IDRC BAMBOO/RATTAN NETWORK

NEWSLETTER

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BAMBOOS AND RATTANS

The bamboos and rattans are both plants with immense socio-economic importance. They are the source of livelihood for millions of rural people and find place in their daily lives. Though categorised as 'minor forest products', both bamboos and rattans contribute significantly to the national economies of many countries. Both are used as raw material in cottage industries and several handicrafts are made from them. Besides both are monocots. Indeed, we can call them "woody twins".

Bamboo, however, finds industrial application in the production of paper. It is largely utilized internally whereas rattan is more often than not an export commodity. Whereas the rattans are confined to the wet tropical forests, bamboo is distributed from the wet tropical through the hot semi-arid to the semi-temperate regions.

A DECADE OF COMMITMENT

Beginning with two small meetings in 1979/1980, the IDRC has been continually supporting research on rattan and bamboo. The next issue of the newsletter will carry articles to commemorate the completion of a decade of support by the IDRC to research on these two plant groups.

Dear Network Scientists and Friends:

We are very pleased to bring to you this tenth newsletter of the Network. With IDRC's commitment to research on bamboos and rattans over the past 10 years in the background and the new decade of the 1990s ahead of us, we could not think of a better opportunity for presenting this 'new look' newsletter to you.

The newsletter will henceforth be a more regular affair of the Network. Secondly, it will have a broader scope and will become a vehicle for greater information flow and interaction among project scientists/project leaders as well as with other interested scientists from all over the world. The newsletter will now welcome letters regarding research problems, research materials as well as any news and views that may be useful to others. We also invite semi-technical and technical notes and articles from all interested bamboo and rattan scientists. The basic philosophy underlying these changes is to provide a mechanism for maximising information exchange on bamboos and rattans. The newsletter will also contain information about scientific meetings, publications of interest etc. We hope you will like the present format (thanks to Rama) and will participate more actively by contributing to the Newsletter. We would also welcome your comments and suggestions.

To set the ball rolling we have in this issue three articles on Rattan Germplasm Conservation at the Forest Research Institute Malaysia, Some Statistics of the Rattan and Bamboo Trade, and Early Induction of Rhizome Formation in *Bambusa arundinacea* Seedlings.

Best wishes:
Cherla B. Sastry

ANNOUNCEMENTS

Publication of Network Booklet

We are happy to inform you that another publication of the Network has been brought out. This is a booklet on Propagation of Bamboo and Rattan Through Tissue Culture. This State-of-the-Art report which includes details of the methods involved in the multiplication of bamboo and rattan through tissue culture, has been produced with the objective of informing the reader of the status of research in this area. It is also meant to serve as a guide for those embarking on similar research and development programmes. Plant tissue culture offers two main avenues for rapidly multiplying plants - somatic embryogenesis and micropropagation. In somatic embryogenesis, individual cells or tissues taken from plants divide and grow in culture into embryos similar to those found in seeds. Micropropagation, on the other hand, is broadly, the production of micro-cuttings in culture and rooting them.

The booklet consists of the following five chapters:

- Current Status of Bamboo Cultivation: the Necessity for Tissue Culture-Based Mass-Propagation
- Bamboo Tissue Culture - A Review
- Bamboo Mass-Propagation Through Tissue Culture
- Current Status of Rattan Cultivation and Tissue Culture
- Rattan Propagation Through Tissue Culture

The booklet is being distributed with this newsletter.

Dr. N. Manokaran Joins as Network Adviser and Intern

We are pleased to welcome Dr. N. Manokaran, Senior Research Officer, Forest Research Institute Malaysia (FRIM) Kepong, Selangor, 52109 Kuala Lumpur, Malaysia as Network Advisor. Dr. Manokaran who is consultant to IDRC rattan projects, is well known to most of you and does not really need an introduction to the Network. He will advise and assist in the activities of the Network.

Dr. Manokaran who is a Ph.D. from the University of Aberdeen, has been actively conducting research on rattan ecology and silviculture for the past 15 years. He is active in the FRIM-IDRC Rattan Phase II Project. He is also Project Leader for Rattan and Bamboo silviculture at FRIM. Dr. Manokaran has published over 25 papers on this subject. He brings with him solid editorial experience and is presently an editor of the Rattan Information Centre Bulletin. For several years, Dr. Manokaran used to be editor of the Malaysian Forester. He has co-edited the proceedings of several rattan conferences. He is also chairman of Section S1-07-16 on Rattans in the Environment and Silviculture Division of IUFRO.

Dr. Manokaran will also be associated with the IDRC as an Intern for a period of six months. The objectives of his internship are:

- to carry out a critical appraisal of the contribution of rattan and bamboo resources to the Asia-Pacific region,
- to critically review research needs for future utilization of rattan and bamboo resources on a sustainable basis, and
- to gain experience in project management by association with rattan and bamboo projects of the IDRC.

Dr. Manokaran will be visiting some countries in the South-East Asia-Pacific region in connection with his internship.

I.V. Ramanuja Rao (Rama)
Network Coordinator

IUFRO Congress: Session S1-07-16 on Rattans

As many of you are already aware, the IUFRO XIX World Congress will be held in Montreal, Canada from August 5-11, 1990. Preparations are underway for holding of the plenary, sub-plenary and technical sessions. The main theme of the Congress is "Science in Forestry: IUFRO's Second Century". This is supported by two sub-themes concerned with tropical forestry and forestry decline.

Under Division 1: Forest Environment and Silviculture of IUFRO, the Working Party of Section S1-07-16 (Rattans) will be organising a technical session. The official theme of this session, as decided by IUFRO, is Rattans. I have been given the privilege, as Chairman of the Working Party, to organise this technical session.

The forests of the Asia-Pacific region are the home of rattan and bamboo, two materials of great economic and cultural value. During the last few decades, these forests have been subject to massive exploitative pressures principally due to the manifold increase in world trade in tropical timber. The combined effects of widespread forest clearing with accompanying changes to the forest ecosystem, and overexploitation of canes to satisfy the demands of world trade, have resulted in a shrinking resource base, and in many cases, shrinking income to the rural poor. In response to this, recent research and development activities in several rattan-producing countries have been geared towards village-level and large-scale rattan cultivation. Apart from the village-level plantations in Kalimantan (Indonesia) which have been productive for over a century, rattan cultivation has been actively pursued during the last decade in Sabah (Malaysia), People's Republic of China and the Philippines. Indonesia, home of 80-90 percent of the world's raw material, is also embarking on further rattan plantation establishment programmes. To safeguard their resources for the development of their own rattan industry, the key rattan producing countries have banned the export of raw or semi-processed rattan. The Philippines banned export of rattan poles in 1977, Thailand banned the export of all rattan items except that of furniture in 1978, Indonesia has allowed the export of only finished products from January 1989, and effective December 1989, only finished rattan products are allowed to be exported from Peninsular Malaysia.

Taking the cue from these developments, it is proposed to focus the technical session of Section S1-07-16 (Rattans) on The Economics of Rattan Cultivation and World Trade in Rattan. Papers are invited that would discuss the economic and financial aspects of rattan cultivation from case studies and provide information on export, import and price trends in relation to the international trade in rattan and rattan products. The outcome of the technical session, it is hoped, would provide a clearer picture of the direction in which the rattan trade is headed and how research and development activities should be focussed to ensure sustainable exploitation while meeting the requirements of the trade.

Not withstanding the above, I invite you to share your thoughts on how best to improve the focus of the technical session. Please convey your views to me as quickly as possible, so that preparations for the session could be made well in time.

N. Manokaran

IDRC/CASAFA Workshop on 'Rapid Propagation of Forest Tree Species'

29 November - 1 December 1989

I along with my wife Dr. I. Usha Rao, had the pleasure of participating in the above workshop which was held in Paris. This meeting was organised by CASAFA (Commission on Application of Science to Agriculture, Forestry and Aquaculture which is under the ICSU (International Council of Scientific Unions) with support from IDRC and other donors. The convening of this meeting was a sequel to the proposed incorporation of forestry research into the CGIAR (Consultative Group on International Agricultural Research) system. Participants in the meeting were from Australia, Belgium, Canada, Egypt, France, India, Malaysia and West Germany.

We presented two papers on 'Bamboo propagation through conventional and in vitro techniques' and 'Rapid propagation of bamboos through tissue culture'. Conventionally, bamboos are mostly propagated by seeds, rhizome offsets, and culm and branch cuttings which do not make efficient use of the resource. On the basis of information gathered from in vitro studies, increased seed germination and early rhizome induction have been achieved in vivo. Several thousands of bamboo plantlets have been produced through the tissue culture techniques of somatic embryogenesis and micropropagation and are now growing in the forests of several states all over India. There was general agreement at the meeting that tissue culture could be an effective technique for the mass-propagation of bamboos because of the serious problem of a rapidly diminishing resource on the one hand and the low availability of propagating materials on the other.

The meeting also recognised that bamboo was a truly multipurpose species with the widest conceivable range of uses. Bamboos are rapidly growing, laterally spreading, tree-like giant grasses which provide a familiar, socially accepted and a naturally pre-finished, multipurpose material. In countries such as India and Thailand where eucalypts are not well-received, bamboo could well be an ideal and acceptable multipurpose alternative 'tree'.

I.V. Ramanuja Rao

Workshop on 'Bamboo for the Himalaya'

The G.B. Pant Institute of Himalayan Environment & Development located at Kosi, Almora U.P. - 263643, India, is organising a workshop on Bamboo for the Himalaya to be held by the end of March, 1990. The workshop would concentrate upon diverse aspects such as biology, ecology, management and utilization of bamboo resources. Those interested can get in touch with **Dr. K.S. Rao, Scientist,** at the above address.

Rattan Germplasm Conservation at the Forest Research Institute Malaysia

N. Manokaran
Forest Research Institute Malaysia, Kepong, Malaysia

A rattan garden is being established in the grounds of the Forest Research Institute Malaysia (FRIM) at Kepong, Peninsular Malaysia. The garden was started under Phase II of the Rattan Information Centre, and has now been incorporated in Phase II of the FRIM-IDRC Rattan Project.

A stretch of land alongside the Dipterocarp Arboretum in FRIM's campus was selected as the site of the garden. This area was planted with indigenous tree species a few decades ago and has a small stream flowing alongside it. Besides being easily accessible and already having potential support trees for the rattan plants, the site receives adequate light at ground level at various places and has a generally high water table throughout the year. The mean annual rainfall is 2481 mm.

Three to five seedlings of the following nine rattan species were planted in the garden in April 1987.

1) *Calamus manan*
2) *C. tumidus*
3) *C. caesius*
4) *C. laevigatus*
5) *C.* sp. 1
6) *C.* sp. 2
7) *C. trachycoleus* (from Indonesia)
8) *C. merillii* (from Philippines)
9) *C.* sp. (from Philippines)

Juvenile to mature plants of *C. scipionum* and *C. javensis* from previous plantings are also present at the site.

Rattan wildlings were collected from the Pasoh Forest Reserve, Negeri Sembilan in May 1987 and raised in FRIM's nursery. In May 1989, one to three individuals of the following species (it is hoped to increase the number when seedlings become available) were outplanted in the rattan garden.

1) *C. speciossisimus*
2) *C. insignis*
3) *Daemonorops geniculata*
4) *D. verticillaris*
5) *D. calicarpa*
6) *D. sabut*
7) *D.* sp.
8) *Korthalsia* sp.

Rattan seedlings raised from seeds obtained from the People's Republic of China and Sri Lanka were also outplanted in the rattan garden in May 1989. Six seedlings each of the following species were outplanted.

1) *C. tetradactylus* (from China)
2) *C. thysanolepis* (from China)
3) *C. simplicifolius* (from China)
4) *D. margaritae* (from China)
5) *C. ovoideus* (from Sri Lanka)

A total of 24 species from three genera are now represented in the rattan garden. These include 17 species of *Calamus*, six of *Daemonorops* and one of *Korthalsia*. Indigenous species total 16 and the remaining eight are exotic. Besides the rattan garden, existing silvicultural plots in the FRIM campus of *C. manan, C. caesius, C. trachycoleus* and *C. scipionum* serve to conserve rattan germplasm and function as seed sources.

Some Statistics of the Rattan and Bamboo Trade

N. Manokaran
Forest Research Institute Malaysia, Kepong, Malaysia

Information on the trade in rattans and bamboos is found widely scattered in the literature. A search was made for such information from papers in proceedings of the rattan and bamboo meetings held in recent years (sponsored by IDRC) and from other literature. Such information, for several key countries, is presented here.

RATTAN

Indonesia: Production of raw material is about 120,000 tons annually, with about 83,000 to 100,000 people employed full-time in the trade (1984 estimate). In 1987, foreign exchange earnings to the country amounted to US$191.9 million (143,000 tons) accounting for 89 percent of exports of non-timber forest products. Effective 1st January 1989, Indonesia banned the export of all forms of rattan except as value-added finished products. In response to this ban, 100 new rattan processing plants and 124 rattan handicraft centres began operation in 22 provinces. With these developments, the Industry Ministry of Indonesia has estimated that based on the projected increase in rattan product exports to about 600,000 tons annually, rattan export earnings will increase to US$600 million in the not too distant future.

Philippines: The value of rattan exports increased from US$1.8 million in 1973 to US$62.5 million in 1986, and this was entirely of rattan furniture. The annual growth rate of rattan furniture exports was 38 percent from 1978 to 1985. In 1985, rattan furniture accounted for 70 percent of the total furniture export of the Philippines. With the expansion of the rattan trade, raw material supply has become a problem (raw material is entirely from the wild) and in 1985, US$1.02 million worth of raw/semi-processed rattans were imported mainly from Indonesia and Hong Kong. (Hong Kong does not have this resource and obtains it mainly from Indonesia: the latter is the main supplier with 80 to 90 percent of the world's raw material). With the Indonesian ban (the Philippines banned export of rattan poles in 1977), the development of plantations, and with it of all related research, has become urgent.

Malaysia: The value of rattan exports increased from US$5.2 million in 1986 to US$30.6 million in 1988 (with US$13.2 million in 1988 coming from furniture export). In November 1988, the Malaysian Rattan Furniture Industry Group projected that export earnings from rattan furniture would be US$45.3 million in 1990. In September 1989, the Malaysian Government announced that effective 1st December 1989, there will be a ban on the export of all forms of rattan, except as finished products, from Peninsular Malaysia. With this move, the rattan furniture and handicraft industry is expected to expand greatly and export earnings to increase tremendously.

Thailand: The value of rattan exports in 1982 was US$11.5 million and at the same time Thailand imported US$1.7 million worth of the raw material. In 1987 rattan imports rose to US$5.8 million. In 1978, Thailand banned the export of all rattan items except that of furniture.

Papua New Guinea: There is known to be a large reservoir of rattans in PNG but the industry here is still in an embryonic stage. There is great scope for research and development to ensure the orderly and efficient growth of the industry.

The total value in world trade of finished rattan products is estimated to be about US$2.7 billion a year.

BAMBOO

China: The annual bamboo culm production is about 6-7 million tons. There is great potential for the development of the pulp and paper industry in China as well as of a bamboo shoot export industry.

India: The annual culm production is estimated to be about 4.5-5 million tons, and this is about one-fifth of the total wood production. About 71.25 million man-days are required annually for harvesting. The pulp and paper industry utilizes about 3.5 million tons of bamboo annually.

Indonesia: Estimates of annual bamboo consumption vary greatly from 33-147 million culms. Practically all bamboo products are consumed domestically.

Thailand: The annual bamboo culm production is about 49 million culms. Export of bamboo shoots in 1984 was valued at US$3 million. Bamboo handicrafts fetched US$2.6 million.

Malaysia: The potential for trade in bamboo is largely unexploited. Bamboo exports (mostly chopsticks) in 1988 were valued at US$83,000. There was an increase in chopstick factories from 2 to 33 during the period 1986-1988. However, Malaysian exports of chopsticks to Japan, China and South Korea are miniscule mainly because of the lower quality of the chopsticks.

Taiwan: Export of bamboo shoots during 1975-80 exceeded US$20 million annually.

It appears that unlike rattan, which enjoys a well-developed and expanding international market, the international trade in bamboo is still developing. This is possibly due to the fact that bamboo in countries like China and India, which account for about 67 percent of the world's production, is to a large extent consumed internally. Bamboo shoots seem to be the main export item.

There is great scope for the development of a lucrative export market in bamboo shoots. Systematic evaluation of the bamboo resources needs to be carried out to identify potential species and coupled to expansion of bamboo areas with species used for edible shoots. The export market for bamboo handicrafts is another area that needs development.

Early Induction of Rhizome Formation in *Bambusa arundinacea* Seedlings

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I.V. Ramanuja Rao

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The formation of the rhizome is the most significant event in the growth of the bamboo seedling. The rhizome which is a horizontally growing condensed shoot, has the capacity of giving rise to the economically important vertically growing shoots (culms) as well as of producing roots. In the normal course, rhizome formation takes place after 6-8 months of germination. We report here an easy method of inducing early rhizome formation in seedlings of *Bambusa arundinacea* involving detopping of the seedlings and treatment with growth regulators. This method induces rhizome formation within two weeks of germination.

Seeds of *B. arundinacea* were washed in 2 percent Teepol (Shell, India) solution on a magnetic stirrer for 5 minutes. The Teepol solution was removed by washing in running tap water for 5 minutes followed by a rinse in distilled water. The seeds were surface sterilized with 60 percent saturated chlorine water for 5 minutes. The seeds were then washed thoroughly with sterile distilled water and the excess water on the seed surface removed with sterile filter paper. These were then implanted on to freshly prepared B5 basal medium. The cultures were kept at $30 \pm 2°C$ under continuous light (3300 lux from cool-white daylight fluorescent tubes). Seed germination was noticed on day 3. The seedlings were allowed to grow in the same medium until a visible node was produced. The shoot tip and roots were then removed and the plants transferred to B5 basal medium alone or supplemented with various growth regulators. The cultures were then transferred to $28 \pm 2°C$ under continuous light and scored for rhizome formation in 50 percent of the seedlings.

Within two weeks of inoculation, the formation of the rhizome was observed and a shoot developed from the axil of the leaf irrespective of the medium used. In seedlings that were not detopped, it took up to three months for the initiation of the rhizome. It was also observed that the use of growth regulators enhanced rhizome induction in the detopped seedlings. α - Napthaleneacetic acid at 10^{-6}M and 5×10^{-6}M concentrations in the B5 basal medium first promoted root growth and later rhizome and shoot bud formation.

When 6-benzylaminopurine (BAP) was incorporated into the B5 basal medium, the initiation of rhizome occurred within seven days of culturing and a concentration of 10^{-6}M was found to be most effective. The seedlings first developed the shoot and rhizome and later root formation was found only from the rhizome and not from the seedling base.

The fact that the detopped seedlings inoculated on to the basal medium showed an early induction of rhizome demonstrates that the addition of growth regulators into the medium plays only an enhancing role rather than inducing the process. Detopping of the seedlings removes apical dominance resulting in the germination of axillary buds and in rhizome induction. Cytokinins are known to suppress apical dominance and hence aid in rapid initiation of the rhizome.

Although this study was done under sterile conditions in vitro, subsequent experiments have shown that detopping works as effectively even with seedlings germinated in the nursery. Seed-soaking or soil-drench treatments with growth regulators can also be used to obtain rhizome formation in a larger number of seedlings.

The early induction of the rhizome by the method outlined here not only enables earlier culm formation, but also protects the seedling against grazing as survival through the underground rhizome is assured. In tissue culture also, the formation of the rhizome is very useful as it enables the easy transfer of plantlets to soil.