a large proportion of the total expenditure on forestry.

*Evergreen:* Is this the first time that O. D. A. is financing establishment of facilities for forest products research?

*R. H. K.:* No. We have been involved in assisting countries in establishing forest product laboratories in the past and this is something in which the Princes Risborough laboratory has been involved for a large number of years. It is certainly less in our total programme in forestry than assistance to production forestry. But nevertheless it is something we have been involved.

**India has enormous amount to offer to the rest of the world in teaching forestry. This will be particularly so in social and community forestry. Models which are going to be developed here under the pressure of all the problems are going to be immensely valuable to other countries.**

*Evergreen:* Getting aid to set up Wood Science Division here will really go a long way in training people in the field of Wood Science. What other areas do you think, where collaboration with U. K. and India will be useful?

*R. H. K. :* There may be a number of different aspects across the field of forestry. I think, the Government of India is in the best position to see where it would like to have assistance. India has enormous amount to offer to the rest of the world in teaching forestry. This will be particulary so in social and community forestry. Models which are going to be developed here under the pressure of all the problems are going to be immensely valuable to other countries. This is where collaboration, say for example between the Commonwealth Forestry Institute and the Indian Institutes, could be very valuable. Joining together, they could probably make it valuable to other countries too. What is happening in India is going to happen in other countries, very soon if it has not already happened. Models developed in China which has similar problems are not directly transplantable to other countries because Chinese model is peculiar in social and political ways whereas in India you have a wide spectrum of an open democratic society which has to work through all normal difficulties of interaction between people. Out of these will come new models of social forestry which will be very useful. This will be one field for collaboration which I believe the whole Commonwealth not just India and U. K., can be involved in.

*Evergreen :* Thank you Mr. Kemp.

**Macronutrient status and biomass** for ten teak plantations (0.5–9-yr-old) on different site classes and a mature forest stand which preceeded them in Western Llanos of Venezuela indicate that in mature forest most N, P and Mg are stored in the soil, whereas 70% of the K and 40 - 50% of the Ca are stored in the vegetation; the ecosystem K stores of the teak plantations are an average of 40% lower than in the original forest. The study suggests that substantial amounts of Ca will be removed from the site by the teak harvest after the forest rotation and base depletion will lead to a reduction in teak productivity which is more pronounced and will first be noted on highly productive sites situated away from the rivers. On the other hand, the nutrient stores of sites in the same topographic position but with lower site quality will undergo less dramatic changes. On these sites the harvest losses are only modest when compared to the nutrient inputs. On all soils at a low topographic position near rivers, the continuous rotation of teak can be established without soil deterioration. (For. Ecol. Manage., 6 (1): 33–57 (1983).

**Bark probe** - an instrument for measuring thickness of eucalypt bark consists of a modified solid brass cylinder through which moves a plunger tipped with a blunt needle. The needle is pushed through the bark to the wood surface and the depth of penetration is read from a scale on the barrel. The instrument enables fast and accurate measurements of bark thickness to be made on gum, peppermint and stringybark eucalypts. The measuring technique is virtually non-destructive and is simpler and more accurate and precise than other commonly used techniques, including the Swedish bark gauge. (Aust. For., 45 (3): 206-208 (1982).

**To improve decay resistance,** against *Gloeophyllum trabeum, Lentinus lepideus* and a white rot fungus *Coriolus versicolor,* wood of Southern pine and Sweetgum were chemically modified with isocyanates, isothiocyanates, and phenylhydrazine. Reaction of wood with phenylhydrazine resulted in weight gain of 2 per cent and an increased nitrogen content. Nearly complete protection (weight loss of a few percent) was shown when modification, expressed as weight gain, exceeded 10 percent. Though wood modified with both allyl isocyanate and methyl isocyanate showed improved decay resistance, the effect was greater in the former than in latter. (Wood Science, 15 (2): 81-89 (1982).

**Basal area growth and yield** of the forest stand can be estimated by the application of the logistic curve. Graphic analysis with the basal area growth data, from permanent sample plots in red pine (*Pinus resinosa* Ait.) plantations of southern Ontario, exhibited reverse logistic trends. The parameters of the reverse logistic function were estimated by nonlinear regression techniques. Freese's chi-square test was employed to determine the accuracy of the resulting estimates of basal area growth and yield. Results, from the data used here, indicate that the function not only fits the data well but also has high predictive power. (Can. J. For. Res., 13 (2): 289–297 (1983).

**Integrated Pest Management (IPM)** is facing a major problem of interdisciplinary nature. Given the psychosocial problems inherent in interdisciplinary co–operation, an obvious question is what are the prospects for the effective implementation of IPM? This question is pursued by examining the research literature on two broad topics: the psychosocial factors that influence the ability of research scientists to co-operate effectively in interdisciplinary groups; and the ability of forest managers to integrate conflicting information into coherent pest control strategies. It is concluded that the psychosocial problems involved in these activities are numerous while the ability of researchers and forest managers to overcome them is somewhat rudimentary. Misunderstanding, or intolerance of the scientists working in a team of interdisciplinary research was evident in their unwillingness to develop integrated goals and an impatience to get on with their specialized research. (Prot. Ecol., 5 (3) : 253 – 267 (1983).

**Volumes of individual trees** are estimated using a volume-age-diameter function. This method circumvents measurement of tree heights through the use of age which, however, restricts the application of the function to plantations or forests whose age is predetermined. Analyses with stem-analysis data from red pine (*Pinus resinosa* Ait.) plantations of southern Ontario indicate that the function estimates tree volumes more accurately than the standard methods commonly used. (Can. J. For. Res., 13 (1) : 32 – 39 (1983).

# Some Alternative Tools and Improved Techniques in Logging: 2. Felling, Limbing and Crosscutting

Felling, limbing and crosscutting are some of the important operations in logging. The types of tools and methods used in the operations play a significant role in reducing wood wastage and ease in operation.

In India most widely used tool for felling is the traditional axe which varies in size and shape from region to region. A typical malabar axe is shown in

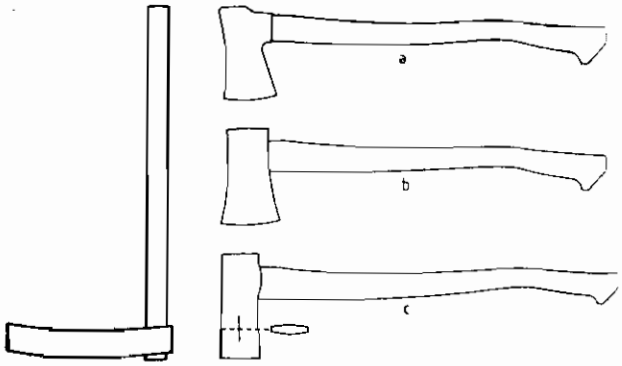



*Fig. 1. Malabar axe; Fig. 2. Better designed axes*

Figure 1. In place of this axe, different better designed axes can be used for higher efficiency and ease of work. For felling and crosscutting some alternate tools such as chainsaws and felling levers are also recommended here.

1. **'Better designed' axes:**. Three types of 'better designed' axes are illustrated in Fig. 2a, b, c (by permission of a major manufacturing company, FISKARS, Mammerhemin tie 14 A, P. O. Box No. 235, SF 00101 Helsinki 10, Finland).

| | Model | Weight of head (kg) | Width of head (mm) | Length of axe (mm) |
|---|---|---|---|---|
| a) General type (Fig. 2-a) | Large | 1.4 | 93 | 650 |
| | Small | 1.1 | 83 | 600 |
| b) Chopping axe (Fig. 2-b) | Large | 1.2 | 105 | 650 |
| | Small | 0.9 | 90 | 610 |
| c) Splitting axe (Fig. 2-c) | | 1.5 | 75 | 720 |

These axes have the following advantages over the traditional ones.

1. They are designed for the productive straight-back working.
2. The handle design is better for directional aim, absorbing shock and reducing impact vibration. Further more, handle knob ensures non-slip grip for work safety.
3. Hammer design is favourable for pounding.
4. The long double coned eye makes the joint between handle and head firm (Fig. 3).
5. The edge is sufficiently wide for chipping and correctly shaped for splitting.

**Chainsaws:** Use of chainsaws in felling and crosscutting is becoming common because wood wastage is less compared to axes and it is less strenuous from the point of view of work physiology. However, in India it is not so popular probably with the assumption that chainsaws are not suitable for cutting our large tropical hardwoods. Recently, it

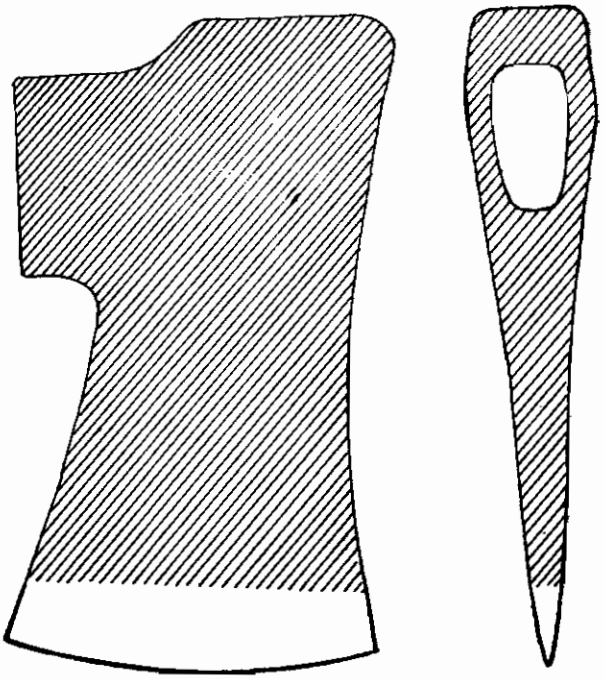
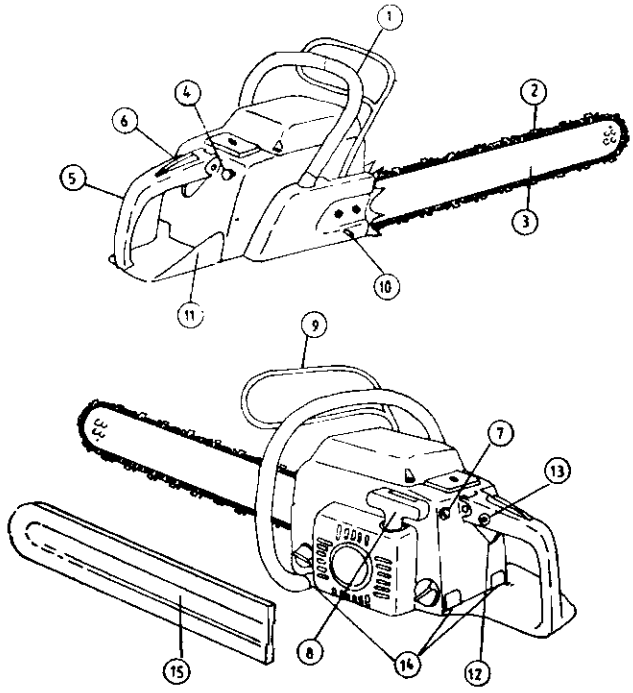


*Fig. 3. A better designed axe showing long double coned eye.*

has been shown that they work to the fullest satisfaction even for larger trees if appropriate techniques are used in logging operations. Although currently they are not being manufactured in our country, all essential spares and service are available. If it is widely introduced in our forestry, local manufacture should not be a problem.




*Flg. 4. 1. Front handle; 2. Saw chain; 3. Guide bar 4. Choke; 5. Rear handle; 6. Throttle; control lockout; 7. On/off control; 8. Starter; 9. Front handle guard with chain brake; 10. Chain catcher; 11. Rear handle guard; 12. Throttle control trigger, 13. Throttle control latch; 14. Antivibration device; 15. Guide bar cover.*

Most chainsaws are similar in design. The main parts are illustrated in Fig. 4 (source: FAO Training Series - 2; Chainsaws in tropical forests, FAO and ILO, Rome 1980. - with the permission of FAO of the United Nations). On 5 litres of fuel and 2 litres of chain oil a chainsaw will run from half a working day to a whole working day, depending on the cutting time.

**Safety devices:** Working with a chainsaw can be dangerous. Modern chainsaws therefore have several safety devices. For example, front handle guard with chain brake protects left hand and stops saw chain during kickback; chain catcher catches chain if it breaks; rear handle guard protects right hand; throttle control lock out prevents saw chain from starting to move unexpectedly; antivibration devices prevent vibration diseases of the hands; guidebar cover avoids injuries during transport of chain saw.

**Felling lever:** An additional tool required in using chainsaw is felling lever (See Fig. 5) (FISKARS). It is a multipurpose tool which can be used for several logging operations like felling, limbing, debarking and loading as shown in illustrations.

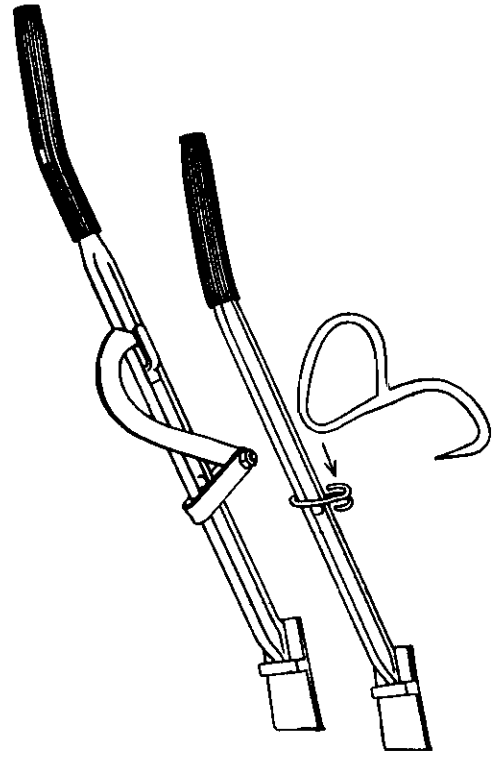


*Fig. 5. Felling levers*

Technical specification (FISKARS):

| Model | Weight (kg) | Length (mm) |
|---|---|---|
| No. 19340 | 2.4 | 800 |
| No. 19300 | 1.4 | 650 |

This lever has good ergonomic design for productive straight-back working position and accident preventive grip with vulcanized rubber handle.


Fig. 6 Cut the bushes and lower branches to clear a safe working space; Take a steady leg spread position for efficient and safe working.



Fig. 7 - 8 Lift up the axe, keeping right hand near axe - head for good aim and to save muscular power. The right hand positions the axe and slides down till the hands are together when hitting the tree. Also twist the body and transfer your weight from right to left leg, thus putting weight of the body behind the blow (learning both right hand and left hand grip makes work easy and efficient).


Fig. 9 Stay in a firm position when limbing (debranching). Proceed from the closest branch. Hit close to the stem, always away from your legs, in the same direction the branch bends.

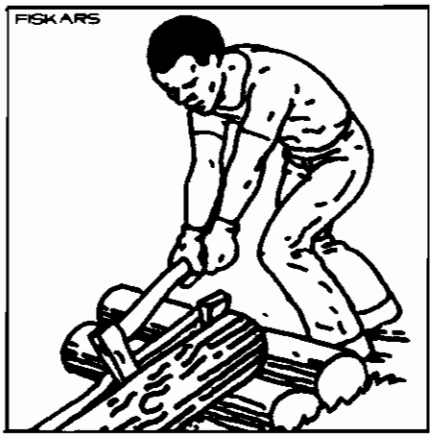



Fig. 10 Use two cross logs when splitting. Never split against the bare ground. Use a wedge also when splitting thick logs.

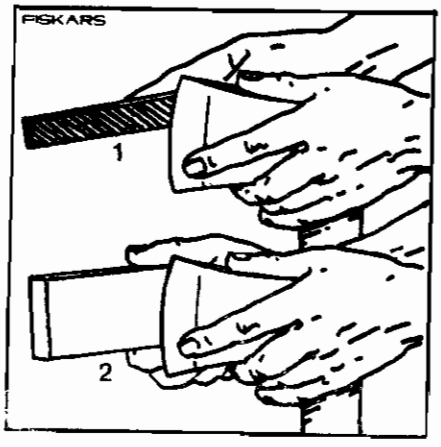



Fig. 11 Day to day maintenance: Use a whetstone only (several times daily) Major periodic sharpening: Reshape the axe, using a file, into the original shape. Do the rough sharpening with a file. Finish the edge with a whetstone.

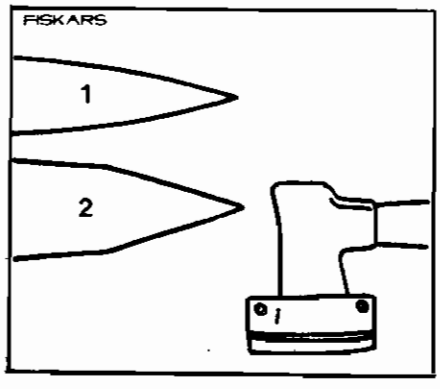
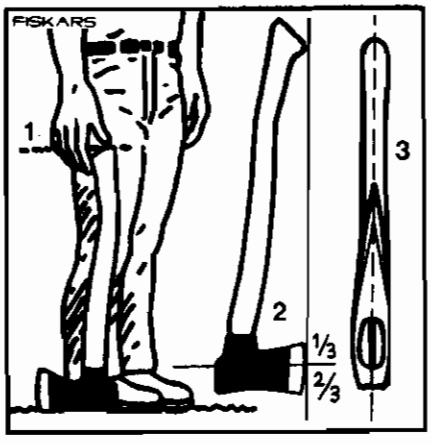



Fig. 12 The Limbing axe is sharpened into a rounded shape (1). The splitting axe is sharpened into a straight shape (2).



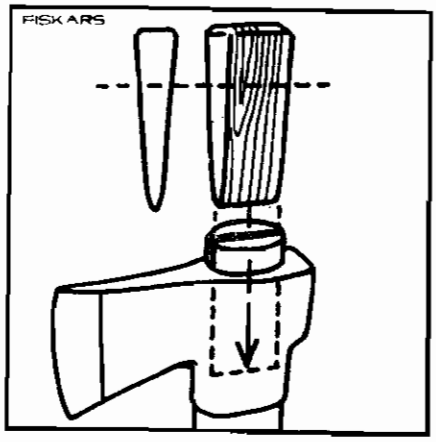




Fig. 13 Proper length of handle (1) correct position of handle (2-3).
Fig. 14 Make the wedge of hard - wood across the growth rings. The wedge should be equally wide at both ends. (Hit the wedge with flat side of another axe. Saw off protruding part of handle and wedge, leaving over a length of 0.5 cm.)

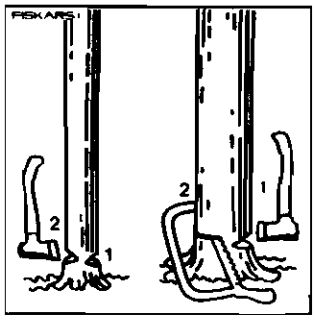



Fig. 15 The undercut (1) determines the direction of fall. Make the backcut (2) higher up the tree than the bottom of the undercut.

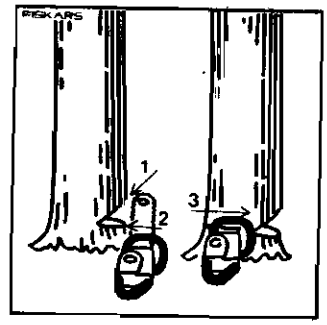



Fig. 16 First make the upper incision (1) of the undercut and then the lower incision (2) and lastly the backcut (3).

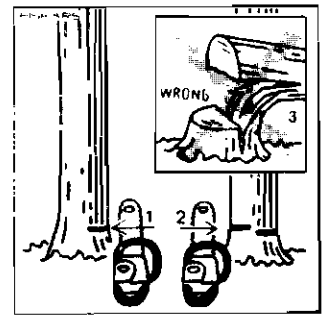



Fig. 17 For small trees a low incision (1) with a chainsaw is enough for an undercut. Make it deep enough to avoid splitting (3).

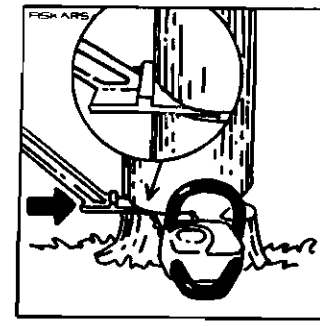



Fig. 18 Insert the felling lever as soon as possible. Leave 2-3 cm hinge to ensure felling direction.

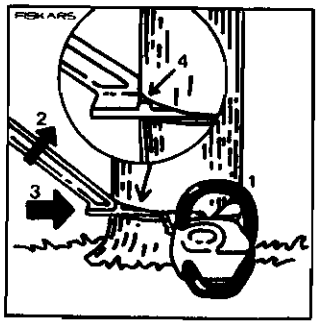



Fig. 19 Then continue to cut (1) lift the lever (2) and push it deeper (3) till the tree rests on the step (4) remove saw.


Fig. 20 Use your leg muscles and keep your back straight. When tilting with the felling lever.

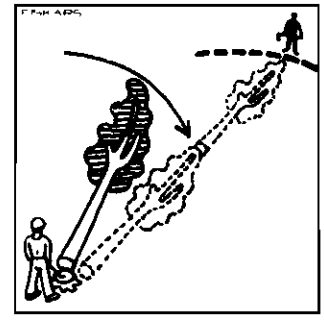


Fig. 21 The safe area for other people is outside a circle twice the length of the felled tree in radius.

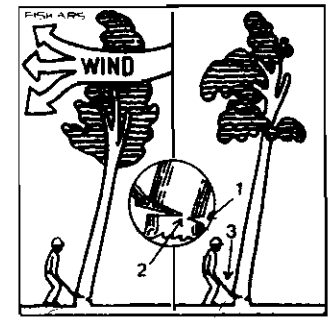



Fig. 22 Felling against the wind or against the natural falling direction of the tree requires a good undercut (1) a felling hinge (2) and a felling lever (3).

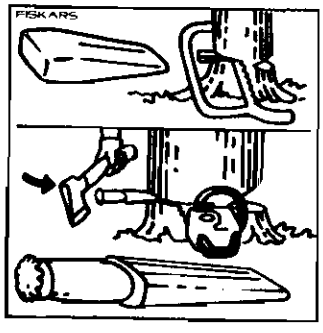



Fig. 23 Wedge can also be used. Insert the wedge before the saw gets jammed.

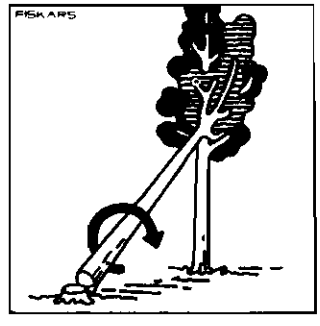



Fig. 24 Release a hang-up by cutting it completely loose from the stump, and then turn the trunk with the felling lever.

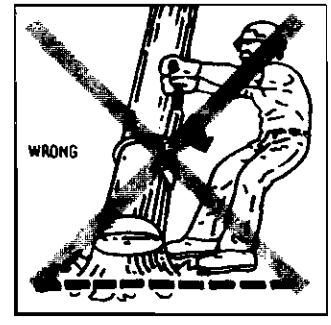



Fig. 25 Never stay where a hung-up tree can fall or roll on you.

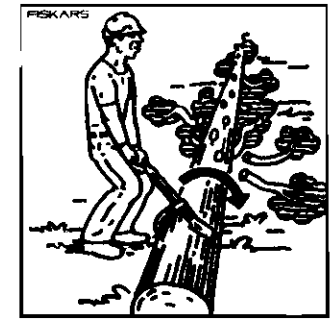



Fig. 26 When the tree has been limbed, turn the stem around with the turning hook of the felling lever.

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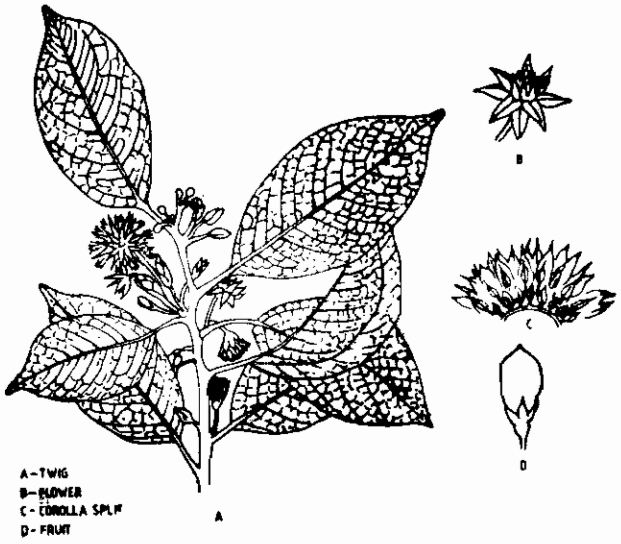
# *Mimusops elengi* Linn. (Elengi)

*Mimusops elengi* (Family: Sapotaceae) known as Elengi in Malayalam is a large evergreen tree with a dense crown of shining coriaceous leaves. The tree is known as 'Kesara' and 'Sinhakesara' in Sanskrit, 'Mogadam' in Tamil, 'Pogada-in-anu' in Telugu and 'Halmadhu' in Canarese. It is reported to be growing naturally in tropical evergreen forests of West Cost in South India, Andamans and Burma. It is often cultivated in gardens as an ornamental tree and as a sacred tree in some of the temples in Kerala.




Leaves of this tree are used in treating headache. The powdered leaves form one of the constituents of good tooth powder. A decoction of the astringent bark is a useful gargle in diseases of the gums and teeth and fevers. It is also used in treating discharges from the mucus membranes of the bladder and urethra. A 29.3% bark extract decoction contains 6.8% tannin. Some Caoutchoue, wax, colouring matter and 9.4% of ash are also obtained from the bark. The volatile oil obtained from the flowers by distillation is a stimulant and is used as perfume. The flowers are utilized in the preparation of a lotion used in treating wounds and ulcers. The dried flowers are powdered and used as snuff to relieve head-ache. As the flowers are fragrant they are used for making garlands and for stuffing pillows. Powdered ripe fruits are mixed with water and given to promote child birth. The fruit pulp is astringent and used in curing chronic dysentery. The pulp of the mature fruit is edible and contains a large amount of sugar. The seed kernels yield 16-25% of an edible oil, which is also used in painting and lighting.

The tree attains a height of about 25 meters and a diameter of about 65 cm. The bark is dark grey and rough with vertical fissures. The thick grey suber on the older branches separates in irregular scales, leaving isolated attached portions, the inner surface being red and coarsely striated with white specks. Leaves are dark green, alternate, elliptic-oblong or oblanceolate with inconspicuous nerves and undulated margins. Flowers are creamy white, fragrant, small, star shaped, axillary or solitary or in fascicles. Sepals are 8 in number arranged in two series, the four exterior ones being leathery. Corolla tube is short and fleshy with double series of segments. The corolla usually fall off in the form of showers. Stamens, 8 in number and staminodes are lanceolate in shape. Fruit, a berry, ovoid and smooth, becomes orange yellow in colour on ripening. Seed, 2.5 cm long, is solitary, oblong and compressed with a smooth greyish brown shining hard testa.

The wood of this tree is commercially called 'Bullet wood'. Sapwood is pale reddish to brownish white. Sharply defined heartwood is deep red to dark reddish brown. Growth rings are distinct. Wood is very hard, heavy and seasons well. It is easy to saw, takes good polish and very durable. The wood is used in construction of buildings, bridges, boats, furniture, agricultural implements, musical instruments, tool handles and walking sticks.

The tree regenerates well under shade. Flowering is from February to April and fruits ripen during February to June in the following year. It is best propagated by sowing seeds singly in baskets and planting two year old seedlings in the field during the rainy season.

In Kerala forests the trees of *M. elengi* are seen only very rarely. This tree with immense medicinal value requires special attention of the Forest Department. Though it is a slow growing tree sincere attempts should be made to propagate them, lest they might disappear from our forests once for all.

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# Rural Institutions for Development of Appropriate Forestry Enterprises: A Case Study of Institutions Involved in Tarditional Reed Industry in Kerala

The choice of techniques in the production process is a seriously debated issue among planners and policy makers eversince its relevance in development planning has been understood. Earlier attempts were primarily directed at identifying technologies appropriate to factor endowments in a given situation, totally ignoring the role of institutions. In the ultimate analysis, how institutions are organised and decisions are made influence technological choice, appropriation of benefits, etc. Appropriateness of institutions has become a focal point of study in forestry in the context of the role assigned to the sector in local community development. The Food and Agricultural Organisation has initiated the preparation of a conceptual framework and guidelines for development of appropriate forestry enterprises. Necessarily such an attempt has to be made on the basis of performance of existing institutions. A case study of the institutions involved in reed based industries in the erstwhile Travancore-Cochin region in Kerala was undertaken to provide illustrative material for the purpose.

Reed based traditional industries such as matweaving, basket-making, etc. play an important role in the rural economy of Kerala. Reed industry is one of the major household activities in the non-factory sector. This provides full time or part time employment to about 3,00,000 workers belonging to the socially and economically backward sections in society, particularly scheduled castes and scheduled tribes. Important products, centres of production and end uses are given in the Table 1 below.

Apart from these major centres household production of baskets, mats and other householdwares is found in a smaller scale all over the region.

Reed-based activities developed as a leisure time/off season activity which helped in supplementing income from other activities. Proximity to raw material sources and markets provided ideal conditions for undertaking production on a household scale. Receding of reed bearing areas and increased distance to markets have brought changes in the industry. Being a product of low value/bulk ratio, profitable operation is possible only if economics of scale in transport are taken advantage of. A household operating independently has inherent limitations in increasing the scale of activity and hence incapable of realising scale economies. Increased demand from bulk markets provide an ideal situation for the operation of intermediaries. Although they fulfill an important role by way of organising supply of raw material and marketing of products, illiterate and poorly organised workers become an easy target for exploitation.

*Table 1. Reed Industry in Travancore - Cochin Area*

| Products | Centres of production | End uses |
|---|---|---|
| 1. Mats | (a) Angamaly-Kalady | Dunnage material in ware-houses |
| | (b) Aryanad-Nedumangad | partition walls, roofing etc. in. temporary construction and |
| | (c) Pathanapuram–Punalur | drying of grains, pepper etc. |
| 2. Baskets | 1. Thalappilly Taluk | Fruit baskets and |
| | 2. Harippad-Karunagappilly Vithura | fish baskets |
| 3. Table mats | Irinjalakuda-Kodungallur | Dining table mats and wall hangings. |

Institutions such as the Kerala State Bamboo Corporation (a goverment undertaking) and co-operative societies formed by reed workers have been established primarily to eliminate intermediaries and to ensure that a larger share of the value added accrues to workers. Kerala State Bamboo Corporation, established in 1971, is the most important government agency involved in reed industry. There are 15,000 weaver families registered with it and the Corporation supplies raw material to them and markets the mats procured from them. In addition, the Corporation is responsible for collection and supply of reeds to all traditional users in the Travancore-Cochin region. Thus, in the traditional sector Bamboo Corporation plays a pivotal role.

There are about 40 co-operative societies involved in the manufacture of reed products. Co-operative societies can be categorised as service societies and workshed societies. Service societies provide necessary support to household producers by organising supply of raw materials and marketing of products. The workshed societies are directly involved in production and their activities are more integrated. Except those undertaking table mat production, all societies involved in traditional reed industry are harijan societies and now their activities are being co-ordinated by an apex society, the Kerala State Harijan Girijan Co-operative Development Federation.

A detailed study on the technological, economic organisational and institutional aspects was undertaken to assess the appropriateness of the above types of institutions. Appropriateness was defined on the basis of the contribution towards. (1) satisfaction of basic needs, particularly those most in need, (2) reduction in dependency through self-reliance, (3) preservation of ecological balance, (4) reduction of social, economic and political inequalities and (5) enhancing the social identity of individuals

The technology currently adopted in reed industry is adaptable and highly labour-intensive. Except table mats and wall hangings, all other products directly or indirectly cater to basic needs. Production is primarily carried out by women and the income that accrues directly contributes to household consumption needs. As regards preservation of ecological balance, reed collection to meet the low demand from traditional users has no serious adverse effects. Only mature reeds are suitable for mat and basket-making and the selective cutting seldom causes resource depletion.

More than the technology *per se.,* it is the way in which the institutions are organised that determines the contribution of an activity towards the objectives identified earlier. Establishment of the Bamboo Corporation has more or less eliminated the intermediaries and has enhanced the share of income accruing to reed workers. However, the heirarchical structure of the Corporation does not permit workers' participation in decision-making. The employer-employee relationship that has developed now could affect decisions pertaining to choice of techniques, diversification of production, etc.

Although co-operative societies provide an ideal framework for democratic functioning, in reality, active participation by members in decision-making is an exception. Class and caste stratification that exists in society permeates the co-operatives, undermining the objectives of their formation. In some cases co-operatives are controlled by traders and other intermediaries. The few isolated instances of success is almost entirely due to the commitment and leadership qualities of important office bearers and not due to the collective strength of the members.

Financial viability of the Bamboo Corporation and co-operative societies depend to a great extent on the assistance provided by government. But for the subsidised supply of reeds from the government forests, the Corporation would not have been able to operate profitably. The co-operative societies also depend on government for share capital contribution, grant for purchase of land and construction of office building and worksheds, grant to meet expenditure on pay and allowances of managerial staff in the initial years, etc. Dependency on government assistance makes these institutions less self-reliant.

Both institutions and technology can not remain static, but have to evolve in response to changing social, economic and political environment. Stability of the institutions depends on their adaptability to changes and whether they continue to fulfill the objectives for which they have been established. It would appear that government support is essential for all the institutions studied. Left to themselves they have to respond to market forces which may necessitate adoption of technologies which are less appropriate. Otherwise they tend to whither away facing severe competition. Net output generated in the traditional reed industry is very low and it faces severe competition from the modern sector, particularly pulp and paper. Improving the internal structure of the institutions, although necessary and useful in the short term, can not solve the basic problems arising from the socio-political environment in which they have to function.

– Division of Forest Economics

# The Unique Phenomenon of Resupination in Orchid Flowers

Orchidaceae stands unique among the other monocot families, owing to their mode of growth, formation of flowers, and seed production. All orchid flowers possess some kind of modification with regard to its floral parts, especially the lip or the labellum, which morphologically is the median petal. The structural diversity of flowers in orchids can be attributed to the methods of pollination found in the family wherein the flowers appear to be in an upside down position due to the phenomenon called 'Resupination'. Resupination is the rotation of the floral axis into 180° as a result of which the adaxial (upper) side of the flower becomes abaxial (lower) (Figs. 1, 2a). But in *Malaxis, Oberonia, Satyrium* etc., a double resupination takes place and the flower rotates 360° (instead of the usual 180°) at its axis and attains the original position quite different from their related genera (Figs. 2 b, c, d, e).

Lee, in 1765 defined the resupination as 'the upper lip of the corolla looks towards the Ground and the under lip towards the Heaven' (Ames, 1946). While closely examining the floral development of some of the orchids such as *Phaius grandifolius* and species of *Calanthe,* the transitional stages occurring in the phenomenon of resupination can be observed. In bud the lip with its spur is adjacent to the inflorescence axis. At maturity, the lip by gradual twisting of the pedicel comes to upside down position, making the flower thus morphologically confused.

Regarding the median petal, Ames (1938) has rightly commented "in the bulk of orchid species the labellum owes its satisfying position to a twist of 180° in the ovary or pedicel, proof enough that it is in reality the uppermost member of the perianth, rendered the lowermost by some vagary of nature, or shall we say, a sympathetic physiological response to the behaviour of those food seeking insects which accomplish pollination". In species like *Goodyera* it is possible to trace in the flower buds every stage of ovarian torsion and curvature between the adaxial position of the labellum and the axes and complete resupination of the perianth in the developmental stages. In certain cases the twisting can be noticed in the inflorescence axis itself. It may be either clockwise or anticlockwise as in *Spiranthes,* in which the inflorescence takes the shape of a spiral. This is as a result of torsion in the inflorescence axis itself at first, and then the ovarian twisting.

Many theories have been put forward to explain the phenomenon of resupination in orchidaceae. But none of them provide satisfactory explanation. It is generally maintained that the ovary or the pedicel twists because of the weight of the lip, thus supporting the law of gravitational force. Since this is an universal phenomenon in orchids it may be presumed that it is due to the result of spontaneous evolution, convergent evolution or a trait attained independently. The explanation of resupination as due to the force of gravitation has been refuted by Ames (1946). He observed a very interesting feature in *Catasetum.* In the female flowers of this orchid the lip was found to be on the upper side, and in the male flowers the lip was on the lower side. In the former the lip was heavy and large while in the latter the lip had lesser weight. In cases where both male and female flowers were borne on a single raceme, the lip of the female flowers was uppermost and the male flowers had resupinated lip.

Resupination in orchids has no taxonomical significance. It is only a morphological peculiarity seen within this group. Generic and specific limit cannot be determined based on the position of the labellum or extent of resupination. John Lindley had erroneously arranged orchid genera based on the position of labellum considering in part resupination as a generic character. Similarly, Harry Bolus, in his treatment of South African orchids, recognised resupination as a sectional character. If taxonomists are to take the resupination as a character for establishing sub-tribes, alliances or species, then in *Spiranthes gracilis,* and *Spiranthes cernua,* several new varieties will have to be brought forth, as in these species the recemes twist in various ways (Fig. 2f). In the group Neottinnae, Mansfeld argues extreme simplicity among monandrous orchids. The labellum in some is uppermost throughout the genus or a group of genera as in Cranichideae, which is characteristic of the formative genera. Sometimes in our effort at simplification we ignore the integration of fundamental traits which serve as a guide towards differentiation.

A phenomenon termed as pseudoresupination has been described in a tropical species *Trichopilea suavis* by Ames (1947). In this species the inflorescence is lateral, arising from the base of the

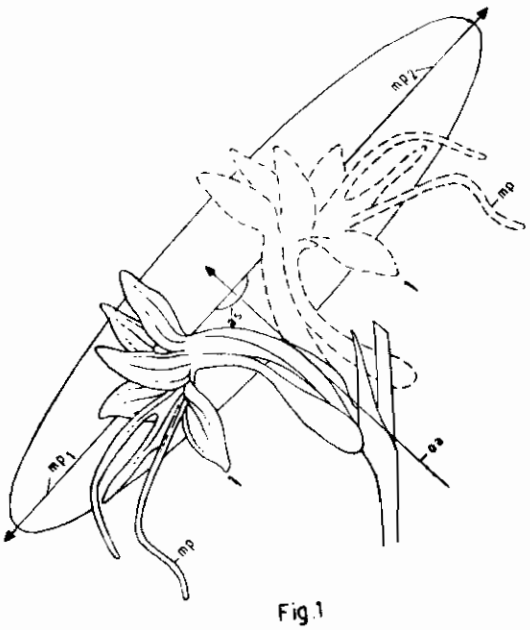


Fig.1

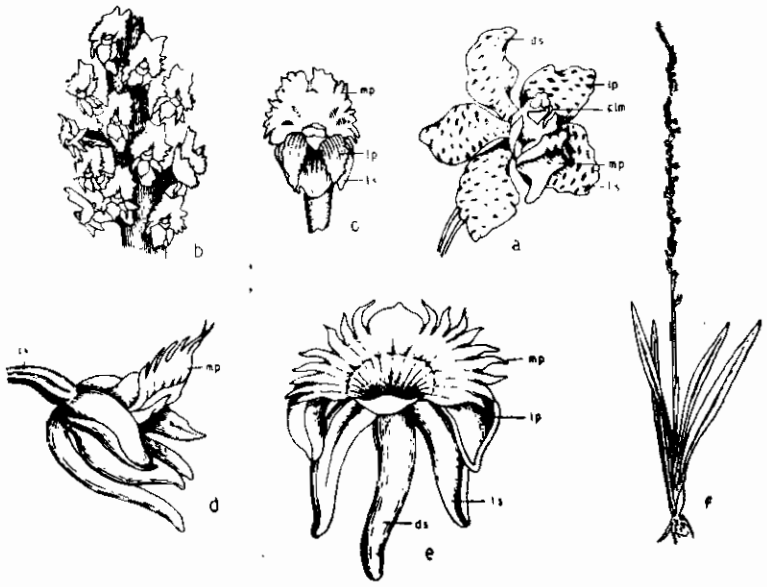


Fig.2

Fig. 1. An overlay of two flowers of *Habenaria siamensis* showing the position of floral organs in a resupined flower (1'A) and the would be position of floral organs in a non-resupined flower (1 B).

as – angle of resupination; $mp_0$ – median petal (labellum); $mp_1$ and $mp_2$. – position of the labellum in resupined and non – resupined flowers; Oa – ovarian axis.

Fig. 2 (a – f). Resupination in Orchid Flowers. 2a. Typical Orchid flower of *Vanda tesselata* showing the labellum in the lower position, 2b, c; part of the inflorescence and a flower of *Oberonia viridifolia* showing the labellum at the top position, 2d, e; two aspects of the flower of *Malaxis versicolor* showing the labellum on the upper side, 2f; A plant of *Spiranthes sinensis* showing the twisting of the inflorescence axis and that of flowers. (ds. - dorsal sepal; *ls.* - lateral sepal; *lp.* - lateral petal; *mp.* - median petal; (labellum); *clm.* - column; *ov.* - ovary).

pseudobulb. When the inflorescence axis emerges, it rests closely on the substratum. It has three flower buds which remain crowded in the early stages of development by the slight twisting of the pedicel. The lateral flowers get adjusted in such a way that the lip takes the lower position until the flower attains maturity. When the flowers become mature the pedicel and ovary curve upwards and the lip is brought into a position so as to facilitate cross pollination. In *Phaius longifolius* the flowers are normally resupinate; when the buds mature, it will be pseudo-resupinate owing to the complete absence of twisting.

Though different views have been expressed the exact cause of this odd but fascinating phenomenon of resupination in orchid flowers is yet to be substantiated beyond doubt. However it may not be wrong to presume that it is the result of co-evolution between plants and insects serving as an adaptation for cross pollination.

1. Oakes Ames, 1938. Bot. Mus. Leafl. Harv. Univ. 6 : 145 – 183.

2. — 1946. A. O. S. Bull., 15 : 18-19.

3. — 1947. A. O. S. Bull., 16: 370-372.

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# Management of Moist Evergreen Forests Through Selection System - An Appraisal and Need for Data

It is now increasingly recognised that a programme for maintaining and replenishing forests is indispensable to provide a satisfactory basis for their long term exploitation. With these broad objectives forest management took its origin. However, when management is introduced, the first consideration of silviculture is the regeneration or establishment to ensure that the exploited or senescent trees are replaced in greater quantity and quality to the limit of full stocking or to establish a fully stocked crop of desirable species. The principles governing the choice of a system of silviculture are, therefore, on the one hand be adapted to environmental conditions and on the other meet the requirement of good management. Thus, they are of two kinds viz., biological and economical.

Based on these guidelines a number of silvicultural systems were evolved like 'clear cutting system', "shelterwood system", "selection system" etc., with their modifications here and there. The present treatise is restricted to selection system and its impact on forest management.

The silvicultural treatment of the tropical moist evergreen forest is a comparatively new phenomenon. Although as early as 1906 improvement fellings were introduced in Andaman islands, India, which in so many fields of tropical silviculture has been the source and inspiration for current practices around the world, made a comparatively little impression on managing these complex communities.

Moist evergreen forests in India are confined to two major areas, the southwestern Peninsula and northeastern India excluding the Andamans. The moist evergreen forests are considered as renewable resources and they serve as a storehouse for railway sleepers, and as raw materials for wood based industries. To sustain an uninterrupted flow they are seldom clearfelled and the commenst silvicultural system adopted in southwestern India is the Selection System which has been in vogue for nearly three decades. In essence, it envisages the removal of mature, usually the largest or oldest trees, as scattered individuals, repeated indefinitely, by means of which continuous establishment of reproduction is encouraged and an uneven stand maintained. During the process of selective extraction, the exploitable girth class, the felling cycle and number of trees to be removed in a given unit area are the major criteria employed. Where necessary, selection felling is followed by tending which involves climber cutting, weeding to free regeneration, and girdling or felling in the understorey to raise the height of lower canopy. Artificial regeneration may also be employed after logging. By this method, it is generally believed, that the evergreen nature of the forest is not endangered and there is no setback in the ecological status on account of over exploitation and that the bumpy nature of the canopy is never permanently damaged. The girth limit is generally 180 cm. at breast height and felling cycle usually 30 years. The maximum number of trees permitted to be removed from any one hectare, during each felling cycle used to be 8 to 12 in number. However, due to increasing pressures and in areas with a preponderance of overmature trees a shorter felling cycle is adopted and sometimes even the number of extractable species are violated beyond the prescriptions of Working Plans, thus endangering the continuity of operations

The selection system which helps to maintain an uneven aged stand has the following assumed advantages and disadvantages.

**Advantages:**

1) It ensures gross production whether measured in biological or economic terms thus making way for increase in merchantable yield.

2) It offers stability of environmental conditions that is not available in even aged stands.

3) It helps to maintain a continuous cover of a protection forest on steep slopes in order to prevent erosion, landslides, avalanches or rapid run off.

4) The danger of fire is less since the fuels are shaded.

5) It is generally regarded as being less susceptible to damage by biotic enemies like fungi, mistletoe etc.,

6) It ensures the presence of a permanent seed resource.

7) Due to vertical closure of the stand damage due to wind is reduced. However, by creation of extensive gaps wind can funnel and accelerate sufficiently to cause great damage.

**Disadvantages:**

1) The progress of regeneration and the condition of the growing stock are often submerged and hence more difficult to evaluate the results of operations.

2) It is necessary to cover a larger area to harvest a given volume in one operation.

3) It reduces the productivity of the forests by contributing to dysgenic selection. While this risk is of unkown magnitude it is probably difficult to avoid even under intensive application of the method.

4) Environmental factors like shade, root competition, microclimate etc., would be subjected to drastic fluctuations which may retard natural regeneration of important species.

5) During the process of logging a lot of damage is done to the surrounding trees and the gaps caused depend upon the height of the tree and size of the crown. And when large gaps are created, they are colonised by heliophilous pioneers like *Macaranga, Leea, Chromolaena (Eupatorium), Lantana*, etc., which are difficult to exterminate.

6) The complexity of operation is such that it repuires supervisory skill and attention by an experienced and efficient forester.

As seen from the foregoing, the balance sheet is not clearly in favour of Selection System. Yet, it is being adopted on the assumption that this is the best workable system available at present.

The Working Plans generally provide the guidelines regarding the areas to be worked systematically. Besides, they also indicate the marking as well as felling rules to be adopted.

Studies on the impact of Selection System are few and far between. Even where such studies are ongoing they are mostly confined to an assessment of logging damages and regeneration status of the extracted species. Unfortunately, in India no study has been carried out on this aspect. A project entitled "Impact of selection felling in a forest ecosystem in Kerala" has been sponsored by the Department of Environment, Government of India to the Kerala Forest Research Institute with the author as the investigator.

The main objective of the project is to evaluate the likely ecological disturbances, due to selection felling along the following lines:

a) As this system is meant to ensure and perpetuate the regeneration of workable species, the regeneration status of such species will be ascertained.

b) Since the regeneration of the species is directly dependent upon microclimatology, the changes that are likely to be brought upon due to selective felling will be investigated. Some of the broad paramaters are atmospheric and soil temperature, relative humidity and soil moisture.

c) Consequent to the tampering of the top canopy the intensity of light available to the various strata will vary. Data on the incidence of light available to various strata will be generated.

d) Due to logging operations the structure of plant community is likely to undergo changes and hence the dynamism of the forest will be studied along with the phenological pattern.

e) An assessment of the damages to seedlings and coppices due to logging operations will be done.

This task is no less gigantic in magnitude and when carried out will pave way for a rational management of the tropical moist evergreen forests of the western ghats of India. While projecting this problem the author lavishly seeks exchange of scientific information.

**- K. Balasubramanyan**
Division of Ecology

# Books of Interest

**PLANTATION FORESTRY IN THE TROPICS. By Julian Evans,** Clarendon Press Oxford, 1982. XV + 472 pp.

Although plantation forestry has a long history in the tropics, large scale afforestation is of recent origin. Considering the diversity in environmental, social and economic conditions, generalisations have serious drawbacks. Nevertheless, it is useful to provide an overview of forestry activities especially those related to man-made forestry. The information gap in this respect has been bridged quite effectively by Julian Evans through his book, 'Plantation Forestry in the Topics'.

Dr. Evans combines his experience and information gathered from the vast literature to compile a useful reference book. The book is divided into four parts. The introductory part deals with the positive and negative factors favouring plantation development, general history of plantation forestry in the tropics and its present status. Part II includes chapters on planning plantation development and the general social and economic factors that need to be taken into account while undertaking man-made forestry. Plantation Silviculture, the core of the book, is covered in Part III, Silviculture and management of man-made forests covering selection of species, collection of seeds, nursery practices, site preparation, maintenance, protection, thinning, and harvesting have been dealt with exhaustively. Aspects such as integration with other land uses, protective afforestation, afforestation of difficult sites, and ecological factors affecting long term productivity are presented in part IV.

The bibliography which contains about 540 references, is particularly useful for those who are interested in gathering more information on any specific aspect.

The main strength of the book arises from its comprehensive coverage of all aspects of silviculture and management of plantations in the tropics. The author has illustrated the various principles based on situations that actually exist. However, a bias in favour of highlighting instances of success of plantations is evident while failures tend to be treated as isolated instances. Although the author recognises the fact that "..... principles and practice of application well entrenched in temperate forestry are on the whole less clearly defined, less well researched, and perhaps are less widely applicable to the multitude and variety of tropical situations' (P.VIII), the overall message emanates tend to advocate large scale plantation forestry. Admitting the fact that "much of this book is concerned with the success and increasing importance of forest plantations", the author attempts to "provide a balanced account" (P. 403) of certain issuses concerning monoculture in chapter 22. The discussion on the effect of plantations on habitat diversity, displacement of other ecosystems, susceptibility to pests and diseases and long term site productivity however turns out to be an unbalanced dismissal of criticisms as insignificant, and not based on adequate information. Where adverse effects are obvious the author stresses that "plantation forestry, as in agriculture, allows greater opportuniiy for diseases and pest management and, again as in agriculture, breeding for resistance and use of sophisticated techniques of cultural, chemical and biological control must be pursued" (P,416).

Social and economic impacts of plantation development have been dealt with superficially, the justification being that the book cannot deal with the question of development strategy and ethics. Nevertheless, the readers are told that social benefits from plantation development are significant. Table 6.3 (P.102) lists the benefits from forestry and there is an implicit indication that all these are realisable from plantation forestry also. Considering the fact that more than 50 percent of the plantations raised in the tropical region are intended to meet industrial demand (P 41), their usefulness to local communities is rather limited. Even fuel plantations raised under social forestry schemes tend to be utilised to meet industrial requirements. In passing it is stated that "there *may be* some social costs of forestry" (P. 100), but it is contended that few studies have been made on these, Although the author himself cites a number of examples where plantation forestry has upset the pattern and style of life of indigenous population, it is concluded that much of forestry is "basically a social service" (P. 100).

Despite these drawbacks, the book is useful for providing certain basic information on plantation forestry. Concepts and principles of silviculture and management have been lucidly explained. The book will be quite helpful to foresters and forestry scientists.

**C. T. S. Nair**
Division of Forest Economics

**FODDER TREES OF INDIA. By R. V. Singh.** Oxford & IBH Publishing Co., New Delhi. 1982. XV + 663 pp. Rs. 120.00

Being an agriculture-oriented country with the largest cattle population in the world, India needs large quantities of fodder for its livestock. But due to scarcity of agricultural land and lack of irrigation facilities, at present, fodder crops are seldom raised on a large scale in our country. Hence our cattle population depends largely on straw when the pastures get dried up during summer and in this context growing of trees which can ensure the availability of forage throughout the year becomes important.

Till now, the potential of trees as source of fodder is not well appreciated in our country and wherever lopping is practised, it is done only as a stop-gap arrangement during periods of pasture scarcity. However, in the marginal areas of the forests, people resort to lopping on a regular basis to feed the livestock. The author has emphasized the importance of trees as forage crops in India by enumerating about 350 of them some of which can also be utilized as firewood, timber and pulp yielding species. Information on forage trees of India being scanty with an earlier enumeration of only less than a hundred species in total by Chandrasekhara Iyyar and Venkataramana Reddy (1942), Wilson (1944) and Shabnam (1959), the book under consideration is much useful in that it furnishes detailed information on the fodder quality of 354 of them growing as native or naturalized in India.

The book is in three parts, with species in each part arranged alphabetically by their botanical names.

Part one includes species, whose nutritional value as a fodder has been determined. A typical entry in this part containing a total of 51 species, gives details like species name, common (local) names, distribution in India, habitat requirements with details of climate and soil, life history with information on phenology, seed germination and seedling development stages, silvicultural characters and methods of propagation. Information is also added on pests and diseases and the nutritional value of the fodder. The second part presents tree species of regional importance and the nutritional value of whose fodder has not been determined. Here information on local names, distribution, habitat details, stages of plant growth, silvicultural aspects and methods of propagation are given for 46 taxa. The last part covers those species which are lopped only locally and the nutritional value of their fodder is yet to be determined. Under this section, 257 species are tabulated with details on local names, range of distribution, silvicultural characters and methods of propagation.

The book being a compilation, an exhaustive list of relevant references are appended. Towards the end, there is also a classified index to common names and a list of botanical names used in the text with their more common synonyms. Printing mistakes are avoided, get-up is good and the price is also reasonable. However, much desired illustrations and photographs at least of selected species are wanting and in the elaborate first part of the book, information is lacking as to what all categories of livestock can be fed with forage from the trees enumerated there. Leaving apart such minor defects, the work is of much practical utility and in any scheme of tree planting, i. e., from afforestation programmes to domestic tree farming, it is recommendable to account for the fodder value of the species chosen and as a source of authentic information on quite a large number of them, this book can rightly be referred to.

**- K. K. N. Nair**
Division of Botany (Plant Taxonomy).

## Hormone - mediated induction of ovulation in the Asian elephant

Records of Kerala Forest Department dating back to 1957 indicate a certain trend in the breeding rate of elephants held in captivity; confinement to camps with limited access to the natural conditions appears to restrict the breeding potential. This could be ascribed to either cows displaying preference to wild males and/or to substantial enough behavioural changes in the cows to affect the cycling pattern. The latter was considered more probable as captive males have been reported to sire a number of calves in North Kerala cows living in semi-wild conditions. In an attempt to explore the causes of infertility, opportunity was available to study the confined females only. Vaginal smears of 5 cows were monitored from September '82. It was found that 3 of these were anestrous. In June and July '83, therefore, for the first time ever in elephants gonadotropic hormones were injected to induce ovulation and normalise estrous cycles. Vaginal cytology closely followed the responses expected for gonadotropic hormones in other mammals. Estrus could be recognized easily by the overt behavioural signs exhibited by the males exposed to the treated females. Indirect evidence of ovulation was obtained from vaginal smears. It is suggested that the most probable cause of infertilities following confinement is anestrus resulting from behavioural changes. Nevertheless, it should now be possible for such cows to conceive following hormone therapy.

**- R. Sharma**
Division of Wildlife Biology.

# Recent Publications

## Published in Journals and Books

Bhat, K. V. and Bhat, K. M. 1983. Anatomical changes associated with interlocked grain in *Anacardium occidentale* L. IAWA Bulletin n. s. 4 (2/3): 179–182.

*Abstract:* Structural changes accompanying the reversal of spirality in interlocked grain were studied in *Ancardium occidentale* L. The reversal of spirality sometimes occurs within a narrow zone comprising a few cell layers of the growth increment. This zone is distinguishable by numerous small vessels occuring in groups and clusters, shorter and thin-walled fibres, abundant parenchyma and wider rays densely filled with extractives. The course of vessels is irregular and their anastomosis is frequent in this zone. While adjacent to it, a tendency towards left or right spirality is evident. This tendency is more pronounced in the vessels.

Gnanaharan, R. 1983. Preliminary note on the fungal problem of rubber wood (*Hevea brasiliensis*). International Research Group on Wood Preservation Document No. IRG/WP/3246. 7p.

*Abstract:* Susceptibility of rubber wood to fungal attack limits its wider utilisation. Fungal problems encountered in treating rubber wood with boron compounds by diffusion process have been discussed. Sodium pentachlorophenoxide and 2-thiocyanomenthythio benzothioazole (TCMTB) were investigated for possible control of fungal growth during diffusion storage and their performance has been reported.

Ghosh, S. K. 1982. Citrus greening under field conditions for detection of plant diseases. Pages 37-43 In: Problem of citrus diseases in India, Edited by S. P. Raychaudhuri and Y. S. Ahalwal, Surabhi Printers and Publishers, New Delhi.

*Abstract:* A rapid, inexpensive method of early diagnosis of diseased trees is essential to suggest any timely control measure This article reviews the various techniques developed for the detection of the yellows disease of plants. The ultrastructural morphology of the greening pathogen and the possibilities of detection of the citrus greening disease in the field are also discussed.

Muktesh Kumar, Nambiar, V. P. K. and Manilal K. S. 1982. Floral anatomy of *Burmannia championii* Thw. J. Indian Bot. Soc., 61 (suppl.) 40.

*Abstract:* The anatomy of the flower of *Burmannia championii* is described. Apart from an outer ring of three fertile carpels, an inner ring of three sterile carpels are shown to be present in this species. The stamens are completely free from the style and stigma in contrast to the opinion expressed by some earlier workers. While no evidence is found to support the assumption that *Burmannia* is closely related to Apostasiaceae, the anatomy of the flower indicates its affinity with Cypripedilinae of Orchidaceae

Seethalakshmi, K. K., Venkatesh, C. S. and Surendran, T. 1983. Vegetative propagation of bamboos using growth promoting substances-1. *Bambusa balcooa* Roxb. Indian J. of Forestry, 6(2) 98-103. 1983.

*Abstract*: In preliminary trials, lateral branch and culm cuttings of this commercial bamboo treated with particular growth promoting substances, rooted and survived while the controls failed to root. Coumarin, NAA and a mixture of Coumarin and IAA gave the highest percentage of rooting as well as survival after transplanting in the field. Branch and culm material are more economical and convenient to deploy for large scale vegetative propagation of bamboos than the conventionally used offest and rhizome material.

Varma, R. V. 1983. Hormonal mechanism of soldier differentiation in *Postelectrotermes nayari*. *In*: Current themes in Tropical Science Vol. 3, Chapter 29, Edited by T. R. Odhiambo, Pergamon Press

*Abstract:* The effect of treatment of FME on pseudergates of *P. nayari* has been studied. High doses of FME (2, 2.5 and 3.0 $\mu$g) restulted with formation of presoldiers. Low doses (0.5, 1 and 1.5 $\mu$g) did not produce any presoldiers, although a dosage of 1.5 $\mu$g produced pseudugate-presoldier intercaste. Other intermediate form, Pseudo-imagoes were also obtained from several treated groups The possible role of JH in soldier formation in *P. nayari* is discussed on the basis of results obtained in other lower termites

# KFRI Research Reports

Mathew, G. A survey of beetles damaging commercially important stored timber in Kerala. KFRI Research Report No. 10, Final Report of the project Entom 07/79, June 1982, 92 pp.

*Abstract:* About 100 commercially important timber species are being extracted from the natural forests in Kerala and stored in depots. The stored timber is often attacked by borers belonging to the insect order Coleoptera. In the present survey, about 53 species of beetles were recorded as pests of one or more of 46 species of stored timber. These belong to the families, Cerambycidae, Bostrychidae, Lyctidae, Platypodidae, Scolytidae, Curculionidae and Anthribidae.

The major cerambycid borers collected in this study were, *Batocera rufomaculata* (attacking *Bombax ceiba, Ceiba pentandra, Mangifera indica* and *Syzygium cumini); Clenecamptus bilobus* (attacking *Artocarpus hirsutus* and *Lagerstroemia microcarpa*) and *Xystrocera globosa* (attacking *Albizia odoratissima).* They generally attack the sapwood as well as heartwood of freshly felled timber with intact bark.

Borers belonging to the other families are small in size but often cause considerable economic loss. They generally attack the sapwood. Maximum damage is caused to the low density timbers having marked sapwood portion. Finished products such as match veneers, plywoods, packing case boards, brush-handles, bobbins, photo-frames etc., made out of these timbers are heavily damaged in godowns and storage yards. The major timbers are heavily damaged in godowns and storage yards. The major borers noticed during the present survey were : *Dinoderus minutus, Minthea rugicollis* (Lyctidae); *Platypus solidus, P. latifinis* (Platypodidae); *Xyleborus similis* and *X. interjectus* (Scolytidae). The important timbers damaged by these borers include, *Ailanthus triphysa, Anacardium occidentale, Bombax ceiba, Ceiba pentandra, Canarium strictum, Erythrina indica, Hevea brasiliensis, Mangifera indica, Polyalthia fragrans, Tetrameles nudiflora and Vateria indica.*

For easy identification of important borers, a pictorial key was prepared for each borer family dealt with in this work.

Nair, K. S. S. Seasonal incidence, host range and control of the teak sapling borer, *Sahyadrassus malabaricus.* KFRI Research Report No. 16, Final Report of the project Entom 08/79, December 1982, 36 pp.

*Abstract:* The life history, ecology, pest status and control of *Sahyadrassus malabaricus* (Moore) (Lepidoptera, Hepialidae), an insect borer of teak saplings in Kerala, were investigated.

The larva bores into the stem of saplings and lives in a tunnel along the pith. The mouth of the tunnel is covered by a thick mat of wood particles spun together with silk, underneath which the larva feeds on the callus tissue that grows as a result of continuous browsing.

The insect has an annual life cycle with most moths emerging in late April and early May. The moths do not feed and the female lays thousands of eggs soon after emergence. Circumstancial evidences suggest that the early larval instars survive on weedy ground vegetation, older larvae migrating to young saplings later. Most larvae are established in plantations by August although continued establishment may occur upto November.

*S. malabaricus* has a wide host range of over 40 species of woody shrubs and trees belonging to 22 families, of which Ulmaceae, Verbenaceae, Mimosaceae and Myrtaceae contain the most commonly attacked species. Among forest plantation species, saplings of *Tectona grandis, Eucalyptus* spp., *Gmelina arborea, Anthocephalus chinensis, Sterculia companulata, Albizia falcataria* and *Calliandra callothyrsus* were attacked. In some 2 to 4 year old plantations of teak studied, 6 to 61 per cent of the saplings were attacked. *Trema orientalis* and *Clerodendrum viscosum* were the most attractive hosts, medium sized *Trema* trees supporting as many as 30 larvae per tree unlike others in which multiple infestation was rare. Occurrence of these species in the vicinity and dense weed cover within the plantation favoured high incidence of the borer. Resistance of trees, intra-specific competition, predation by a bird and infection by a fungus were the main natural mortality factors operating after the larvae had established in saplings. Originally confined to mountainous forest areas, this species appears to be spreading gradually to the plains.

*S. malabaricus* is not a serious pest. As the larva feeds only on callus growth in the vicinity of the tunnel mouth, the damage caused is negligible. In rare instances, the stem is ring-barked, resulting in drying up of the sapling or the stem breaks off at the point weakened by feeding.

In experimental plantations, seed orchards, etc., where each sapling is valuable, attacked saplings may be protected by spot application of an insecticide quinalphos. Quinalphos (Ekalux), a contact cum stomach poison, may be applied at a concentration of 0.125% (active ingredient) solution using a brush, to the tunnel mouth region after pulling off the particle mat cover. It gave complete control in comparison to Lindane, Carbaryl (Sevin), Sevimol and tar, all of which gave only partial control. HCH (BHC), at 0.5% concentration, was ineffective. A preparation of *Bacillus thuringiensis* was also ineffective by the method of application tested. A thick, nondrying formulation of insecticide, was developed in an attempt to increase the effectiveness of insecticides, but Ekalux was sufficiently effective even without adjuvants. In less valuable plantations, incidence of attack can be reduced by following some cultural practices which are described.

Gnanaharan, R. and Mathew, G. Preservative treatment of rubber wood (*Hevea brasiliensis*). KFRI Research Report No. 15, Final Report of Research Project Wood 03/1979. December 1982, 16 pp.

*Abstract:* Susceptibility of rubber wood to fungal and insect attack limits its wider utilisation otherwise possible. The objective of this study was to increase the service life of rubber wood by introducing a cheap preservative into wood by diffusion process, employing a simple technique which can be carried out even in a small size saw-mill.

Treatment with boron solutions of higher concentration resulted in higher loading of chemicals into wood. However, using solutions of higher concentration has some disadvantages. This study found that adequate loading of chemicals can be obtained by using solutions of lower concentration at ambient temperature.

Immersing 25 mm thick material in a 10% boric acid equivalent (BAE) solution containing 0.5% sodium pentachlorophenoxide at ambient temperature for 40 minutes gave adequate loading of chemicals. It was found that increasing the immersion time does not increase the loading of chemicals appreciably.

Rubber wood is very permeable and it does not pose any problem for the chemicals to diffuse into the wood. Treatment with boron chemicals to a loading of 0.4% BAE was found adequate to protect rubber wood gainst the insect borer *Sinoxylon anale*. Material treated by diffusion process will be suitable for making furniture, door and window frames, etc.

## SEMINARS, CONGRESS, LECTURES ...

### INTERNATIONAL MEETINGS

Dr. S. Kedharnath, Director, participated in the Workshop on "Environmental impact assessment" held in China at Canton (now called Guangzhou), in March 1983. The workshop was sponsored by the International Society for Ecological Modelling, United Nations University, United Nations Environment Programme and the Ministry of Urban & Rural Construction & Environment Protection. On the way back he also visited Forest Research Institute, Las Banos, Phillippines.

Dr. K. M. Bhat, Division of Wood Science, participated in IUFRO All Division 5 Conference held at Madison, Wisconsin, U.S.A. from June 27 - July 5, 1983 and presented a paper entitled "Wood properties of one-year-old *Eucalyptus tereticornis* Sm." by K. M. Bhat and K. V. Bhat.

Shri Thomas P. Thomas (Soils) attended the 'National Seminar on Environmental Management' held at Engineering College, Trichur, 4 – 5 March 1983.

Dr. S. Kedharanath (Director), Shri M. Balasundaran (Plant Pathology – NF) and Shri Mathew P. Koshy (Genetics) attended the 'National symposium on Advances in Tree Sciences' held at Forest Research Institute and Colleges, Dehra Dun, 11 – 12 April, 1983. Shri Balasundaran presented a paper entitled 'Towards the control of mistletoe on teak through tree injection using weedicides' by S. K. Ghosh, M. Balasundaran and M. I. Mohamed Ali.

Shri N. Gopalakrishnan Nair (Botany, Plant Taxonomy) gave a lecture on Environmental management at Summer School held in Govt. Engineering College, Trichur, 14 May, 1983.

Shri P. Vijayakumaran Nair (Wildlife) and Shri K. K. Ramachandran (Wildlife) attended the 12th Annual Conference of the Ethological Society of India at Bangalore. Shri Nair presented a paper entitled 'Development of behaviour and social interaction in captive elephants' and Shri Ramachandran presented a paper entitled 'Eco-ethological studies on elephants of Periyar Wildlife Sanctuary'.

Shri V. V. Sudheendrakumar (Entomology) attended a Summer Institute on Microbial Control of Insects and Pest Management, held at the Tamil Nadu Agricultural University, Coimbatore, 1 - 25 June, 1983.

Dr. C. T. S. Nair (Economics) attended the National Seminar on Strategies for Environmental Awareness held at Trivandrum, 1 July 1983, and presented a paper entitled 'Man and Forest Co-existence or mutual annihilation'. Dr. Nair also attended a Symposium organised by KFRI Employees Union at Trichur, 7 August, 1983 and presented a paper entitled 'Forestry in a Changing Society'.

Shri E. A. Jayson (Wildlife) completed a training in ecology, capture and census of rodents at the Central Arid Zone Research Institute, Jodhpur, 25 July - 4 August 1983. Shri Jayson also gave a talk entitled 'Wildlife farming' on All India Radio, Trichur on 11 July 1983.

Dr. R. V. Varma (Entomology) participated in a Seminar on Pesticides and Environment held at Tamil Nadu Agricultural University, Coimbatore, 4 - 5 Aug. 1983.

## KFRI Seminars.....

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| Dr. K. K. N. Nair | : Angiosperm Classification – Ancient to Modern (28 March, 1983). |
| Sri. K. Ravindran | : Library Procedures (04 April, 1983). |
| Sri T. K. Dhamodaran | : Chemistry of wood : Fundamentals and applications. (18 April, 1983). |
| Dr. K. V. Sankaran | : Plant - Microbe Interrelationships : the Rhizosphere (02 May, 1983). |
| Sri V. V. Sudheendrakumar | : Biological control of insect pests (30 May, 1983). |
| Sri C. N. Krishnankutty | : Applications of Linear Programming Technique in Forestry (13 June, 1983). |
| Dr. D. L. Pearson, Dept. of Biology, Pennsylvania State University, U. S. A. | : Co – evolution – Plants and Insects (20 June, 1983). |
| Sri P. K. Muraleedharan | : Some Aspects of land Use and Cropping Pattern in Kerala (27 June, 1983). |
| Dr. S. Sankar | : Impacts of Forest Land-Use Alternatives on Environment (04 July, 1983). |
| Dr. K. Vishnu Bhat. | : Heartwood Formation - A general Account (18 July, 1983) |
| Shri M. I Mohamed Ali | : Plant Protection Chemicals and Their Uses (01 August, 1983). |

## Forthcoming events of 1984

Feb. THAILAND. Symposium on Seed Quality of Tropical and sub-tropical Tree Species, Bangkok

Contact: Surce Bhumibhamon, Ministry of Science, Technology and Energy, Rama IV Road, Bangkok 4, Thailand.

March 29 - April 19. ZIMBABWE. Training course on Genetic Improvement of Tropical Forest Trees, Harare.
Contact: R. D. Barnes/G. L. Gibson, Commonwealth Forestry Institute, South Parks Road, Oxford OX1 3RD, U. K.

April 9 - 14. ZIMBABWE. Provenance and Genetic Improvement Strategies in Tropical Forest Trees, Joint meeting of IUFRO Working Parties (S2. 08-08, 52.03-01 and 52 03-13), Mutare.
Contact: R. D. Barnes/G. L. Gibson, Commonwealth Forestry Institute, South Parks Road, Oxford OX1 3RB, U. K.

April 26 - May. 1. U. S. A. 2nd World Congress of Biomaterials, Washington, DC.
Contact:S R. Pollack, Dept. of Bioengineering, 285 Town Building D3, University of Pennsylvania, Philadelphia PA 19104, U. S. A

April 30 – May 5. SOUTH AFRICA. Symposium on site and productivity of fast growing plantations, Pretoria and Pietermaritzburg.
Contact: Symposium Secretariat S.314, CSIR, P O. Box 395, Pretoria 0001, Republic of S. Africa.

May 7-11. HAWAI, U. S. A. IUFRO Symposium on Effects of Forest Managements on Erosion and slope stability; Honolulu.
Contact: 1984 IUFRO Symposium, C/O Redwood Sciences Lab., 1700 Bay View Drive, Arcata, CA 95521, U. S. A.

July 23 – 28. FINLAND. Symposium on Crop Physiology of Forest Trees, University of Helesinki and Forest Res. Inst., Helesinki.

Aug. 18 - 26. W. GERMANY. 17th International Congress of Entomology, Hamburg.
Contact: L. A. Mound, British Museum (Natural History), Cromwell Rd., London SW7, U. K.

Aug 24 - 30 CANADA. 6th International Palynological Conference, Calgary.
Contact: L. Kokoski, Conference Office, Faculty of Cont. Ed., Education Tower, Rm 102, Univ of Calgary, Calgary, Alberta, Canada T2N 1N4

Aug. 26 - 31. JAPAN. 3rd International Congress on Cell Biology, Tokyo.
Contact: Secretariat, 3rd Int. Cong. on Cell Biology, C/o Japan Convention Services, Inc., Nippon Press Centre Bldg., 2-1, 2-Chome, Uchisaiwai - cho, Chiyoda-ku, Tokyo 100, Japan.

Oct 1 - 5. JAPAN. Pacific Regional Wood Anatomy Conference (PRWAC) jointly sponsored by IUFRO Div.5 and IAWA, Ibaraki.
Contact: S. Sudo, Wood Technology Division, Forestry and Forest Products Res. Inst., P. O. Box 16, Tsukuba Norin Kenkyee, Danchi Nai, Ibaraki, 305, Japan.

Oct. MEXICO. 9th World Forestry Congress.
Contact: P. A. Wardle, Forestry Statistics and Ecnomics Analysis Unit, F. A. O., via delle Terme de, Caracalla 60100-Rome, Italy.

Date Undet. U. K. Symposium on Weed Control East Mailing.
Contact: Dr. D. Atkinson, East Mailing Res. Station, Maidstone, Kent ME19 6BJ, U. K.

## Campus news * Campus news

**Joined KFRI recently**

Shri. V. A. Sudhakaran - Pump operator/Plumber
Shri. D. Skariah - Pump operator/Plumber

**Left KFRI recently**

Dr. K. T. Philip - Research Fellow
Dr. V. S. Vijayan - Scientist (Wildlife Biology)
Dr. Nazma - Scientist (Wood Science)

Shri. C. K. Soman, Field Assistant (Physiology) who was away on leave for study purpose returned to KFRI in May, 1983 after successful completion of Post-graduation in Botany at Sardar Patel University, Gujarat.

Shri. P. S. Easa, Research Assistant (Wildlife) who was on study leave to undertake doctoral work at Kerala University, returned to KFRI in September, 1983.

Shri. K. Yesodharan, Field Assistant (Pathology F) has proceeded on two years' study leave for post-graduate course in Botany at PIS College of Science, Surat, Gujarat.

# OBITUARY

**Shri K. P. Balan**

(1944 - 1983)

It is with profound sadness we announce the death of Shri K. P. Balan on 21 June, 1983.

In his death KFRI has lost a very sincere and honest employee. Shri Balan was born on 15 May 1944, at Thannoor, Malappuram Dist. After working in the Indian Navy as a Cook for five years, he joined KFRI in February 1981 as Cook-cum-attendent at the Nilambur sub centre rest house. During his short term of service at this Institute, he showed marked honesty, sincerity and devotion in discharging his duties.

May God console and comfort his bereaved widow and other members of the family.

E. M.

## National Seminar on Eucalypts

The Kerala Forest Research Institute is organizing a National Seminar on Eucalypts in collaboration with the Kerala Forest Department at Peechi, 30 – 31 January, 1984. The theme of the Seminar will be 'Eucalypts in Indian Forestry – Past, Present and Future' and will cover the following major fields: 1. Silviculture, 2. Genetics and tree breeding, 3. Pests and diseases, 4. Utilisation, 5. Environmental effects, and 6. Economics, management and policy. Papers are invited on the above topics for presentation at the Seminar. For further details please write to the Convener, National Seminar on Eucalypts, Kerala Forest Research Institute, Peechi 680 653, Kerala.

## Tree planting in KFRI campus

The campus tree planting programme was inaugurated by the Director, Dr. S. Kedharnath on 3rd August 1983. About 125 saplings of mahogany were planted on a hillock on the western side of the Institute's campus. All the staff members of KFRI participated enthusiastically. The planting was organised by Prof. V. P. K. Nambiar of Division of Botany (Taxonomy).

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

No. 2 (1) * KFRI. 1977. Availability of wood raw-materials for plywood industry - Kerala - Karnataka Region. Final report of research project 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 report of research project sponsored by the Federation of Indian Plywood and Panel Industry, Part - 2, 85 pp. (Mimeographed).

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

No. 4 * Alexander, T. G.; Sobhana, K.; Balagopalan, M. and Mary, M. V. 1980. Taungya in relation to soil properties, soil erosion and soil management. Final report of research project 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 report of the project sponsored by the Department of Science and Technology, Government of India, 235 pp. (Mimeographed).

No. 6 Nair, K. S. S. and Varma, R. V. 1981 Termite control in eucalypt plantations. Final report of the research project Entom 01/76 July 1976 to June 1980, 48 pp.

No. 7 Alexander, T. G.; Balagopalan, M.; Thomas P. Thomas and Mary, M. V. 1981. Properties of soils under teak. Final report of the research project Soils 02/1977, April 1977 - December 1980, 13 pp.

No. 8 Alexander T. G. Balagopalan, M.; Mary M. V. and Thomas P. Thomas 1981. Properties of soils under eucalypts. Final report of the research project Soils 03/1977, April 1977 December 1980, 12 pp.

No. 9 Nazma; Ganapathy, P. M.; Sasidharan, N.; Bhat. K. M. and Gnanaharan, R. 1981. A Handbook of Kerala timbers. Final report of research project Wood 1980,260 pp.

No. 10 Mathew, George. 1983. A survey of beetles damaging commercially important stored timber in Kerala. Final report of the research project Entom 07/1979, January 1979 - June 1981, 92 pp.

No. 11 Varma, R. V. 1982. Investigations on the possibility of non - insecticidal control of termites. Final report of the research project Entom 06/1979 January 1979 - December 1980, 28 pp.

No. 12 Gnanaharan, R.; Nair, K. S. S. and Sudheendrakumar, V. V. 1982. Protection of fibrous raw - materials in storage against deterioration by biological organisms. Final report of research project Wood 04/1980. July 1980 to September 1981, 24 pp.

No. 13. Venkatesh, C. S.; Koshy, Mathew P.; Chacko, K. C. and Indira, E. P. 1983. Genetic improvement of teak in Kerala. Final report of the research project Genet 01/79 January 1979 to January 1983. (Under preparation)

No. 14 Alexander, T. G. and Thomas P. Thomas. 1982. Cultural practices for managing soil erosion in forest planations: A state of knowledge report. Final report of research project Soils, 05/1981, April 1981 to March 1982, 11 pp.

No. 15 Gnanaharan R. and Mathew, George. 1982. Preservative treatment of rubber wood *(Hevea brasiliensis)*. Final report of research project Wood 03/1979; 16 pp.

No 16 Nair, K. S. S. 1983. Seasonal incidence, host range and control of the teak sapling borer, *Sahyadrassus malabaricus*. Final report of research project Entom 08/79, January 1979 to June 1981, 36 pp.

## Information Bulletins

No 1* Chandrasekharan, C. 1975. Wood use in Kerala and its implications for forest land use and development, 30 pp.

No. 2 KFRI. 1980. Matti (Perumaram), (in Malayalam). 8 pp.

No. 3 KFRI. 1981. Termite control in eucalypt plantations. Division of Entmology, 6 pp.

No. 4 KFRI. 1981. Medicinal plants of Kerala Forest: A tentative checklist(Malayalam & English). Division of Botany, 31pp.

No. 5 KFRI. 1982. How to establish Seed Orchards of Teak (*Tectona grandis* L.) (English & Malayalam), Division of Genetics, 10 pp.

Note: Publications marked ' * ' are no longer available for distribution. For free copies of other publications please write to The Librarian, Kerala Forest Research institute, Peechi 680 653, Kerala India.