BAMBOO, PEOPLE AND THE ENVIRONMENT

Proceedings of the Vth International Bamboo Workshop
and the IV International Bamboo Congress
Ubud, Bali, Indonesia
19-22 June 1995

Volume 4

Socio-economics and Culture

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International Network for Bamboo and Rattan (INBAR)
Environmental Bamboo Foundation (EBF)
Government of the Netherlands
International Plant Genetic Resources Institute (EPGRI)
international Development Research Centre (IDRC)

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ISBN 81-86247- 15-7

Textdesign, layout and typesetting: Edit International, Bangalore, India.
Cover design: Shalini Malhotra

Printed and Bound in India by Thomson Press (India) Ltd.

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Foreword

The Vth INBAR International Bamboo Workshop was jointly held with the IV International Bamboo Congress from 19 to 22 June 1995 in Ubud, Bali. The Workshop was organized under the auspices of the International Network for Bamboo and Rattan (INBAR) and the Congress under the banner of the International Bamboo Association (IBA).

Over 600 people from different walks of life – scientists, engineers, architects, designers, crafts people, environmentalists, rural development experts, government officials and plain bamboo enthusiasts-congregated at Ubud to partake in the five-day event of the year. Several representatives of the Indonesian government, international organizations, diplomatic' community, and local and foreign media attended the Bali Congress. A large number of scientists participated in the intensive and keen scientific discussions at the 15 scientific sessions.

That the event was such a huge success was largely due to the painstaking efforts put in by a number of people from the organizations involved, particularly by Dr Elizabeth Widjaja, Ms Linda Garland and their team at the Environmental Bamboo Foundation, which was the local host. It also made a great difference that the International Plant Genetic Resources Institute (IPGRI) and the Government of the Netherlands actively supported some of the scientific sessions. It would only be appropriate here to thank all of them.

The Bali Congress was held at a time when bamboo and other forest resources were being increasingly subjected to overexploitation and unsustainable use. This aspect was integral to the theme of the event – Bamboo, People and the Environment. Several papers and posters were presented at the Congress on subjects ranging from bamboo propagation techniques to anatomical studies on pachymorph bamboos, from the role of bamboo in rural development to use of bamboo in religious rituals, from bamboo conservation strategies to use of molecular markers, and from design input into bamboo crafts to bamboo building codes.

In compiling the proceedings, we decided to make a departure from the previous practice of gathering all the papers in one large volume. We felt that segregating the papers presented at the sessions into different subject areas would provide a sharper focus, and presenting them as handy volumes would serve the readers better. Consequently, the proceedings are being published in four volumes: Propagation and Management, Biodiversity and Genetic Conservation, Engineering and Utilization, and Socio-economics and Culture. The last volume, Socio-economics and Culture, also contains the list of participants.

We have taken care to ensure that this publication imbibe the essence of the Bali Congress. Dr Elizabeth Widjaja, Dr P.M. Ganapathy, Dr Jules Janssen, Dr V. Ramanatha Rao, Mr. Brian Belcher and Prof. Trevor Williams have very kindly assisted with the technical editing of the papers, and we thank them for their time. We hope that you, as reader, would derive as much satisfaction as we did in bringing Bamboo, People *and the Emiron*-ment to you.

I.V. Ramanuja Rao
Cherla B. Sastry
General Editors

Preface

This volume is the last of the four-volume series *Bamboo, People and the Environment,* which cover the proceedings of the Vth INBAR International Bamboo Workshop and the IVth International Bamboo Congress, jointly held in Indonesia from 19 to 22 June 1995. It contains papers presented on the socio-economic and cultural aspects of bamboo.

In the 1980s, most publications dealing with the socio-economics of bamboo focused on the value of very diverse socio-economic systems of bamboo uses, the costs-benefits of those systems and the important role women had in them. They very rarely identified interventions which would assist socio-economic development. In the early 1990s, during the planning for the creation of INBAR, it became apparent that research on the socioeconomic background of bamboo resource utilization would have to be central to all other aspects of strategic research.

This meant that the interdependence of the resource base and the people who use it have to be understood more clearly, so that increased income generation and poverty alleviation can be promoted through more sustainable resource management and consumption systems.

Several papers in this volume illustrate a wide range of consumption systems – whether for livelihood at the micro enterprise level, for religious rituals or cultural use, or for input into more major economic systems. The newer approach to socio-economic background is beginning to show in research across Asia, in large part owing to the catalytic effect of INBAR.

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The Role of Bamboo in Development

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Abstract

Bamboo has an important role to play in development. It is a natural tool with which to encourage sustainable, integrated farming systems and an excellent resource on which to build a variety of income and employment-generating opportunities. With its multiple uses and high value in a range of products aimed at national and international markets, there is great potential for value-adding operations, and many different entry points for development intementions which are accessible to and appropriate for resource-poor people. In order to do this well, improved understanding is required about the bamboo sectors, about the people involved and about the main problems they face. Research is needed on the economic, policy, institutional and social aspects of the bamboo sectors, as well as on the technical aspects involved. In this way, interventions can be focused to address the real problems and opportunities faced by people, and from this basis a well-targeted research and development agenda can be designed.

Introduction

The bamboos are an incredibly versatile and useful group of plants. Bamboos have been used by people in imaginative and widely varied ways wherever they are found. They have long histories of use and play important roles in the daily lives of millions of people. Furthermore, and especially important in these days of rapid environmental degradation, they are highly renewable resources.

The International Network for Bamboo and Rattan (INBAR) is founded on the premise that bamboo, and rattan as well, provide important entry

points for development, Therefore, research on bamboo can help improve the efficiency of production, processing and marketing of bamboo products, and thus stimulate development.

The beauty of bamboo from this perspective is that it is an important commodity at many different levels of economy. It is a subsistence crop and a source of income to people with very limited opportunities to earn cash income. It is a versatile raw material for a wide range of small and medium-scale enterprises, and so serves as a basis for employment and income generation. The products made from bamboo, as well as the raw materials themselves, find international demand, and so are able to generate much-needed foreign exchange for cash-strapped developing countries. At each level in the economy, there are opportunities for research and development, which can lead to sustainable development. This paper discusses the role of bamboo at these different levels, and the research appropriate for them, particularly with reference to the INBAR research programs.

Sustainable Development

"Development" and that ubiquitous term "sustainable development" have been defined in almost as many ways as bamboo is used. Without going into semantics, "development" in its essence means improving human welfare and "sustainable development" means improving human welfare without degrading environment.

The main focus of INBAR, as with that of development assistance generally, is on improving the welfare of people who are resource-poor and who face the difficulties of trying to get out of the poverty trap. Ethnic and tribal minority groups, women, and rural and forest-dwelling people are frequently disproportionately represented in this category. These are the people who are poorly served by government services; people who often do without basic health care or educational opportunities; people who are frequently hungry and malnourished; people who work long and hard for limited rewards; and people who often have to watch helplessly as their children die of preventable diseases.

Resource Base

Bamboo grows over very wide areas in Asia. The statistics are poor – another indication that it has not been accorded the kind of importance it is due. Some that are available are, however, very impressive: 200 000 ha of bamboo in Bangladesh (Banik 1994); 1.2 million ha of bamboo in Thai-

land and 1.3 million ha in Vietnam (Tewari 1992); nearly 4 million ha (3 791000 ha) in China (Zhong and Xie 1995); and a huge 10 million ha in India, accounting for about 12.8% of the total forest cover in the country (Tewari 1992). The annual production of bamboo from India and China combined is greater than 8 million culms. The Philippines accounts for nearly half a million culms on its own (Tewari 1992; Pabuayon and Espanto 1995; Zhong and Xie 1995).

Bamboo at the Rural Level

In Asia, bamboos take the character of "poor man's timber" since for many people, bamboo growing, harvesting and processing are essentially subsistence activities. Bamboo is a fundamental part of people's overall livelihood strategies. In some cases, bamboo may be mainly for home consumption, as a raw material for household utensils and farm tools, and as a building material for shelters, fences, bridges, fish pens, or even water pipes. Bamboo products have high value in use. Without bamboo, these products would have to be constructed from another less suitable material, or purchased, using scarce cash resources, from outside. The number of bamboo users is enormous, quite likely running into billions.

There are also millions of people who depend on bamboo for part or all of their income. For example, in India, it is estimated that there are two million traditional bamboo artisans. Their livelihoods depend almost entirely on the harvesting, processing and selling of bamboo and bamboo products such as baskets, mats and handicrafts. In China, there are millions of farmers who grow bamboo as a component in integrated farming systems. In other countries, the numbers are smaller; but wherever bamboo is found, there are people who depend on it, in whole or in part, for their livelihoods, and many of them are very poor.

There are several reasons why bamboo is so closely associated with the lives of many poor people. To begin with, raw material has been widely available at low cost. Large amounts of material still come from natural stands, often on state lands. The bulk of the 10 million ha in India is on government land, as is the 4 million ha in China. Indeed, part of the problem encountered in managing bamboo resources is that they have often been treated as "free goods" and so have been over-exploited. Bamboo is also relatively easy to cultivate and manage; it is especially good for sloping lands and other land that is unsuitable for agriculture – the kind of land that the poor are often relegated to.

Furthermore, there are traditional, low-cost processing technologies available and ready markets for the many products which can be fashioned from these versatile plants. Entry into the industry is relatively easy. With low overhead costs, and relatively low skill requirements, poor people can create jobs for themselves. In many cases, the timing of the work can be synchronized with periods in which people would otherwise be unemployed or under-employed. Handicraft work can be done at home, making it ideally suited for women who must stay at home to perform domestic duties but who have periods of spare time. For many, the sale of bamboo is one of very few opportunities to generate cash income in otherwise subsistence economies: it is the money that is needed to pay for school fees and supplies, agricultural inputs, medicines, and goods from the cash economy.

Bamboo in Small and Medium-scale Enterprises

Some, including NGOs working with bamboo growers and artisans, emphasize self-sufficiency and eschew involvement in large-scale regional, and especially international, markets. Our feeling, however, is that to be effective in stimulating development, production should not be limited to rural areas. Bamboo is important as a tool for development because it is not only a “poor man’s crop”, but also a raw material in an increasing number of high-value consumer goods and building materials. Unlike some products which people abandon as soon as they have access to or can afford better substitutes – "inferior goods” in the lexicon of the economist – bamboo provides an impressive range of products, for which there is a steady or increasing demand. Therefore, there are many possible points and types of intervention along the bamboo production-to-consumption system which can be used to influence the system for the benefit of the target groups.

Overcoming poverty requires creating employment and income-generating opportunities. As the rural sociologist Robert Chambers put it: “Rural poverty is much less a problem of total food availability than of who produces the food and who has the income to buy it.” (Chambers and Ghildyal 1985). In an increasingly market-oriented, cash-based world, people need access to cash income. Bamboo is an important commodity in the cash economy. Growing demands translate into jobs within the processing sub-sector, and increase the demand and cash income in the raw material production sub-sector.

Research has shown that small and medium-scale forest-based enterprises are very significant providers of employment and income, and within that sector bamboo industry is a major component. One of the major advantages of bamboo as an entry point to development is the fact that so many products can be produced from it, and most of them can be produced by small and medium-scale enterprises. Such enterprises can be established with modest capital investments: the economies of scale are not nearly as high as in some other manufacturing industries. They are labour-intensive industries, and result in large-scale employment generation.

Furthermore, and every bit as relevant from a development perspective, certain bamboo products, and other non-timber forest products (NTFPs) including rattan as well, have very high value in export markets. These products generate much-needed foreign exchange and thereby serve to increase the wealth of the exporting country.

Research for Development

How can research help the people involved at various levels in the bamboo sector? How can one ensure that developments in the sector help poor people and do not leave them out?

To begin with, one needs to know much more about the bamboo industry, about who is involved and about the main problems they face. As mentioned earlier, the statistics on the bamboo sector are spotty at best.

INBAR is beginning to address this through a series of small projects which are collating available information on the economic, policy, institutional and social aspects of the bamboo and/or rattan sectors in several Asian countries. Work is in progress in China, India, Indonesia, Nepal, the Philippines and Thailand. Similar activities are in the exploratory phase in several other Asian countries. The resulting information will be merged as a single database, and will provide an estimate of the size of the bamboo sector in the region. These studies also include literature reviews which will yield annotated bibliographies on qualitative aspects of the bamboo and rattan sectors.

Unfortunately, bamboo has hitherto not been considered an important commodity and consequently, government bureaux of statistics have not kept good records. Gross inconsistencies exist in the data in terms of: the definition of categories (one year bamboo products are lumped together with wicker-ware, in another year they are placed with handicrafts, and it is impossible to know what portion is actually bamboo); differing units of

measurements (number of culms and tonnes); lack of standard grading and classification systems for bamboo raw materials; incomplete and out-of-date inventory data; large gaps in time series; and non-existent data on the people involved in the sector. These inherent weaknesses in the statistics are compounded by the systematic under-reporting of production and consumption information, especially with regard to the large volume of material traded in informal markets which is never recorded in official statistics.

Statistical information is just the beginning: it is necessary for strategic planning and, perhaps, for marshalling political support for bamboo. But one also needs to know much more about the constraints and the opportunities which exist in the bamboo sector, and to devise approaches to take advantage of them. At any level in the economy people face a range of constraints from the technical through to the economic and political.

Research, and especially extension, in the bamboo sector has been limited. Perhaps, this is because of its status as a "poor man's crop", or because it falls through that big crack between traditional disciplines of agriculture and forestry, or because the statistics do not reveal how important it is to how many people and so does not get the necessary political support. Research so far has focused primarily on technical aspects: reproduction, silviculture and management, post-harvest preservation and processing, engineering characteristics, etc. Such research has had important impacts, and has supported the growth of the bamboo industry. However, the benefits have not always reached the very poor.

Technical solutions frequently tend to miss the real problem. This fact was realized in agricultural research in the 1960s and the 1970s. Agronomists and plant breeders were able to accomplish impressive productivity improvements under research station conditions, but on-farm improvements lagged behind. For a variety of reasons, poor farmers were unable and/or unwilling to adopt new high-yielding varieties and the technology packages that went with them. In retrospect, the reasons seem quite obvious – inadequate access to or inability to pay for inputs (fertilizers, pesticides, irrigation), time constraints during periods of peak labour demand, culturally unacceptable plants, and so on. Furthermore, when their richer neighbours were able to take advantage of new technology, poor farmers may have been made relatively, and absolutely, worse off.

In response, agricultural research in developing countries took on a broader focus. Farming systems research was born, with attention to the

whole farming system and the various constraints faced by farm households, whether they be technical or economic, social or political. This approach is also being used in agroforestry research, and a similar approach is being followed in current research on village-based bamboo enterprises in Kerala, India.

A better understanding of the whole production-to-consumption system is also needed. As in China, a combination of policy changes can stimulate profound changes in a bamboo production-to-consumption system, with significant impacts in terms of generating employment and income at many levels in the economy, from growers through to factory owners and labourers.

Conversely, a good example of policies being the main limiting factor comes from India. In the state of Madhya Pradesh, there were an estimated 200 000 traditional bamboo artisans. of these, approximately half the people have abandoned their occupations to live as migrant agricultural labourers or to pick up work as unskilled labourers in towns and villages. The reason is that the bamboo resource has been physically depleted and has become increasingly inaccessible. The bulk of Indian bamboo production goes to the paper industry, at subsidized prices, and has effectively been taken out of the control of traditional artisans. In other situations, the factors which limit the system may be simple lack of cash or credit, inadequate infrastructure, unavailability of appropriate planting material or inputs, lack of appropriate technology...the list is very long. What is needed is a systematic way to narrow it down to the most important elements and to design ways to address them.

INBAR's socio-economics program is beginning to tackle the issues. The program includes a series of case studies designed to satisfy two principal objectives. First, they should identify constraints and opportunities for sustainable development within particular production-to-consumption systems, and recommend appropriate interventions. Some of these recommendations are likely to be for research to tackle technical problems, or for the transfer of existing knowledge. These can be referred back to appropriate advisory working groups within INBAR (Production, Post-harvest, Genetic Resources, Information). Others will aim to overcome resource constraints, either through institutional mechanisms (credit market development, for example) or through improving delivery systems (nursery development, for instance). Still others will aim to improve incentives for particular courses of action through policy reforms, and targeted rural development projects.

The second objective of these studies will be to provide an empirical basis for the development and refinement of framework for analyzing NTFP

production-to-consumption-systems. The bamboo and the rattan sectors are characterized by a wide range of production, processing and marketing systems. These systems employ numerous species and produce many classes of final product. Within the various production-to-consumption systems, there is great potential for improvements which could contribute to sustainable increases in the welfare of resource-poor people. However, achieving this goal will require a thorough understanding of very complex social, economic and policy contexts. One needs to be able to provide the right kind of assistance to people to overcome their particular problems and to improve the way they use their enterprises and resources.

Clearly, each system is unique, with a complex set of socio-economic and technical parameters governing the way resources are used and the way benefits are distributed. Nonetheless, there are common elements. By developing a framework, INBAR hopes to facilitate comparisons of one system with another. Research can describe different production-to-consumption systems, identify opportunities and constraints in their development, and prescribe development interventions. As an empirical basis is developed, it will become easier to identify "typical" production-to-consumption systems, and the constraints and opportunities common to them. As development projects which address some of these constraints are undertaken, the results can be compared in a systematic way.

At this stage, there are four case studies each on bamboo and rattan production-to-consumption systems being carried out. Cases have been selected to represent various levels of management intensity at the raw material production stage. Examples of extraction-based systems through to plantation-based systems, with several intermediate situations as well, are being studied. The studies are tracing the flow of material through the various processes and transactions to the ultimate consumer and identifying stakeholders. They are describing as fully as possible the social and economic factors that make up the "decision-making environment" – that is, the factors that affect the way people use their resources. With improved understanding in this area, it will be easier to know what kind of development interventions (technical, policy, institutional, investment, etc.) are needed to benefit INBAR's target groups in a sustainable way. These studies will also help to show where further research is required. Information generated in this way will increasingly fashion the research agenda within INBAR and will help ensure the relevance of all its technical research activities.

There is also a need to improve the way research is transmitted to those who need and use research results. By the same token, researchers need to improve their understanding of the real problems faced by the people working in the bamboo sector so that they ask the right questions. The research approaches described above will go some way in meeting this need. But there is also a large community of organizations – grassroots or NGO – which could become very effective partners in bamboo-based development.

Conclusion

Bamboo has an important role to play in development. It is a natural vehicle with which to encourage sustainable, integrated farming systems. It is an excellent resource on which to build a variety of income and employment-generating opportunities. With its multiple uses, and high value in a range of products aimed at national and international markets, bamboo shows a great potential for value-adding operations, and many different entry points for development interventions. Bamboo is not just a crop for poor people: it can generate important political and economic support which, if things are managed well, can translate into true sustainable development. Bamboo also provides an excellent model on which to base the development of other non-timber forest products.

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The Role of Bamboo in Village-based Enterprises

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Abstract

In many parts of the worid, bamboo is grown in and around village areas. This "rural bamboo" has to be understood in the context of overall farming systems and not in isolation from them. It also has to be understood from a range of perspectives: not just from that of the producer, but also from those of the other groups such as traders, processors and consumers. Awareness of these facts is important for natural scientists and development practitioners as it is for social scientists. Approaches to identifying and solving problems should bring together a range of disciplines; not to work on their own but to work together with all the different sections of the society which have an interest in bamboo.

Introduction

A boom in bamboo ("bamboom") ultimately depends on people; not the small scientific community, but the producers, traders, artisans and other rural people who are the largest buyers, sellers and processors of bamboo.

Bamboo is often thought of only as a forest plant. But in many parts of the world it is grown in and around village areas where the clumps are owned or managed by local people alongside food and tree crops. Such bamboo may be termed as "rural bamboo". Although forest bamboo is important for its quantity and the diversity of species, it is usually managed

by governments or commercial companies which limit the access of local communities. Any successful enterprise needs to have control of its access to raw materials, and for most village-based bamboo enterprises this is only possible with rural bamboo.

At previous international bamboo workshops, there have been many accounts of how bamboo is used to earn revenue for rural communities (for example, mat and basket making, production of handicrafts). Local people can also earn money by selling cut culms, seedlings and shoots. Bamboo is also important for subsistence where it is used in building, weaving, fencing and other functions in the house or on the farm.

But descriptions of how bamboo is used are, by themselves, of limited use in considering how local people might obtain increased benefit from this highly versatile group of plants. Together with understanding the plant or the technology, one must also understand the enterprises themselves. The purpose of this paper, therefore, is to examine more precisely the facts and features of village-based bamboo enterprises, from production to purchase, to show how social and economic factors affect the way bamboo is utilized by enterprises and their importance for the way bamboo is promoted.

The role of people, either as producers, craftspersons, traders or purchasers is crucial to any understanding of village-based enterprises. This paper examines the social and economic factors involved, their complexity and relatedness, and highlights those which are most relevant to developing improved bamboo enterprises. The emphasis is very much on the authors' micro-level experiences.

Three case studies have been used here: Penglipuran in Bali, Indonesia, and Palakkad and.Thrissur districts of Kerala, India.' The data from these studies reflect the methodologies used and the different disciplines that have been involved. In Bali, rapid rural appraisal (RRA) techniques were used by a team focusing on social development issues. In Kerala, natural and social scientists have worked together using both traditional survey techniques and participatory rural appraisal (PRA).

1 The Penglipuran study resulted from collaboration between the Natural Resources Institute and the Environmental Bamboo Foundation part-funded by the UK Overseas Development Administration (ODA). The studies in India are the result of collaboration between the Kerala Forest Research Institute, the International Mycolcgical Institute and the Natural Resources Institute which began in 1993 and are scheduled to run until 1996. They are funded by ODA's Forestry Research Program.

Social and Economic Obstacles to Village-based Enterprises

As recent authors have shown (for instance, Blowfield 1995b; Duraiappah 1994), the current resurgence of interest in bamboo faces a number of macro-level constraints such as an unfavourable policy environment and scattered, unmethodical and poorly processed data. However, our field experiences suggest that removing such constraints will not lead to the prophesied "barnboom" unless attention is also paid to two other aspects: (1) the role of bamboo in farming systems; and (2) the relationship between cultivation, marketing and processing.

The role of bamboo in farming systems

Bamboo is seldom the main source of farmers' income and therefore, decisions about managing clumps normally take into consideration a range of factors that are separate from the requirements of successful bamboo cultivation. This is clearly seen in the following Penglipuran case study.

The bamboo bank[2]

In Penglipuran, where all of the households are in some way dependent on agriculture, 60% of adult males list farming as their primary occupation. There are approximately 110 hectares of land divided into five main categories — household compounds, religious land, wetland rice fields, unirrigated farm land and bamboo forest. In terms of labour investment and day-to-day income, the rice fields and the unirrigated farm land are the most economically important. Most farmers depend on livestock rearing and inter-cropping of tree and annual crops, as well as on tree crops planted in their compounds.

Surrounding the village is a bamboo forest, most of which is managed by individual households. Bamboa-is an established crop and there is a healthy market for the 13 species of bamboo in the forest. Bamboo is used extensively in buildings, something that has been further encouraged by the promotion of traditional architecture for the tourist industry. The village is home to a significant number of bamboo craftspersons and traders who produce woven walls and roofs, as well as household items for internal and external markets.

2 Data from Blowfield (1995a)

Yet, despite the presence of a sustainably managed forest, many villagers have to buy bamboo from neighbouring communities. To an extent, this reflects the hold bamboo traders have on the market (see below). But traders say that they often cannot meet demand from the Penglipuran forest. The reason for this is not a shortage of bamboo *perse* but the way it is perceived. Individual households appear to look on crops as bank accounts. Crops from arable land are the equivalent of a current account, used to meet day-to-day needs by providing both subsistence and cash. Bamboo is a savings account, used either in times of emergency or to pay for long-term investments such as children's education.

These attitudes, in turn, affect management practices. While significant amounts of time are spent almost every day on arable land, there is no tradition of clump management apart from clearing grass and weeds after the clumps are felled. Only one person in living memory is known to have regularly cultivated bamboo, and today there is neither the interest nor the knowledge for a more advanced system of bamboo cultivation. Some owners of bamboo forest do not even know the exact boundaries of their bamboo and most do not work in the forest themselves, preferring to employ labourers. Months or years can pass without an individual harvesting bamboo, even though the value of clumps is competitive. Such neglect makes clumps too dense and the middle culms difficult to harvest.

The bamboo pest [3]

The owners of Penglipuran's bamboo forest are amongst the wealthiest in the community, and differences in wealth, gender, marital status and age are all important factors in understanding farming systems as is clear from the following Indian case study.

In 1993, the Kerala Forest Research Institute (KFRI) began working with farmers from different social and economic categories to find out more about clump management in home gardens, the homestead farm system characteristic of much of Kerala.

Initially KFRI found few farmers expressing enthusiasm about their clumps, regarding them as a necessary evil used primarily for fencing. A common complaint was that bamboo interferes with other crops, thus

[3] Data from Southern and Krishnankutty, 1995.

reducing the already restricted area of productive land. In other parts of Asia, rhizomatous crops grow successfully under bamboo shade and KFRI introduced this technology to local farmers. Most of the farmers were surprised at the success of understorey-cropping which promised useful crops such as turmeric and ginger on areas of hitherto unproductive land.

But the uptake of this new technology varied according to individual farmers' social and economic background. Wealthy farmers, for instance, felt the activity was too labour-intensive and they could grow the same crops more efficiently on other parts of their holdings. Female farmers, regardless of economic status, tended not to have enough time to invest in the activity and felt that crucial activities such as preparing beds, applying manure and harvesting were men's work. Women from poor households especially felt they could not spend time on extra crops and could not afford to hire outside labour. Similar problems were also found amongst poor male farmers because the need to seek waged work prevented them from spending much time on home gardens.

Consequently, despite initial assumptions that bamboo would be of most benefit to poor farmers and women (Blowfield 1995b), the farmers who were most likely to introduce under-cropping into their home-gardens were from middle-income households. These felt a direct benefit fromunderstorey-cropping (that is, the availability of food crops that would otherwise have to be purchased) and were able to devote time and employ labour to cultivate the crops.

Beyond the Producer

Successful promotion of bamboo cannot stop with the farmer. Farmers are only the first in the bamboo supply line that stretches from producer to consumer. There is a common assumption that supply will respond to demand and that if rural bamboo is in decline, then this is a result of falling demand. While this might ultimately be true, the neglect of bamboo in recent years means that it is unwise to draw over-signified conclusions at the present time.

Understanding the different stages in the bamboo pipeline is important for farmers and processors. Groups that add value to bamboo through their own labour (for example, weavers) have in the past been given most attention. Yet, in establishing successful village-based enterprises, the role of traders is critical, enabling producers to supply users beyond their immediate environment.

Traders are often considered in a negative light in rural studies because they are seen as making a profit without adding to the value of the crop. Furthermore, groups such as weavers are generally classified as poor and therefore more appropriate objects of attention by development workers than the wealthier traders. Studies from southern India (Krishnankutty 1988, 1991; Krishnankutty et al. 1995) reveal the pivotal role of traders in linking producers with processors.

The example of Penglipuran (Indonesia) shows how traders, producers and processors interact at a grassroots level (Blowfield 1995a). Within the village, there are producers selling raw bamboo from their bamboo forests (see above) and weavers processing bamboo for the construction and handicraft industries. Households that depend on weaving for their livelihoods are amongst the poorest in the village. They do not own bamboo forest and are unable to afford bamboo which, as noted earlier, is only sold when large amounts of cash are required. Weavers, therefore, depend on the village's two traders to buy bamboo. The traders then place orders with weavers to process this bamboo. In return, the weavers are paid on a piece rate basis for high-value items, and are allowed to keep the remainder of the bamboo, which is used to make lower quality items that the weavers sell themselves locally.

The importance of the traders is not just as buyers and sellers of bamboo. They also provide short-term loans to producers and weavers, and longer term loans to owners needing to mortgage their bamboo forest. Other social dimensions noted in relation to farmers such as gender also apply to processors. In Penglipuran, traders only place orders with male weavers as female weavers are not involved in making the bamboo walls, ceilings and roofs that the traders sell. But female weavers are important contributors to the household economy and dominate production for the handicraft industry. However, they largely depend on male relatives to obtain bamboo and market the products themselves.

Bamboom for Whom?

Recent excitement about the potential of bamboo, the poor man's gold, has led to an assumption that the predicted "bamboom" will benefit the poor (Blowfield 1995). Yet, the above examples of how rural bamboo fits into farming systems and the complex relations between producer and processor show that it is not necessarily poor producers who can take advantage of bamboo opportunities. Whether bamboo helps the poor

ultimately depends on people's goals: to increase the supply of rural bamboo? to encourage biodiversity? to help alleviate rural poverty? to expand the range of utilization?

The answers to these questions all have a human dimension. If, for instance, one wants to increase the amount of rural bamboo, then it might be better to work with wealthy farmers because they have access to land. If the aim is to use bamboo to help in reducing rural poverty, then one must work with the poor but be aware of the problems the poor face.

These are complex issues that lie at the heart of future village-based bamboo enterprises. To address them effectively means looking from the perspectives of different disciplines involving both natural and social scientists (Boa 1995). Understanding the role of bamboo in farming systems and the links between supply and demand would allow us to develop models to identify the opportunities and constraints to bamboo promotion amongst different sections of society. At present, there are sufficient data to attempt to develop such models, but the section below shows examples of some of the issues based on data to hand. The examples given are for producers, but a similar analytical approach could be applied to bamboo processors.

Bamboo Opportunities and Constraints for Poor Producers

Opportunities

1. ***Bamboo does not bring poor farmers into competition with wealthier farmers.***

It was earlier mentioned that one of the problems with rural bamboo was that it has not received attention from development organizations. Yet, this neglect itself could be advantageous to poor farmers because bamboo is often unattractive to wealthier farmers (Blowfield 1995b). Examples from the green revolution and others show that where wealthy and poor farmers are in competition, the former benefit usually to the disadvantage of the latter. But since wealthy farmers have little interest in bamboo, the chances of poor farmers benefiting should be greater.

2. ***Bamboo can increase the value of marginal land.***

Poor farmers can be divided between the landless or land-poor, and the landed poor. While the former have little or no land, the latter may have quite large areas of land but this land is of such poor quality that it does not support the farmer's choice of crops. However, there are bamboos that can

grow in poor soils, and where available, these can increase the value of the land as well as the income from agriculture. For instance, in the low-rainfall zone of Kerala where poor farmers cannot irrigate, bamboo has been introduced into hitherto barren areas (Blowfield 1995b).

3. ***Bamboo isperceived as an annual crop in relation to land rights.***

In many ways, bamboo has many of the advantages of perennial tree crops (such as low labour inputs and long productive life). Poor farmers, such as those with usufructuary rather than ownership rights to land, are usually excluded from planting tree crops because these are seen as giving the planter a long-term stake in the land. However, in terms of land rights, bamboo may be seen as an annual crop and therefore the land owner does not consider it a threat to his rights in the land.

4. ***Bamboo does not require intensivlabour inputs if sufficient land is available.***

Compared to food crops, bamboo does not require intensive labour inputs, especially if there is enough land to avoid the need for trenching to control the spread of roots. As the earlier example from Kerala shows, even this labour input may be too much for some poor farmers and especially women. Nonetheless, where the choice between one crop and another depends on availability of labour, bamboo has advantages over many other crops.

5. ***Producers can add value to bamboo with limited technical knowledge and capital.***

The wide variety of uses for bamboo means that if households have sufficient labour and marketing mechanisms, bamboo producers can also be processors with affordable technologies and without needing large amounts of start-up capital.

6. ***Bamboo has a subsistence as well as cash value.***

Unlike many tree crops, bamboo has a wide variety of uses within the household. Even if poor farmers do not have the skills to process the bamboo themselves, they can often call in skilled labour to process the bamboo for them in return for part of the harvest.

Constraints

1. **Bamboo requires land.**

Although bamboo can have a positive impact on land and land rights (see below), it is of use only to poor farmers who have access to land.

2. *Considerable labour inpiuts* are *required to establish and harvest* bamboo.

Labour inputs for bamboo, taken over the whole year, are low compared to food crops. Nonetheless, there are times when successful bamboo cultivation requires high labour inputs (for mounding, trenching, harvesting, etc.). Furthermore, harvesting especially is considered onerous work, and is often given as a reason for employing hired labour or neglecting the clump.

3. ***Bamboo is unfashionable.***

4. *Men may be unwilling to invest labour in bamboo.*

In some societies, much of the work required to manage bamboo successfully is considered to be men's work. Where bamboo is unfashionable and where there are other income-earning opportunities, men are often unwilling to devote time to managing clumps.

5. *Support services are not available.*

Successful agriculture depends on a range of support services such as research, extension, credit and marketing. Such services have normally been developed in relation to specific crops rather than for overall farming systems. For bamboo, such support services are almost non-existent in most countries.

Bamboo Opportunities and Constraints for Wealthy Producers

Opportunities

1. *Local market for bum boo is strong and under-tapped.*

In both of the areas referred to in this paper, traders report a shortage of bamboo. Moreover, there is a growing movement to encourage the use of bamboo instead of timber. Wealthy fanners, who to date have preferred tree crops and other cash crops to bamboo, are placed to meet shortages in the supply of bamboo because of their access to land, labour and capital.

2. *Bamboo bas similarfeatures to tree crops.*

Tree crops have long been attractive to wealthy farmers, not only because of the price but also because of other benefits. They enhance security of land tenure, represent a long-term investment and require less labour than annual crops. Since bamboo already offers some of the advantages of tree crops, there is no reason why attitudes cannot change so that bamboo eventually brings the same status and security as tree crops.

3. *Bambooprovides more-frequent and quicker yields than tree crops.*

Compared to tree crops, bamboo can produce economic return in a relatively short period of time. Furthermore, while trees grown for timber can only be harvested once, a bamboo clump can be harvested many times over.

Constraints

1. *Bamboo has a poor image.*

At the present time, wealthy farmers in Kerala are probably typical of wealthy farmers in many regions in not regarding bamboo as a worthwhile crop. Even in Penglipuran where wealthy farmers realize the economic value of bamboo, they are not actively involved in managing it or expanding production. There are many reasons for this, but as already noted, these are not just economic but relate to the attitude of farmers towards bamboo.

2. *There is a low degree of local knowledge about bamboo.*

Because of their disinterest in bamboo, wealthy farmers have little knowledge about how to manage clumps efficiently. Years of neglect in favour of other crops mean that in many areas local knowledge is dying or dead. In its place, various rumours about the negative qualities of bamboo have become accepted as fact (for example, that bamboo causes tree diseases or that nothing can be grown near bamboo).

3. Bamboo *does not provide access to economic andpolitical oportunities.*

Price is not the only consideration in choosing one crop over the another. Factors such as political influence, social status and access to finance are important considerations for wealthy farmers. In Java and Bali, rice cultivation has brought farmers access to a range of social and economic opportunities, and the same is true of rubber cultivation in Kerala (van der Werff 1992). Bamboo does not offer these added benefits.

4. *Suppoti services for bamboo are weak.*

This issue has already been raised in relation to poor farmers, but for wealthy farmers used to receiving the full benefit of extension services, credit provision, market information and market access for their current crops it is even more of a constraint.

Conclusion

Rural bamboo cannot be separated from people. Unlike bamboo in research stations or conservation areas, rural bamboo has no meaning unless

it is useful to rural people. For village-based enterprises, bamboo is the means not the end; it is one element in a complex system of rural relationships where human beings are the main actors.

Consequently, rural bamboo has to be understood in the context of overall farming systems and not in isolation from them. It also has to be understood from a range of perspectives: not just the producer but other groups such as traders, processors and consumers. Awareness of these facts is important not just for social scientists but also for natural scientists and all development practitioners. Approaches to identifying and solving problems should bring together a range of disciplines; not to work on their own, but to work with the different sections of society who have an interest in bamboo.

Rural bamboo was ignored for a long time because development experts were blind to what people actually did. Now that the importance and potential of rural bamboo is being recognized, it would be a sad irony if the same blindness prevented the promise of bamboo from being realized.

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Towards a New Approach to Understanding the Bamboo Economy

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Abstract

In most studies and policies on bamboo and rattan (B&R) sector in South Asia, welfare holds a prominent place. However, perceptions on it vary: the governments assume that employment perse (in numerical terms) lead to welfare; the scientific community, on the other hand, assume that productivity gets automatically translated into productive employment and thus to welfare. Such simplistic analyses can lead to counter-productive results. Therefore, the development of B&R sector needs to be looked into at two levels: analysis of issues, and formulation of appropriate development policies.

The issues to be analyzed are the impact of overall development policies on B&R sector, the specificities of the production-to-consumption systems and their implications on the distributive gains of direct producers, and the feasibility of organizational innovations. Policy formulation in the B&R sector has largely focused on micro aspects. However, macro aspects too are important. They relate to: (a) the feasibility and extent of integration of small and medium bamboo enterprises with their larger counterparts, as well as with the rest of the economy; and (b) the feasibility of organizational innovations and strategies.

The ingredients of a new paradigm would relate to: (I) in-depth policy studies based on the specificities of the production-to-consumption systems; and (2) action at the organizational level with due consideration for flexible strategies. This alternative paradigm would help identify an operationally meaningful conceptual framework relevant to the specific situation in each country, and ensure the shift away from the realm of populism to realistic development policies.

Introduction

The role of commodities in development process has been a widely discussed subject in academic and policy circles. The post-World War development initiatives in many of the South and Southeast Asian countries gave considerable thrust to the development of commodities, crops, mineral resources and forest products. The development debate of the 1950s and the policy responses which came in the form of foreign aid (both bilateral and multilateral) led to the establishment of specific institutional structures and policy instruments. Massive development programs initiated by many international funding agencies, and the setting up of commodity boards, development councils, public corporations etc., resulted in enhancement of production and productivity of commodities, as well as in their greater international market accessibility.

The Marxist and the neo-Marxist critiques consider the 'commodity approach' to development as partisan, leading to greater international integration of commodities which, in turn, makes the small producers very vulnerable to the dictates of the market forces.' These theoretical approaches consider the commodity approach to development as agri-business, which leads to the pauperization of the peasantry or the small producers.

The thrust on rural development, which emerged in the early 1980s considers rural development as essential for the eradication of massive poverty. This necessitated a rethinking on the problems and constraints relating to development programs. Inadequate "people's participation" was identified as a major constraint on the successful implementation of diverse projects. In India, for instance, the Sixth Five Year Plan dealt with this issue at length and suggested greater involvement of the "people" in development programs through such measures as the strengthening of initiatives by voluntary organizations. The development policies relating to the bamboo economy also has to be considered against this background.

Academic Thrusts and Policy Concerns

Bamboo and rattan, as major non-timber forest products (NTFPs), play an important role in the lives of millions of people in South and Southeast

1 According to Feder (1976), "modernization of agriculture represents an aggravation of the traditional agricultural systems with all their defects and vices, but with a much higher level of sophistication".

Asia. As forest products, the supply of these resources in many countries are regulated under the prevailing legislation relating to forests. Being essentially a natural resource, "sustainable development" is a crucial concern of the bamboo and rattan economy. Development of this sector is not simply a question of enhancing supply and ensuring productivity. More importantly, what is required is development that meets the needs of the present without compromising the ability of the future generation to meet their own needs.

The major thrust of studies on bamboo and rattan in South and Southeast Asia can be broadly categorized into two: (1) productivity studies; and (2) studies on resources and employment. Though most studies in the area are less than a decade old, they have generated considerable academic debate, with obvious implications at the policy level. Various studies, such as the one by Purnama et al. (1993) in the context of Indonesia, have looked into questions relating to marketing channels, market structure and related aspects. A similar study has been carried out by Serna (1988) on the Philippine situation. Micro-level studies on market structure and firm behaviour have been undertaken by Pabuayon (1988) in the context of the Philippines, Tan (1989) in the context of Malaysia, and de Zoysa et al. (1991) in the context of Sri Lanka.

Traditional cottage activities in bamboo and rattan, and the role of rural institutions such as cooperatives, have been other major areas of enquiry. At the suggestion of the Food and Agriculture Organization (FAO), the Kerala Forest Research Institute (KFRI) in India conducted a detailed study on the role of rural institutions for the development of traditional bamboo industry (Nairand Muraleedharan 1983). The Indian scene has been examined in a wider context and on a different perspective by Mathew and Joseph (1994). This study considers the institutional role of cooperatives as agents of change in a scenario of flexible specialization. Unlike some of the studies in the past, this study looks into the role of cooperative institutions (collectives, in a wider sense) as chains in a wider network, rather than as autonomous entities. The Malaysian situation relating to the traditional bamboo sector has been depicted by Fui et al. (1992), providing a detailed breakdown of employment in terms of such crucial factors as gender, age and income levels. The techno-economic aspects of traditional bamboo craft in the context of India are dealt with by Kirtads (Anonymous 1990) and Nair (1982). The study by de Zoysa et al. (1991) makes a detailed examination of the bamboo and rattan-based activities in Sri Lanka as subsistence activities in the rural areas of the country.

The question of productivity received considerable attention in the econometric study by Irawanti (1993). He attempted to analyze the productivity situation in the industry with the help of a CES production function, in the context of Indonesia. A similar micro-level analysis of size-productivity relationship in the context of Malaysia has been attempted by Latif (1988).

The dynamics of bamboo and rattan resources is a major area of concern since the sustainability of the industry is contingent upon resource availability. Limited studies are available in this area. The questions of protection of forests and establishment of down-stream activities in the context of Indonesia have been examined by Mhitehead (1991). The environmental aspect has been specifically dealt with by Siebert et al. (1985). In the context of Thailand, the sustainability question has been explored in detail in the report of the IDRC Bamboo Project - Phase II. The study by Harun et al. (1992) makes a detailed examination of the question of management of resources in the context of Malaysia. India has produced several studies. Two of the earlier ones (Anonymous 1984; Aravindakshan and Jayasree 1992) gave detailed accounts of the resource position in India. A later study by Mathew and Joseph (1994) examined the resource position in the context of the vitality of product diversification and innovation.

Most of the available studies on the bamboo and rattan sector are confined to improvements in the existing product lines, with only a few studies examining the question of waste utilization (for example, Latif et al. 1987; Mathew and Joseph 1994)[2]. Other areas like gender issues, evaluation of government programs, the substitution of synthetics for bamboo and rattan, environmental aspects, etc. also have attracted academic attention, albeit to a limited extent.

The available studies are mostly confined to pure economic considerations. Policy analysis has been largely limited to the economics of the sector. Policy questions, in most cases, are restricted to identifying those policies considered by the implementing agencies as suitable to the beneficiaries. The question as to why people do not respond to such policies has been

[2] The study by Mathew and Joseph (1994), carried out by the Institute of Small Enterprises and Development, Cochin, India, in cooperation with the Small Industries Development Bank of India (SIDBI), was aimed mainly at exploring the potential of product diversification and greater value addition.

treated as a secondary question. While technoiogica1 changes and generation of new knowledge have enriched our understanding of the economic possibilities and potential of the bamboo and rattan sector, such knowledge does not often trickle down to the people involved in the industry. It is not enough to understand why the technologies developed are not always appropriate to the needs of resource-poor people: asking the right questions is the first step.

The Relevant Issues

The available studies have focused largely on demand, supply and sustainability of the resources. Such studies have emerged in consonance with either or both of the following traditional thrusts: (1) employment per se (by government agencies); and/or (2) productivity per- se (by the scientific community). The former thrust equates employment in numerical terms with welfare. The assumption behind the latter thrust is that productivity is automatically translated into productive employment which, alternatively, means welfare.

In an industry characterized by substantial opportunities of income and employment generation, a simplistic analysis of the causation of welfare, as outlined above, can be counter-productive. Therefore, the development of rattan and bamboo need to be considered at two levels: (1) analysis of issues; and (2) formulation of appropriate development policies.

With regard to the analysis of issues, the relevant questions that need to be asked are:

- How have development policies in the various countries affected the growth of these industries?
- What are the distributive implications of the policies within the diverging socio-economic contexts?
- What methods need to be adopted in order to enhance the distributive gains of the direct producers?
- How do the various production-to-consumption systems operate and what are their policy implications?
- What are the differences in the distribution of gains (welfare) according to factors of extra-economic stratification such as gender, age and social status?
- What is the specific nature of the relationship between the organized and unorganized sectors of production?

Bamboo/Rattan in a Changing Business Environment: the New Paradigm

Since activities based on bamboo and rattan are largely the mainstay of poverty groups in South and Southeast Asia, it is natural that policies aimed at improving the existing order of things are likely to contribute positively to the welfare of these sections of the community. However, the formulation of appropriate development policies cannot take a piecemeal approach. A balanced approach is needed which will take into account both growth and distribution, and will examine the bamboo and rattan sector in a macro context, i.e., in the context of the emerging changes in the overall business environment, as well as in the world economy as a whole. Conventionally, the uncritical acceptance of Fordism[3] assumes economies of scale as the basic law of economics. Anything that does not fit into this model has been considered as peripheral. Rural industry and cottage-level activities have often been analyzed as peripheral and marginal. The imperative for employment generation causes them to be viewed as topsy-turvy, that is, employment as the prime concern and output as subsidiary. The assumption that rural crafts and industries die a natural death has also contributed to such an approach.

Under a theoretical paradigm which negates Fordism, one will be able to give a central place to rural crafts and industries in the theory of development. This demands two important things: (1) an analysis of these industries in a production-to-consumption system framework;[4] and (2) an examination of the feasibility of flexible specialization[5] at the operational

[3] Fordism is a model of production, consumption and work organization, the characteristics of which are extensive division of labour, narrowly defined jobs, little training and skill formation, separation of planning and execution of work, clear difference between white collar and blue collar work, bureaucratic administration, close supervision, and a heirarchical managerial apparatus.

[4] "Production-to-consumption system" is a conceptual framework, which refers to the entire chain of activities — from the production of raw materials, through the various stages of intermediate sales and processing to the consumer of the final product. It is a comprehensive concept which includes the technologies of processing as well as the political, social and economic environment in which these processes operate.

[5] This concept means, moving: (1) away from rigid mass production lines and armies of disintegrated semi-skilled workers used to produce standardized goods; (2) towards a more innovative and flexible system of multi-purpose machines and skilled workers better able to respond to ceaseless changes.

level. The approach needs to be holistic and meticulous. Besides, the emphasis should be on integrated development of rural crafts and industries of various technological orders, employment composition and levels of income generation, rather than on a strategy of autonomous development. Based on in-depth studies, it is possible to identify an operationaly meaningful conceptual framework relevant to specific socio-economic situations in each country, such as industrial districts,[6] bamboo villages', etc. Such an approach, and related actions, are likely to take one away from the realm of populism to realistic development policies.

Conventional economic theory has groomed scientists in an environment, where capital-intensity, productivity and distributive share of labour are assumed to have a directly positive relationship. Productivity enhancement often pre-supposes mass production. In the bamboo and rattan sector, where craftsmanship has a key role in determining productivity, a model of 'flexible specialization', rather than one of technology upgrading perse, is likely to be more realistic and effective. In the quest for productivity enhancement, knowingly or not, the role of machines against that of labour skills was highlighted. However, a come-back in a new environment is necessary. From specialized labour and specialized equipment, one needs to move towards more of multi-purpose machines and multi-skilled labour which can better respond to continuing changes. Less rigid and more adaptable structures need to be evolved. For this, a pure economic analysis of the bamboo and rattan sector will not help; rather, the commodities should be viewed as resources which shape the lives of a large number of people who depend on them.

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Bamboo Shoot Industry and Development

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Abstract

Rural people harvest bamboo shoots from natural forests for their food and sell the surplus for additional income. The bamboo shoot industry, using fresh shoots from both natural forests and plantations, encourages employment in the factories as well as at the sources of shoot production. When compared with other industries, employment generation in the bamboo shoot industry is very low, but in shoot production it is quite high.

The growing stock of 710 million clumps in northern and western Thailand generate an annual employment of 35.5 million workdays. In other words, over a million people would be harvesting bamboo shoots from natural forests if even **5%** of the stock is harvestable.

Rapid development of *Dendmcalamus* asper plantations has taken place during the last five years when the total planting area increased from 25 352 ha in 1989 to **55** 087 ha in 1993,40% of which is found in Prachinburi. The plantations require annually 2 186 265 workdays to maintain the current level of shoot production. Thus the total annual employment in the bamboo shoot sector is nearly 40 million workdays, including the shoot industry workforce, the majority of which are women.

Introduction

Bamboo, as one of the most important minor forest products, provides food, raw material, shelter and even medicine for a good part of the world's population (Austin et al. 1983; Liese 1985). It plays an important role in rural development. Bamboo shoots provide rural people with income during the lean rainy season when no other major agricultural crops can be produced (Thammincha 1987).

Thailand is one of the rich areas in Asia in terms of bamboo resources, with 12 genera and 41 species recorded. Most bamboos in the country are of the sympodial type (Ramyarangsi 1987). The species are mainly found in mixed deciduous and tropical evergreen forests. Bamboo plantations have also been widely established, sometimes replacing other agricultural crops, for shoot and culm production. The bamboo shoot industry ranges from the household industry to the modem cannery, and directly promotes income generation among the rural people who harvest bamboo from natural forests, as well as among those who harvest the shoots from their plantations during the rainy season.

Sources of Bamboo Shoots

Natural forest

The major bamboo resources are in upper northern, lower northern and western parts of the country. Ramyarangsi (1987) estimated the area of forest with bamboo to be 15.66 million ha or 30% of the total land area, 70% of which were in the northern and western parts of the country. Recent resource survey using satellite imagery and ground truthing reveals that bamboos grow in an area of over 5 million ha (Table 1).

Table 1: Natural bamboo resources of Thailand

Region	Area (ha)	Growing stock (million)	
		Clumps	Culms
Upper North	3 069 725	248.4	3 497.8
Lower North	1323 700	10.1	1 891.9
West	859 050	361.5	7 460.7
Total	5 252 475	710.0	13 147.5

The bamboo growing area has been reduced by half since Ramyarangsi reported in 1985. The growing stock in the western region is much higher despite the smaller area because pure stands of bamboo only occur in that region, and these cover 31% of the region.

Bamboo plantations/farms

Dendrocalamus asper is the most popular plantation species in Thailand. It was brought from China about 80 years ago and introduced to fanners

in Prachinburi, about 100 km east of Bangkok. Since then, the plantations have expanded very rapidly, particularly during the past five years (Table 2). Currently, there are about 45 000 farmers involved in bamboo plantation establishment and production of bamboo shoots and culms.

Table 2: D. asper plantations in Thailand

Year	Area (ha)	Shoot output (tonnes)
1989	25 352	105 235
1992	55 087	272 667

Prachinburi plantations, which account for 40% of the total plantation area, are the best-known bamboo plantations in Thailand. The area of plantations has grown fast because of the higher economic returns they bring when compared with other agricultural crops (Table 3). Prachinburi is also the centre of the bamboo shoot processing industry. Earlier, the main income was from shoot production, but in the past five years, income from culm harvesting has become substantial. Culms are sold as raw material for pulp or as building material.

Table 3: Development of *D.* asper plantations in Prachinburi

District	Area (ha)			Yield (kg/ha)	
	1984	1987	1992	1987	1992
Muang	2 368	4 565	5 493	9 375	11 131
Srakaew	640	2 381	7 785	9 375	9 375
Nadee	409	1 920	1 962	IO 625	7 175
Prachantakam	480	997	1 742	15 000	12 500
Kabinburi	458	341	582	9 375	12 875
Aranyapratet	. 46	96	417	10 938	8 462
Wattananakorn		88	1 920	9 375	8 750
Srimahapote	56	20	248	7 500	7 706
Tapraya		20	77	7 500	2 187
Kokpeep	8	16	28	8 125	12 500
Wangnamyen		10	1 216	6 250	18 750
Klonghad	-	18	176		5 000
Bansrang		-	6		
Total	4 465	10 409	21 652	103 438	116 411

Bamboo Shoot Industry and Development

Shoots from natural forests

Eight species in the natural forests are regarded as commercial bamboo for food: *Bambusu bambos, B. blumeana, B. nutans, Dendrocalamus brandisii, D.* strictus, Gigantochloa albociliata, Thyrsostachys oliverii, and *T. siamensis.* The shoots of these bamboos are good for making pickled-sliced shoots, low-quality steamed shoots (for the domestic market) and dried shoots, as well as fresh shoots for immediate consumption.

The most concentrated area of bamboo growth in Thailand is Kanchanaburi, 130 km west of Bangkok. It is the only place where vast areas of pure bamboo stands can be found. During the rainy season, bamboo forests and forests with bamboo in Kanchanaburi generate income for thousands of people.

A study in the area showed that there were at least 2 000 people who cut bamboo shoots from the forests on each side of the 100-km road that runs through the area. The people were local, and those from neighboring provinces who came to the area for additional income during the rainy season. Some people came from as far away as Petchaboon Province (500-600 km from Kanchanaburi) to earn a sizable income and return to their home village before the end of the rainy season. The amount of bamboo shoots harvested tanged from 35 to 75 kg per person per day. At the road-side price of 1 S-2.5 Baht/kg, one could earn as much as 40 000 Baht in one season (Thammincha et al. 1990).

The utilization of bamboo shoots from the natural forests can contribute substantially to rural development if the activities are properly organized. There is enough potential for development from the growing stock of 710 million clumps in the northern and western parts of the country (Table 1). Table 4 presents the contribution of natural bamboo resources.

Table 4: Contribution of bamboo resources

Item	Unit
Total growing stock	710 million clumps
Harvestable stock (5%)	35.5 million clumps
Average shoot yield	40 kg/clump
Harvesting capacity	40 kg/person/day
Total workforce	35.5 million workdays
Minimum working days	50 days
Annual workforce	710 000 persons

If the activities of these 710 000 people could be properly organized and appropriate technology introduced, there would be sustainable development among the rural communities.

D. asper plantations

Steamed bamboo shoots are the typical secondary products of *D.* asper plantations. If it is assumed that the daily wage of a farm worker is 100 Baht, the annual expenditure from the 6th year would be as in Table 5.

Table 5: Expenditures of a bamboo plantation from the 6th year onwards

Item	Expenditure (Baht/rai)
1. Variable cost	2 485.50
- 1.1 Labour	634.56
- 1.1.1 Tending	168.73
- 1.1.2 Harvesting	465.83
- 1.2 Material	1 021.97
- 1.3 Miscellaneous	828.97
2. Fixed cost	373.02
Total cost	2 858.52

The total employment generation by the bamboo plantation (55 087 ha) can be calculated as follows:

Workforce = 6.35 workers/day/rai (1 ha = 6.25 rai) = 39.69 workers/day/ha.

Total employment = 55 087 x 39.69 = 2 I86 265 workdays.

The data related to the steamed bamboo shoot industry in Prachinburi can be summarized as follows:

Number of factories	:	28 factories
Fresh shoot demand	:	67 213 tonnes/year
Total investment	.	265.25 million Baht
Labour force	;	2 052 persons

There are also quite a number of steamed shoot processing units at the household level. Shoots of *D.* asper and T. siamensis are the main export items; shoots of other species are sold in the domestic market. More than 90% of the export consists of steamed shoots, while the rest is composed of deep-frozen and dry shoots.

Japan is the main market for steamed shoots of D. *asper,* accounting for more than 70% of the total export volume. Other markets include USA, Germany, Saudi Arabia and Hong Kong.

Future Prospects

The bamboo shoot industry, using shoots from both natural forests and bamboo plantations, makes a substantial contribution to the economy and development of rural communities, in which people use bamboo shoots as food and also earn substantial income from bamboo shoot cutting. Natural stands must be managed on sustainable basis, while man-made plantations need more investment, particularly among small-scale farmers. The increasing area of D. asperplantations in Thailand is the result of an increasing share in the steamed bamboo shoot market in Japan. However, an increase in bamboo plantation area as well as an increase in bamboo shoot production will depend on two important factors (Thammincha 1990):

(1) The flowering of *D.* asper. Although flowering is only sporadic, it will hamper vegetative propagation, affect the productivity of the plantation and make investment more risky: and

(2) The future trend in foreign markets. There might be a possibility that less bamboo shoots will be produced in Taiwan-China. In such an event, the People's Republic of China and Thailand, the second and the third largest producers, will take more of the market share.

The first factor mentioned has already happened. D. asperin Thailand has flowered gregariously in 64 percent of the total plantation area (over 80 percent in Prachinburi). About three million clumps have been in flower in an area of 38 400 ha belonging to 35 400 farmers. The annual loss for the shoot production sector is estimated to be 2 180 million Baht, while culm production losses are estimated to be 1090 million Baht. Thus, Thailand will certainly lose the market for steamed bamboo shoots during the next five years, or longer if plantation development cannot reach the earlier level within that time. The tremendous loss will impair investment prospects and employment opportunities. In the meantime, development efforts need to focus on natural bamboo utilization.

Conclusion

Bamboo shoot utilization plays an important role in rural development and contributes a great deal to the economy of rural communities through income generation. It is essential that the improvement of bamboo resource

utilization as well as the betterment of income distribution be emphasized. Natural bamboo resources must be harvested with more efficient conservation measures, while bamboo plantations need an incentive for investment. The experience of Thailand with the gregarious flowering of D. asper this year will be a good lesson for the bamboo shoot industry and its future development.

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Knowing Bamboo, Knowing People

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Abstract

Despite the high value of bamboo in farming systems and as a source of food and utility items in rural life, scientific research on this plant group has been limited, especially in comparison to economically important tree species. Understanding of how rural communities manage and value their bamboo resource is especially weak. The emergence of social forestry has seen increased emphasis on understanding the interplay between forestry and agriculture, and also on bamboo research. Work is now needed to apply the knowledge that is being generated for the benefit of rural communities. The Integrated Rural Bamboo Project aims to use a multi-disciplinary approach to improve the utilization of rural bamboo.

Introduction

Bamboo, is a prominent feature of the rural landscape in many regions of Asia. Villages in India, Bangladesh and Indonesia are often surrounded by dense clumps of bamboo, elegantly bending at the tips of the main stems or culms to form a distinctive feature of the countryside. But these clumps are much more than merely decorative; they are essential to many aspects of everyday life. The evidence of intensive use is not difficult to see: house construction, agricultural implements, bridges, fencing and basket making are only some of the ways in which bamboo meets the regular needs of rural communities.

Bamboo clumps themselves help to stabilize soil, and provide shade and shelter. Young culms or shoots of certain bamboo species, barely out of the ground, are eaten by tribal groups in Asia and have well-developed commercial potential in some countries. Bamboo is a major source of paper pulp in India and China.

These many and varied purposes have given rise to numerous accounts

of the importance of bamboo and lengthy lists of how it is used. But despite the paeans of praise and countless catalogues of bamboo uses, scientific research has been limited, especially when compared with the work on other tree species, Furthermore, understanding of how rural communities manage and value their bamboo resource is both meagre and poorly documented.

With the emergence of social forestry, there has been a change in emphasis towards studying the role and use of trees in rural development and considering more generally the interplay between forestry and agriculture. However, research institutes have only just begun to address the new challenges presented by a new social forestry research agenda. One of the identified needs is to make the research process in forestry more responsive to the needs of local people. This clearly involves an expanded and more central role for social development studies; yet, there is little evidence of new and effective alliances between the natural and social sciences.

Against this background of limited research on bamboo, it is encouraging to note a change which began with the injection of small but sustained funding from international donors, particularly the International Development Research Centre (IDRC) of Canada, beginning in the early 1980s. Several other countries, including India and Thailand, also helped to fund limited national programs at about the same time. The overall effect has been an increase in the scientific and general interest in bamboo, and a grdwing appreciation of its uses in rural development. Unlike many of the 'miracle' tree species widely promoted for use by local people, such as *Lezccaena* and neem, there is a long association between bamboo and local people in many countries.

Other benefits which have resulted from this surge of interest have included better training of bamboo scientists and an improved capacity of national institutes to carry out bamboo studies. There has been a welcome increase in published information on bamboo, while conferences and workshops have encouraged better links between scientists in different countries. But there is little evidence of the next stage in the process, that of improving bamboo use and utilization in rural communities – getting knowledge 'off the shelf and into the ground'.

integrated Rural Bamboo Project

There are several important questions that one needs to ask: How to apply bamboo knowledge gathered by scientists for the supposed benefit

of rural communities? Who is going to use it? Are the techniques developed in the controlled environment of the on-station trial suitable for farmers on-farm? More to the point, has research been studying the problems associated with growing and managing bamboo which farmers consider important?

It was these fundamental concerns which promoted the establishment of the Integrated Rural Bamboo (IRB) Project. Funding from the Forestry Research Program of the British Overseas Development Assistance (ODA) was obtained for a three-year project in Kerala, India, starting in late 1993. From the outset, the IRB project encouraged a close working relationship between natural and social scientists, and, as the project progressed, scientists from a broad range of backgrounds (diseases, forest ecology, AIDS studies, slum housing, etc.) have proved willing to adopt new approaches to research. The result of these efforts has been the forging of new and powerful professional liaisons.

This new partnership has allowed natural and social scientists to establish a joint stewardship of project aims and activities, The IRB project is not a natural or a social science project, but one in which all researchers, regardless of their own speciality, share a common goal of improving the use and utilization of rural bamboo.

Kerala State in southern India is not well known for the abundance of its rural bamboo, but this has mattered less in the long run compared with the need for an integrated research approach, a true partnership of natural and social sciences, There has been much talk about the need to move towards a 'bottom-up' or 'demand-led' approach to social forestry, but the translation of this process into new working practices for researchers has still to be effectively tackled and, importantly, described.

The IRB project has now completed one season of field work, and has begun to examine ho6 the available professional experience and expertise can be aligned to the needs and characteristics of local communities which already use bamboo or show potential for exploring it. Apart from highlighting this key process, the project would also help others working with bamboo or with other tree species in social forestry projects.

The original aim of the project was very broad and sought to improve the use and utilization of rural bamboo. It envisaged working in association with local communities in the general areas of propagation, clump management, culm preservation and pests and diseases. But it was clear from the start that there was little available information about how the

communities in Kerala viewed bamboo, what influenced their decision to plant clumps or harvest culms, and the overall importance of bamboo in their everyday life. Using information gained from an initial socio-economic survey – the first piece of field work carried out by the IRB project in its early months – these issues were explored in more detail, which then enabled the planning and decision-making on a series of bamboo activities involving local farmers.

These activities fall into three research or 'output' areas: knowledge transfer; knowledge enhancement; and interaction and cooperation between the above groups. For example, the initial socio-economic survey identified local worries that clumps in home gardens -where much of the project work has centred – interfered with nearby crops and that undercropping within the home garden was not possible. Some farmers did not agree, saying that rhizomatous crops such as ginger and turmeric could be grown.

An experiment was set up involving a small group of those who said undercropping could be done and others who were willing to try. Results after one growing season have confirmed that useful yields can be achieved, and this is being pursued further. This activity is linked to two groups of the output areas: the study of the social and ecological conditions necessary for obtaining useful yield of ginger is a knowledge enhancement activity, while the dissemination of this knowledge to other home gardens and farmers is an example of knowledge transfer.

The third output area, interaction and cooperation activities, takes the experiences of the IRB project and makes them available to a wider audience. This paper is one example of project dissemination. Other examples will range from developing local extension tools to working with non-government organizations in other areas of India and publishing articles in scientific journals. Whatever the output area or other project jargon used, the approach to carrying out research remains the same – using an awareness of local knowledge, needs and perceptions to undertake activities which aim to improve the usefulness of bamboo for local people.

Realizing and achieving this approach to research has not always been easy. The social scientists of the IRB project initially lacked experience of working with bamboo, although this has been a relatively minor problem compared with the desire of natural scientists to carry out on-farm experiments which could equally be done at a research institute. The IRB project's natural scientists were not used to taking a back-seat position when

deciding and designing experiments. Years of training have emphasized the centrality of the scientist to the research and development process, and adjusting to a research agenda set by farmers has not been easy. There are still difficulties in perceiving how farmers or local groups of people might 'know' what research needs to be done, and there is always a temptation to exclude or attempt to control awkward social factors. Yet, these are as important as the natural science aspects of bamboo, and need to be studied and understood.

Regular research planning meetings have helped to overcome some of these problems. Joint teams of social and natural scientists working in the field have also emphasized that the research is being done for people and not for academic betterment, though this is a professional aspect of the work which cannot be ignored. Contrary to many natural scientists' suspicion, the shift in who sets the research agenda does not make the formal scientist irrelevant. But it does require a change in attitude and approach to nurture the shift from top-down to bottom-up research.

Future papers will describe the results from various bamboo studies and activities- Additionally, the project team shall continue to explore and emphasize the professional aspects of its work, drawing upon personal experiences to highlight key aspects of the research process itself. The message is already clear: if sustained and long-term benefits are to be obtained from rural bamboo projects, then it is essential to know the people and know the bamboo. One without the other is no good. Social and natural scientists need to work more closely together and in true partnership if the industry of scientists is going to match the needs of the people.

Employment Generation from Bamboos in India

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Abstract

Bamboos generate large-scale rural employment in the management of bamboo forests, and harvesting, collection, transport, storage, processing and utilization of bamboo. On the basis of current production of bamboo and its uses in India, it is estimated that a total of 432 million workdays and Rs. 13 billion in wages is generated annually.

Enough scope exists for increasing bamboo yields by two or three times in a short period using higher inputs of labour and investments. The increased productivity can fill the gaps in the availability of this eco-friendly material to users both in rural and industrial sectors to generate large-scale employment, eliminate imports in pulp and panel industries, and improve the living conditions of the rural poor, many of whom depend on bamboos for their livelihood. Policy changes with regard to land laws, investment, credit priorities, imports, taxation, etc. can strengthen and hasten this process.

Distribution, Growing Stock and Annual Harvest

Distribution

Bamboos are found in moist and dry deciduous forests in all Indian states. Seven North-East states account for the maximum number of species available and nearly 50% of the total harvest. Bamboos are scarce in Rajasthan and Jammu and Kashmir. In Haryana and Punjab, bamboos are now being raised under social and farm forestry practices. The big thorny bamboo, *Bambusa bambos,* is found in moist deciduous forests in association with important timber trees such as teak, laurel, benteak, yellow teak, kino sal, etc. Axlewood and terminalias are the main associates of bamboo in dry deciduous forests. *Dendrocalamtu* strictus is a major component of bamboo stands and harvests in India. *Melocannu baccifma,* growing mainly in the hills of North-East India, is a non-clump forming bamboo accounting for nearly 15% of growing stock.

Growing stock

In most states, there is no accurate assessment of the growing stock through systematic sampling. Estimates put the growing stock at about 150 million tonnes. The incidence of bamboo clumps in the forests varies from sporadic occurrences along valleys to closed thickets all over the forests.

Assessments are generally made in three categories of low, medium and high occurrence based on number of clumps existing per unit area. Any assessment of the growing stock based on annual harvest is likely to be misleading because: (a) removals made by local residents for their own use are not counted; (b) the harvests are sub-optimal in silvicultural terms since the removals are restricted to the top parts of clumps, since a large proportion of clumps are congested, thorny and unapproachable to the harvesters at their base; (c) bamboos in remote inaccessible forests are not harvested; and (d) bamboos in National Parks, wildlife sanctuaries and bio-sphere reserves are not exploited.

Harvest

Bamboo harvests are made by unscientific methods using local bill-hooks, long-handled axes, etc. In most cases, the culms are cut at a height of 2-4 m from the ground. Culms are ideally cut when two years old, but this rule is not followed because older culms are found deep in the middle of clumps and younger ones growing at the periphery are easier to extract. Decongestion of clumps and cultural operations like soil tilling and water conservation measures are not undertaken. Harvesting is mostly done by unskilled labour engaged by either forest departments or contractors who are entrusted the work by paper mills on the basis of lowest tenders. In this method of extraction, the easily accessible bamboo forests are overexploited, while the more difficult portions of forest are left untouched. The felling by privilege holders is even more unscientific as they cut only those culms that are the easiest to extract. Out of all the bamboo extracted in India annually, about one-third is utilized by pulp mills. The rest is mostly used for agricultural purposes as well as for weaving.

Utilization

Non-industrial uses

Bamboos occupy pride of place in the life of villagers in India literally from "cradle to coffin". Bamboos are a readily available material for

fencing of agricultural lands, compounds and homelots. Different kinds of fencing to protect fields from cattle are in use. Thorny bamboos, cut together with their long branches and twigs, are carefully laid or heaped along boundaries, or the culms are split and woven or tied to bamboo posts in different shapes and styles to make effective fencing. Bamboos are used for making agricultural implements, as tool handles, ladders, etc. Whole or split bamboos are used as posts, beams, rafters and scaffolding in housing. Bambdo splits or slivers are woven into baskets, and used for grain silos, walling, partitions, ceiling, bridges and railings. They are also used to make hand-fans, spears, bows, arrows, core of incense sticks, umbrellas, kites, toys and a large number of handicraft items. Woven bamboo, in different shapes and forms, is put to extensive use in sericulture. It is also employed in fishing, cages for poultry, packaging, transport, and drying of grains, fruits and seeds. Flutes and other musical instruments made from bamboos are quite common in India. The Hindus carry their dead for cremation on a bamboo bier. Soil and water conservation efforts also find in bamboo a useful ally. There are several other uses that bamboo is put to in India, and there is a wide range of literature describing these.

industrial uses

The bulk use of bamboos in industry is for the manufacture of paper pulp and rayon-grade pulp. Slivers of bamboos are woven into mats for use in the manufacture of bamboo mat boards. The woven bamboo is also employed as dunnage in storage of food grains, and drying of grains, sugar etc. in rice and sugar mills.

Employment Generation

General

There is great scope to increase the productivity from existing bamboo forests in India by simple and regular silvicultural practices, such as water conservation, soil working and maintenance of health and hygiene of clumps. There is very good potential to raise bamboo plantations as a business venture both in forests and farms. Hence, it is unfortunate that bamboo production has not received adequate attention either in the forestry or the farm sector, in spite of increasing shortages in its availability. Most processing activities of bamboos can employ a low-skilled rural labour force.

Workforce for silviculture

The process of thinning of existing clumps, soil working and some water conservation measures require about 10 to 25 unskilled workdays per hectare, depending on the number and nature of clumps. Even if 75% of the existing bamboo forests are considered accessible and available for such tending, the workforce requirement at 10 workdays per hectare totals to 75 million workdays. The required investment will become economically acceptable since it leads to a two-fold bamboo output and also to improvement in the quality of harvested culms.

Bamboo plantations

Raising bamboo plantations to increase the output to bridge the yawning gap between the demand and supply has not received adequate attention. From available figures, it is seen that hardly 5 000 ha per annum of bamboo plantations are established against the need and potential of about two million ha to be planted in a period of about eight years. The combined annual bamboo plantation targets in farm and forestry sectors for all states should aim at 250 000 ha per annum. It is estimated that raising one hectare of bamboo plantation, including raising nursery seedlings, generates about 120 workdays. Plantation maintenance from the second to fifth year takes about 40 workdays. Thus, every hectare of bamboo plantation generates about 160 workdays, and so 250 000 ha of plantation raised annually can create 40 million workdays of rural employment over five years.

Bamboo harvesting

Harvesting of bamboo is carried out mainly by (aj tribals, (b) landless rural labour, (c) marginal fanners during lean agricultural seasons, and (d) migratory, landless forest labourers. This workforce constitutes the lower and lowest income groups in rural India. The entire operation of cleaning the branches around the clumps, cutting of intertwining branches, cutting the culm, dragging the culm free of the clump, cutting the branches flush to the culm, smoothening at the nodes, etc. are all done manually with a bill-hook, before sorting and stacking the culms. An average of 8-10 workdays is needed to harvest one tonne of bamboo. In India, on an average, six million tonnes of bamboo are harvested for commercial use, which means that 60 million workdays are generated by commercial harvesting. The balance four million tonnes are harvested by users during their spare time, either for use by themselves or for conversion into saleable products during their spare time.

Transport and handling

Loading, unloading, stacking and handling generate downstream employment after hatvest. Two workdays pertonne are generated by this kind of work. Thus the employment generation for six million tonnes comes to 12 million workdays.

Weaving into usable products

There are several thousand families all over India whose children learn, from a very early age, the art of splitting, taking out slivers or strips, and weaving them into mats and other products like baskets or fans as traditional means of livelihood. Most tribals and landless labourers know the art of weaving and use this art to supplement their income by making saleable products. Bamboos either brought from nearby forest areas or brought from the local market are generally stored in water, split and slivered using a sharp knife. The slivers themselves, or bamboo splits and slivers together, are used for weaving into finished products. There are large seasonal demands for certain items like fruit baskets, sericulture trays and so on. The slivers or splits are not treated and the life of these products depends on usage and method of storage. It is seen from experience that one weaver can split, clean, silver and weave an average of three bamboos per day. On the basis of an average of 120 bamboos per tonne, 40 workdays are required for processing one tonne of bamboo. Considering that an average of three million tonnes of bamboo are used for weaving and other forms of end-use, the employment generation in bamboo processing is roughly 120 million workdays per annum. In addition, many poor agriculturists and workers engaged in part-time bamboo processing account for an equal number of workdays for putting bamboos to housing, fencing, other domestic and agricultural uses.

Industrial labour

Two major industrial uses of bamboos as of now are the manufacture of pulp and mat boards. The installed capacity of all pulp mills together is approximately 3.5 million tonnes. The average utilization of bamboos in pulp making is 33.5%, the other raw materials being wood, recycled waste paper, rags, kenaf, grass and straw. Pulp mills, which utilize an average of two workdays per tonne of pulp, account for about seven million workdays. The share of bamboos (at 33.5% utilization) in this is 2.33 million workdays. There are three factories engaged in the manufacture of bamboo mat boards. Other panelwood industrial units also manufacture bamboo

mat boards. The total average consumption of bamboos for mat boards is about 10 000 tonnes. At an average of five workdays per tonne of bamboo, the annual employment potential of the industry is 50 000 workdays (downstream workforce requirement for marketing of boards, support services, etc. are not taken into account here).

Cottage industries

Bamboos are used in the manufacture of incense sticks, and to meet the requirements of sericulture, handicrafts, etc. Being labour-intensive, the employment potential of these industries is quite high. About 60 workdays are required per tonne of bamboo in the primary processing. The average consumption of bamboos in the incense stick industry is 15 000 tonnes per annum, and another 25 000 tonnes goes for other cottage industrial uses. The employment potential of this sector is 2.4 miJlion workdays. Although there is very good scope for use of bamboos in furniture, nothing much is done so far in this direction. But the potential is large because of the scarcity in rattan supply and the high costs of wood in India.

Summary of Employment Potential of Bamboos

The employment potential of bamboo-based industries in India in its management, harvest and primary processing is summarized below:

Use	Quantity (per annum)	Workdays (million)
Silviculture	25 000 ha	75.00
Bamboo plantations	6 million tonnes	40.00
Harvesting	6 million tonnes	60.00
Transport/storage/handling	6 million tonnes	12.00
Weaving into products	3 miliion tonnes	240.00
Industrial labour	3.3 million tonnes	2.38
Cottage industries	40 000 tonnes	
TOTAL		431.78
		i.e. 432 million workdays

In terms of income generation, at an average wage of US$l per day, the annual wage bill will come to US$432 miliion (approximately Rs. 13 billion).

Profile of Bamboo Workers

Silviculture, management, harvest, collection, handling and storage are normally carried out by rural, landless, unskilled labour consisting of all ages (including children) and both sexes from the poorest section of the society. In most Indian states, weaving is undertaken by traditional weaver families, including tribals and other socially and economically backward classes. In the North-East, a large section of cutters and weavers are settlers from neighbouring Bangladesh or backward class members of village communities who do not own land, Some tribal households engage in bamboo weaving or use bamboo in cottage industries during their spare time between seasonal agricultural operations. In Kerala and the North-East states, the weavers settle in hutments on either side of perennial rivers and streams through which bamboos harvested from the slopes are sent down as rafts to these settlements. The bamboos are kept in water till they are removed for weaving. Such water transport and storage leach out the sap from bamboos to make them more durable and less liable to insect attacks. The weaver families are mostly under the control of bamboo contractors or societies formed by contractors and traders. These contractors or societies invest in the purchase of bamboos, supply them to the weavers and buy back the woven products, keeping a substantial margin of profit. Payment is made on a piece basis. Since the bamboos are untreated except for water leaching, storage for long periods would involve hire of bulk storage spaces, and possible discolouration and deterioration in the quality of the products. Long storages are therefore avoided.

Socio-economic conditions

Most bamboo workers and weavers are illiterate and live in small hutments under conditions of perpetual poverty and ill health. Many bamboo weavers (including women and young adults) are addicted to liquor, which, in turn, adversely affects their health and economic conditions. Only a few tribals, who take up weaving in their spare time to supplement their income from seasonal agriculture, are economically strong and have the capacity to organize themselves into cooperatives or aided institutions to benefit from schemes funded and aided by government agencies.

Case Study of Kerala State

Keraia state is situated in the tropical belt along the Arabian Sea coast in South-West India. The Western Ghats traverse the state parallel to the

sea coast, north to south, and result in the state receiving heavy precipitation from the south-west monsoons during June-October. The main bamboo species are: *Ochhndra travancorica,* popularly called reed bamboo, and *Bambusa bambos,* the thorny big bamboo. Small pockets of *Dendrocalamus* sttictus are found in the deciduous forests on shallow soils of slopes. The bamboos are spread over about 57 000 ha of forest area in the state. Bamboo clumps can also be seen on private lands around households. The estimated yield of reed bamboo is 300 000 tonnes per annum, of which 187 000 tonnes is allotted for extraction by Hindustan Newspaper Limited (HNL) for use as pulp wood. Another 30 000 tonnes are allotted to the Kerala State Bamboo Corporation, which owns a bamboo mat board factory. Another public sector pulp mill is allotted 83 000 tonnes of bamboos per annum, but the factory is closed and therefore, no extraction is done against this allotment. One private sector rayon-grade pulp industry has been allotted 100 000 tonnes of big bamboos from the forests of the northern districts.

HNL manages to procure about 80 000 tonnes reed bamboos per annum against its allotment of 187 000 tonnes. The Kerala State Bamboo Corporation is also unable to extract its full allotted quota. The government and the Corporation reckon 2 1.6 million reed bamboos as equivalent to the 30 000 tonnes allotted to the latter. Against this, the Corporation extracts only an average of 16.5 million bamboos per annum, which is about 79% of its quota. The representatives of the Corporation and the pulp mill say that the yield estimates are high and the availability from accessible forests is nearly half the estimated annual yield.

The Kerala State Bamboo Corporation

This is an old government agency set up to provide proper amenities and benefits to bamboo workers to prevent exploitation by contractors, and to undertake rational utilization and sale of bamboo products. The Corporation has an annual turnover of Rs. 85 million of which Rs. 25 million is from its mat board factory. The Corporation engages about 1 500 bamboo harvesters for an average of 200 days per year for extraction of 1.6 million bamboo culms, which works out to 300 000 workdays. Mat weaving consumes nine million bamboo culms, and about seven million culms are sold to weaver families for conversion to other saleable products, of which baskets form the bulk. There are about 15 000 weaver families with a total of about 50 000 members who get full time work for about 300 working

days. The average earning per person is Rs. 25/- per day. The bamboo workers are provided with some welfare benefits like education allowance, medical benefits, housing loans, and educational grants for children to an extent of 11% of their wages. All this put together works out to approximately US$l per day per worker. The bamboo harvesters earn roughly 10% more than the weavers. One reed bamboo culm gives 1 m^2 of woven mat. Mats are normally woven in sizes of 6 x 4 feet or 5 x 3 feet, rolled into bundles of ten and sold in the market. The mat board factory uses 8 x 4 feet mats which have to be woven specially. The biggest buyer of mats is the Food Corporation of India (FCI), which takes 45% of the mat production, and about 30% is sold in the open market. The Spices Board uses 12 x 6 feet mats for drying spices like pepper, cinnamon, clove, nutmeg, etc. The current sale prices of mats per piece are:

Rs. 10.75 for 5 x 3 feet

Rs. 17.20 for 6 x 4 feet

Rs. 66.00 for 12 x 6 feet

Specially woven 8 x 4 feet mats of 1 mm thickness are sold for Rs. 60.00 each to the mat board factory.

Mat board factory

The factory, working on one shift of eight hours per day, produces about 9 000 m^2 per day of boards of 4 mm thickness. Its annual turnover is **Rs.** 25 million. The annual average production is 2.4 million m^2 of 4 mm boards.

The factory engages about 53 workers per day. Most of the bamboo-ply is sold within the state. There is a ready demand for the product for partitions, doors, windows, furniture, ceiling, etc. The factory has plans to start a second shift, but the constraint is the lack of good weavers who can supply closely woven special mats used in the manufacture of boards.

Analysis and Comments

Kerala is the only Indian state, where natural bamboo is regularly used by a state-owned corporation. Yet, it can be seen that the Corporation has made no special efforts to (a) improve the availability of bamboos by tending clumps or raising bamboo plantation, (b) take up treatment of bamboos or its products against decay by fungi or insects, and (c) improve the living

standards of bamboo harvesters, weavers, etc. The achievements of the Corporation are limited to (a) providing a steady income and some welfare measures to the workers, (b) establishing a factory for conversion of woven mats to panel boards, and (c) providing a marketing mechanism for the woven mats (such market support is not extended to baskets and other products). The state is not charging any royalty to the Corporation for supply of bamboos. It would have been better if the Corporation could undertake measures to increase bamboo production, increase life of bamboo products by treatment, provide complete market support for all bamboo products, and extend benefits to all bamboo workers in the state instead of servicing limited number of families in chosen areas.

Other States

The condition of natural bamboo clumps, their productivity, harvest and utilization in all other states is largely neglected. Bamboo workers' co-operatives have been registered in many states to provide raw material, training and marketing services. But the societies are used by traders and merchants only to get allotment of bamboos at concessional rates to inflate their profits. The bamboo harvesters and weavers remain an illiterate, ignorant, exploited labour class living in miserable condition. There is vast scope to improve the availability of bamboos to the workers by tending the natural stock, increasing the area under bamboo through plantations, applying scientific methods of harvest and utilization to provide quality raw material to users and better durable products to consumers, and above all, improving the living conditions of several thousands of families of disadvantaged people who depend on bamboo for their livelihood.

Policy

Investments in forestry sector, under both social and production forestry, should aim at improving natural bamboo stock and increasing area under bamboo, in order to improve the quality and quantity of harvestable bamboo by two to four times in a period of three to seven years. The increase in bamboo output can meet the shortages of bamboos to weavers and industries. The pulp and paper industry is working at only 60-65% of installed capacity because of the shortage of raw material. The panel wood industry, which largely depends on imported logs for wood veneer, can easily switch over to bamboo mats and thereby save valuable foreign exchange.

The increase in production of bamboo and its increased use in panel boards, chip boards and particle boards can double the empioyment potential for harvesters, handling labour and weavers, and improve their wage earnings and thereby their living conditions. It is time that these eco-friendly woody grasses, which have annual incremental harvests, are made use of by planners to increase rural employment, generate raw materials, reduce imports, and ensure the socio-economic improvement of rural communities. The policies on licensing, imports, investments, credits, taxation and land laws need to be suitably modified to achieve self-sufficiency in production and use of bamboos, and to increase its utility for the creation of better economic and environmental conditions in the country.

Bamboo for Socio-economic Development and Sustainable Resource Management: The Case of Indonesia

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Abstract

Bamboo plays very important roles in the socio-economic and cultural lives of Indonesian people. There are bamboo resources available throughout the country in natural as well as plantation forests. Mostly planted by farmers in their farm yards and by the community in community forest lands, bamboo, together with rattan, is gaining an increasingly significant role in the non-oil and top-100 export commodity structure since the last Five Year Development Plan (REPELITA).

Socio-economic issues need specific research initiatives in Indonesia. Resource inventory and stock management need to be assessed and evaluated in line with sustainable resource management issues. Very few studies have been made on the social, policy and economic aspects of bamboo. This paper reviews the overall socio-economic and resource management issues, and outlines some research needs that should be addressed in the future.

introduction

Bamboo plays an important role in rural development in Indonesia. Bamboo is found in natural forests, plantation forests and in community forest areas in many villages, primarily in Java, Bali, Sumatra, Kalimantan, Sulawesi, Maluku, Irian Jaya and Nusa Tenggara. Some of the bamboo species have been cultivated by people in backyards and home gardens for hundreds of years.

Bamboo culms are commonly used as construction material for rural housing, while bamboo handicrafts form an important source of additional income for rural people. The wide-ranging uses of this universally useful plant not only create employment opportunities, but also ensure better

income distribution. Millions of bamboo culms and thousands of tonnes of bamboo shoots are harvested every year in Indonesia. Bamboo's socio-economic roles are so significant that the life of Indonesians, particularly the rural Indonesians, would be completely different without it.

This paper presents some information and experiences related to the bamboo production-to-consumption systems in Indonesia, and identifies efforts required in the future for continuing research and development activities on the socio-economic and policy aspects of bamboo, particularly regarding sustainable development issues.

Bamboo Forests

Natural forests

There is no national inventory data available either on natural bamboo forests or on plantation forests. No attempt has so far been made by the government, private agencies or NGOs collect such data. Some estimates state that there are more than five million hectares of natural bamboo forests in the country, mostly in the lowland and mid-highland tropical rainforests of Sumatra, Kalimantan, Sulawesi, Maluku, Irian Jaya, Nusa Tenggara islands and Java.

Plantation forests

Most of the bamboo forests in Java are plantation forests, raised by farmers on homesteads and community lands. In West Java, huge bamboo plantations are to be found in places such as the Ciwidey area south of Bandung, Tahura Lembang, Purwakarta, Baja Desa in Ciamis, Tasikmalaya, Sumedang, Cianjur-Cipanas, Sukabumi, Cibinong and Bogor. Scattered on community lands and farmyards are huge, almost homogenous bamboo plantations. Sometimes they are mixed with agricultural crops and multi-purpose tree species, such as durian, mango, coconut, petai, jengkol, aren palm, etc.

Yudodibroto (1987) reported a total of 26 000 ha of bamboo forests in Banyuwangi, East Java, of which 7 700 ha supplied raw materials to a paper mill. A second bamboo forest complex of 24 000 ha located in Gowa, South Sulawesi, is also managed by a state-owned paper mill.

Planted bamboo forests are also found in Sumatra (for example, in the districts of Simalumun, Tapanuli Utara and Karo), Sulawesi (Tana Toraja highlands, Gowa and Minahasa), Nusa Tenggara, Maluku and Irian Jaya.

According to rough estimates, planted bamboo forests total more than 700 000 ha in area.

Bamboo Species

Widjaja et al. (1994) reported that there are 56 species of native Indonesian bamboos of economic potential growing throughout the country. Altogether there are 120 bamboo species in Indonesia. In relatively dry areas, *Bambusa bambos* is the main species planted, while in wetter conditions *Giguntochloa apus* or *Dendrocalamus* asper are preferred (Yudodibroto 1985).

About 22 different bamboo species were planted for research in 1961 on a 16.27 ha land in Arcamanik in the North Bandung Forest District (West Java). There is also a 5-ha bamboo collection of different species in Haurbentes of Jasinga, West Java. Studies are, however, required in the future for the further development of these facilities on a larger and economical scale.

Production and Markets

There are hardly any official data or statistics on the production, markets and consumption of bamboo. Some case studies have been initiated by the Gadjah Mada University, in cooperation with the Directorate General of Forest Utilization of the Ministry of Forestry, to collect information on bamboo production, consumption and utilization in West, East and Central Java, as well as in Nusa Tenggara (Anonymous 1991a, b, c, d). The outcome of these studies will be very valuable in designing further research programs on bamboo.

Yudodibroto (1987) estimated that the annual consumption (1985) of bamboo in Indonesia was about 29.146 million culms by the fanning sector and about 3.5 million culms by the paper mills.

Bamboo utilization by the chopsticks industry is also growing rapidly since the recent investment promotion drive. In 1991, the Province of East Java produced 920 million pairs of chopsticks, using 1.178 million bamboo culms, as can be seen from Table 1 and Figure 1 (Nasendi 1994a).

West Java Province's bamboo small-scale industrial centres are also growing fast under the supervision of the government. There are 272 such centres in the villages of West Java, where 23 520 small production and processing units make a variety of products such as baskets, screens, handicraft items and umbrellas (Table 2). Investments in the bamboo

processing industry are also growing rapidly as can be seen from Table 3 and Figure 2.

Table 1: Production and consumption of the chopsticks industry in East Java, 1911

Location	No. of mills	Production capacity (x 1 000)	Bamboo culm supply
Bondowoo	1	25 000	85 000
Banyuwangi	1	90 000	300 000
Sidoardjo	1	150 000	120 000
Lumajang	3	535 000	385 000
Surabaya	1	60 000	144 000
Tulungagung	1	60 000	144 000
Total	8	920 000	1 178 000

Source: Gadjah Mada University (Anonymous 1991d)

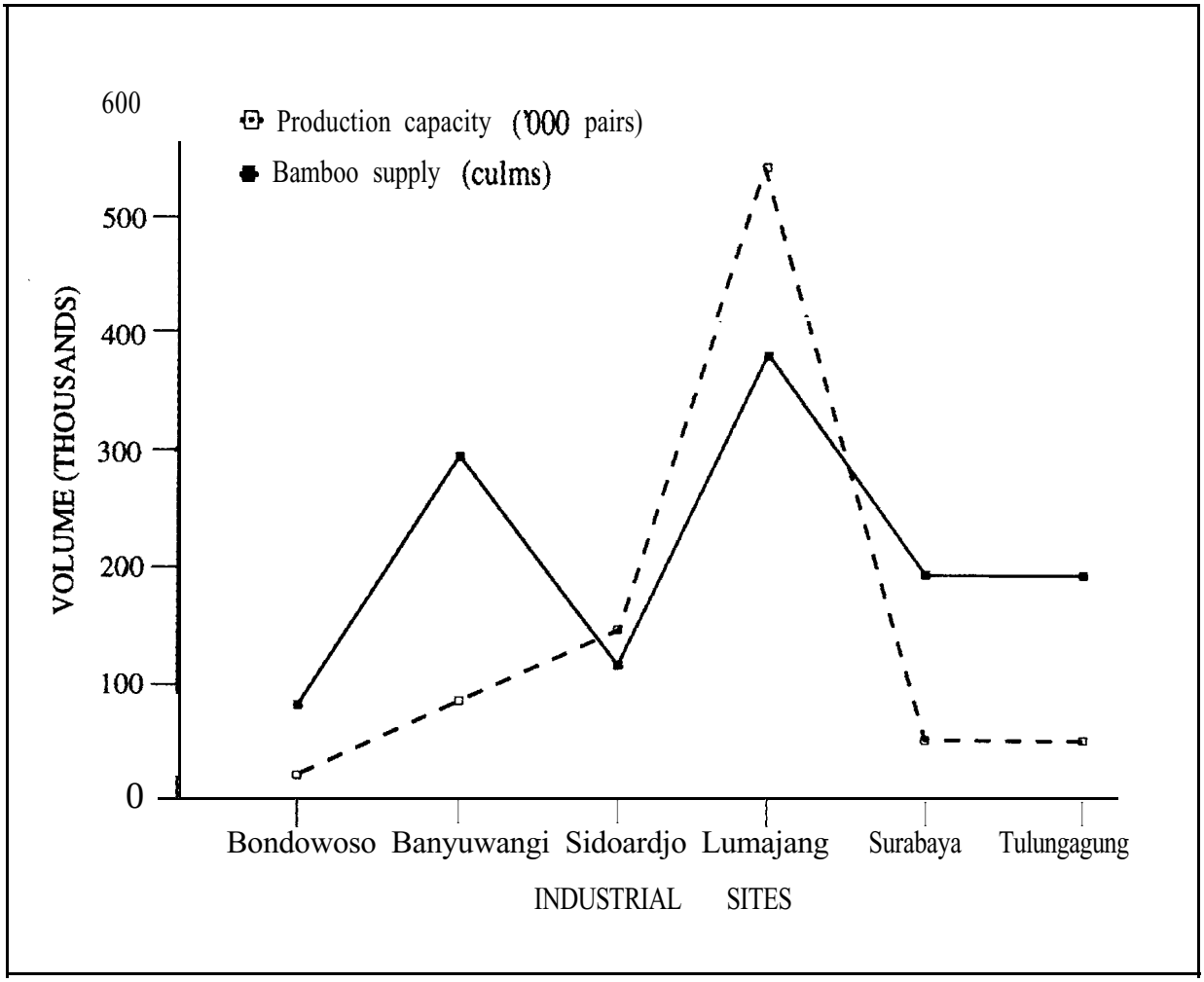

Fig. 1: Production and consumption of the chopsticks industry (East Java, 1991)

Table 2: Bamboo industrial centres in West Java, 1991

Products	No. of centres	No. of units	Production (pieces)	Culm demand	Employ ment
Baskets	250	22 547	664 113 450	11 073 990	58 510
Screens, fences	11	673	2 724 252	2 880 892	900
Handicraft item	10	296	183 816	133 429	446
Umbrellas	1	4	3 000	150	2
Total	272	23 520	667 024 518	14 088 461	59 858

Source: Gadjah Mada University (Anonymous 1991c)

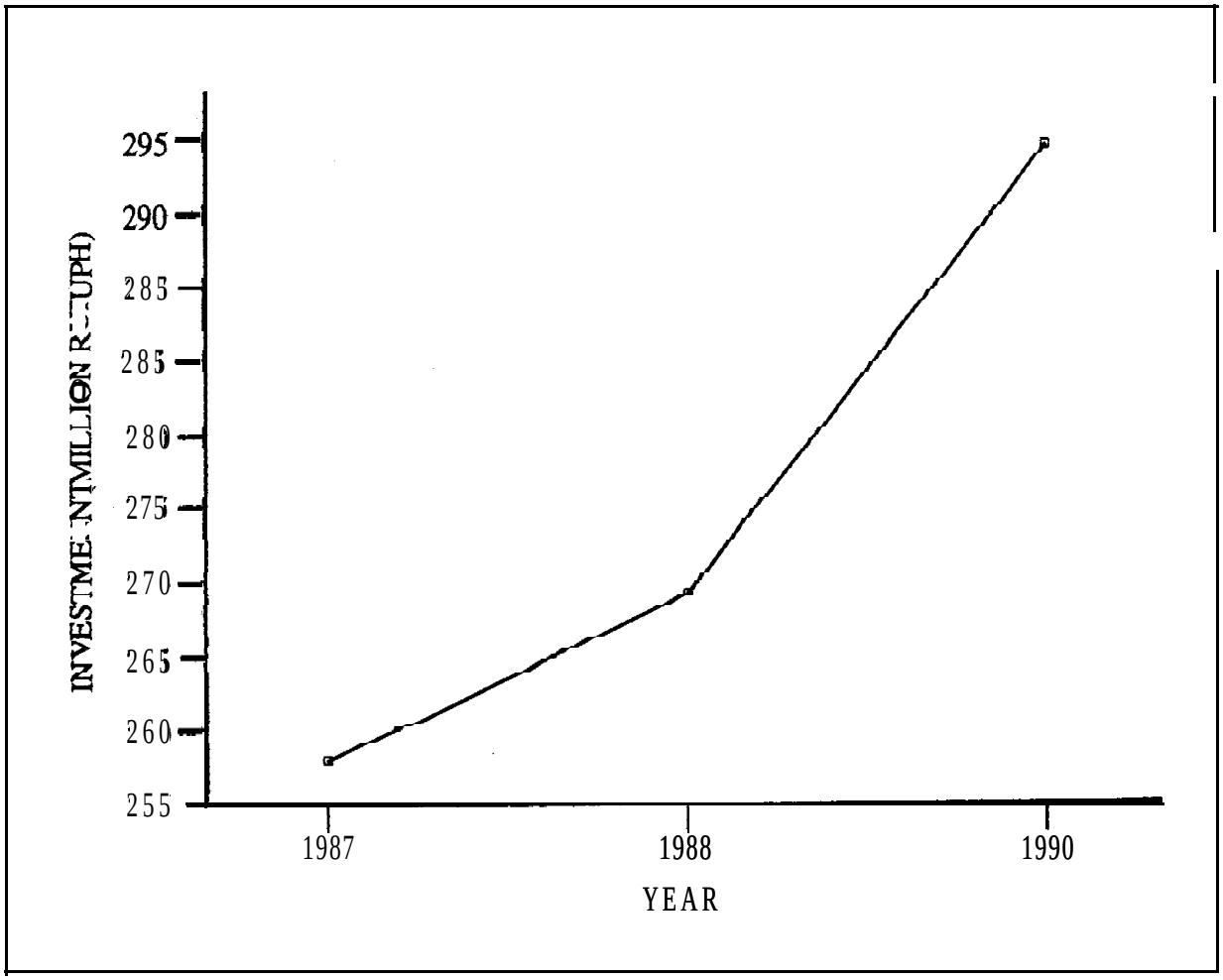

Fig. 2: Investment in bamboo products in East Java, 1987-90

Bamboo products exported from West-Java are mainly furniture and chopsticks, destined for the Netherlands, Hong Kong, Japan, South Korea, Singapore and China-Taiwan. In 1989, West Java earned foreign exchange

worth US$3.8 million from about 2 300 tonnes of products, as shown in Table 4 (Nasendi 1994a). Locally, bamboo is sold either in round form or in processed form. The latter category includes split bamboo for further processing, as well as finished products.

Table 3: Bamboo utilization in the handicrafts sector in East Java, 1987-90

Year	Villages	Handicrafts units	Employment	Investmenr (000 Rp)	Product ('000 Rp)	Raw material Ivalue ('000 Rp)
1987	37	6 305	13 947	257 698	4 101 382	1 679 246
1988	55	7 563	17 200	269 093	4 297 964	1 772 221
1990	103	9 757	22 229	294 178	5 450 188	2 348 541

Source: Province of Easr Java Department of Industry (Anonymous 1991d)

Table 4: Export of finished bamboo products from West Java, 1989

Product	Export		
	Destination	Volume (kg)	Value (US$)
Furniture	The Netherlands	374	607
Chopsticks	The Netherlands	754	8 510
	Hong Kong	71994	25 440
	Japan	1786 731	3 555 476
	South Korea	223 581	153 595
	Singapore	22 286	40 885
	Taiwan	194 194	53 340
	Sub-total	2 299 540	3 837 246
	Grand total	2 299914	3 837 853

Source: Gadjah Mada University (Anonymous 1991c)

The supply of bamboo to meet domestic demands varies from place to place. For example, bamboo is supplied to Jakarta by floating bamboo rafts from Bogor to Jakarta along the Ciliwung river. As reported by Saputra (1985), every day 8-10 collones of rafts pass through the river carrying 3 200 to 4 000 culms of bamboo. One raft consists of 50 culms and one collone is

composed of eight rafts tied to one another. Therefore, it can be estimated that Jakarta consumes at least onemillion culms worth around Rp 250 million (198 5 data; exchange rate Rp 1 120 = US$l).Lampung in South Sumatra has some bamboo shoot exporting ventures. The local company, PT Centra Multicon Jaya, is planting and managing a bamboo forest of about 5 000 ha, using pineapple as an intermediary crop to increase production value per hectare. Some companies in Indonesia — such as PT Basuki Rachmat in East Java and PT Kertas Gowa in South Sulawesi — have been using bamboo as raw material to produce bamboo pulp, including export-quality pulp, and fine papers since the 1950s. PT Asahi Mutiara Nusantara, a private company, is considering a bamboo-based project for pulp and other products on a 5 000 ha bamboo forest land in Nusa Tenggara. PT Indohafiedzco, another private company, from Purwakarta in West Java is also interested in using bamboo for its pulp and paper industry. The firm is trying to enthuse local farmers to plant more bamboo on their back yards and farm lands by guaranteeing supply of planting material, necessary farm inputs (fertilizers, pesticides, etc.) and markets For their bamboos.

In Rajapola and other Taikmalaya villages of West Java, up to 40 different products such as trays, shutters, plates and saucers, snack holders and musical instruments are sold as souvenirs at prices ranging from Rp 150 to Rp 10 000 (1991 prices). These items are sold directly to the tourists, to a cooperative or on the local market. Bamboo weaving for extra income is common in most villages in West and East Java. In the village of Naga in Tasikmalaya, West Java, a bamboo culm measuring 8 - 10 metres in length can be purchased for Rp 500 - 1000. Weaving is mostly done at home, during leisure time in the afternoon or evening (Triarto et al. 1991).

A very important product type, caIled 'plaits products' or 'barang anyaman', use both bamboo and rattan. For instance, rattan is used along with bamboo to produce handicraft items, such as lamp shades and furniture. In 1993, the export of plaits products earned US$49.94 million (11.26% of the total non-wood forest product exports), contributing 0.21% to the 100 top non-oil export commodities. During the three years since 1990, bamboo and rattan products together have contributed more than US$l billion to the Indonesian economy, as shown in Table 5 (Nasendi 1994b).

Social Aspects

Bamboo industry is mostly small-scale. Its employment generation has been significant and particularly beneficial to the socio-economic devel-

opment of the rural sector. In 1770, the bamboo industry in East Java employed 22 227 people (Table 3). In West Java, in 1991, the industry accounted for the employment of 59 858 people, as can be seen from Table 2 (Nasendi 1994a).

Bamboo craft work, like rattan craft work, provides supplementary income for many villagers in Indonesia. One such craft product is *angklung,* one of the most popular musical instruments in the country. *Angklung* consists of tuned bamboo tubes, usually two, set in a frame. Shaking the frame produces musical notes (Anonymous 1990a). Other bamboo-based musical instruments include *calung* and *kuintang.*

In most villages of Java, the intricate techniques of skilled artisans are traditionally handed down from generation to generation. Apart from novelty items, the budding artisans learn how to make articles such as flower baskets, rice baskets, winnows, cups, buckets and other household items (Anonymous 1990b).

Bamboo has sacred and cultural values for most people in rural Indonesia. Several cultural events in Java, Sumatra, Sulawesi, Maluku, Nusa Tenggara, Bali and Iriyan Jaya would be meaningless without bamboo.

Policy and Institutional Aspects

Bamboo processing centres in villages and some specific locations are supervised by the Ministry of Industry's provincial departments and the local government offices. But there is nothing much to say about the policy aspects since very little information is available on the subject in databases or existing literature. The legislation and regulations currently in force are summarized below.

Government legislation and regulations regarding bamboo harvesting is the same as those that cover other forest products (including rattan) and resources (Nasendi 1994a, c):

(a) Law No. 5/1767 regarding basic forestry codes and guidelines for forest management;

(b) Government Regulation No. 21/1970 on the Right of Forest Concession (Hak Pengusahaan Hutan - HPH) and the Right to Harvest Forest Products (Hak Pemungutan Hasil Hutan - HPHH); and

(c) Agriculture Minister's Decree No. 749/Kpts/Um/ 12/ 1974 regarding directives on the granting of HPHH.

The legislation and regulations are supposed to be used by the provincial government as the basis for granting rights to harvest bamboo in

Table 5: Contribution of major forest products in the 100 top non-oil export products of Indonesia and their share in the economy

(A) Contribution to the economy

Year	Plywood	Furniture components	Prefab wood	Rattan products	Furniture	Pictures/ utensils/ containers	Chipwood/ particle board	Industrial paper	Plaits products	Wood frame	Pulp	Shellac/ rosin/ copal
1989	2 380 761	188 515	68 946	158 381		111 473	22 582	28 730	45 845	4 377	36 833	17 914
1990	2 754 952	97 479	196 715	225 057	93 329	185 001	23 522	32 078	37 013	6 385	77 345	24 x47
1991	2 906 324	297 160	165 607	278 281	142 141	226 092	28 309	70 429	51 742	6 769	61 146	25 848
1992	3 252 848	392 113	219692	309 197	208 406	255 793	26 435	86641	53 330	14 084	50 539	28 845
1993	4 243906	399 132	386 860	355 885	324 536	307 901	79 181	75 479	49 940	43 803	39 040	37 649
RANK	1	9	11	13	15	17	46	49	66	73	77	79

(B) Percentage share

Year	Plywood	Furniture components	Prefab wood	Rattan products	Furniture	Pictures/ utensils/ containers	Chipwood/ panicle board	Industrial paper	Plaits, products	Wood frame	Pulp	Shellac/ rosin/ copal
1989	29.25	2 36	0.86	1.99	0 63	1 40	0.28	0.36	0.57	0 05	0.46	0 22
1990	27 20	0 96	1.94	2.22	0 92	1.83	0 23	0.32	0.37	0.06	0 76	0 25
1991	22.10	2.26	1.26	2.12	1 08	1.72	0.22	0.54	0 39	0.05	0 47	0 20
1992	17 40	2 10	1 18	1.66	1.12	1.37	0 14	0 46	0.29	0 08	0 27	0.15
1993	1890	177	172	1.58	1.44	1.37	0.35	0 34	0.21	0 19	0 17	0.17

(C) Percentage growth

Year	Plywood components	Furniture wood	Prefab products	Rattan	Furniture utensils/ containers	Pictures/ particle board	Chipwood/ paper	Industrial products	Plaits frame	Wood	Pulp rosin/ copal	Shellac/
1990	15.72	48.29	185.32	42 10	85.49	65.96	4.16	11.66	19.26	45.86	109.99	38.70
1991	5.40	204.85	15.81	23.65	52.30	22.21	20.35	119.55	39.7')	6.02	20.94	4.03
1992	11.92	31.95	32.66	11.11	46.62	13.14	6.62	23.02	3.07	108.06	17.35	11.63
1993	30.47	1.71	76.09	15.10	55.72	20.37	199.50	12.90	6.20	211.00	22.81	30.4x

Source: SWA Magazine 06/X-Sept/1994 pp. 16-18
Note: Plaits products consist of rattan and bamboo

their respective areas. Bamboo harvesting licence under HPHH is to be issued by the provincial Governor of the Chief of the Provincial Forest Service and granted only to companies legally constituted as PT *(Perseroan Terbatas* - Business Enterprise Incorporated Limited), CV *(Commanditer Venootschop* - Closed Small Family Business Enterprise), Fa *(Firma* - Closed Small Family Business Enterprise Limited) and KUD *(Koperasi Unit* Desn - Village Cooperative Unit), and to individual business persons of the local community and inter-island entrepreneurs.

In practice, however, the legislation and regulations have not been enforced effectively for bamboo. This is mainly because most bamboo culms and shoots are harvested from village homesteads, farm gardens and community forest lands. Only a very small quantity is harvested from natural forests, where the legislation and regulations apply in full force. Moreover, the policy and institutional aspects of the legislation and regulations in relation to bamboo resource development, regeneration, planting, harvesting, processing and marketing are not clearly defined. This deficiency is particularly noticeable when compared with case of other non-wood forest products, including rattan. Every year, the government is losing revenue through uncollected tax on the bamboos harvested owing to these constraints.

On the other hand, it would be worthwhile to formulate a regime of fiscal incentives and tax exemptions for bamboo resource development – particularly planting and tending, or plantation development for industrial raw material supply – with the aim of motivating rural people to include bamboo in their reforestation and afforestation activities (social forestry development), and to develop bamboo resources for supplying raw materials for the furniture, handicraft, and pulp and paper industries.

Specific research should assess the policy and institutional issues, as part of the socio-economic and policy modelling process for the sustainable development of non-wood forest products in Indonesia. Before this can be attempted, a comprehensive review of the information so far available would be necessary.

Socio-economic Studies

The socio-economic aspects of bamboo are significant because of the commodity's role as a major non-wood forest product, and they warrant detailed research (Nasendi 1994a). Though a large number of studies have been done in the past on various aspects of bamboo, only limited

attention has been paid to the socio-economic and policy aspects of Indonesian bamboo, including production-to-consumption systems and sustainable resource development.

As in the case of policy and institutional aspects of bamboo, it would be worthwhile to do a thorough review of the socio-economic studies undertaken so far, and prepare a synthetic paper and an annotated bibliography in English and Bahasa Indonesia. The development of a database on the socio-economic aspects of bamboo is another urgent need. In this regard, it is encouraging to note that the Forest Products and Forestry Socio-economics Research and Development Centre (FPFSE-RD), Bogor, in co-operation with the International Network for Bamboo and Rattan (INBAR) has already initiated a project on the development of a national database on bamboo and rattan.

Research on bamboo harvesting, production, consumption and marketing — both on macro and case study levels — also needs to be carried out. Aspects such as the value added, as well as government options and interventions on investments would require detailed analyses. One or more case studies are needed in selected locations to assess rural community participation and gender roles in sustainable harvesting and production-to-consumption systems. Also, bamboo's linkages to the environment, its socio-economic values in natural and community forest areas, as well as its management in Indonesia, including bamboo industries, trade and marketing, require investigation. These studies should also cover Government policies and their impact on sustainable bamboo resource development in the country (Nasendi 1994a).

Inventory of bamboo forest resources is needed, and the production potential of bamboo in natural and man-made forests requires assessment for better resource development planning.

Summary and Conclusion

Bamboo plays an important role in the socio-economic development of Indonesia, particularly in rural development. The wide-ranging uses of bamboo generate employment, specially to women and other disadvantaged groups, ensure better income distribution, earn valuable foreign exchange through exports and contribute to environment stability.

Agriculture and forestry economists, natural and social scientists, and decision-makers at different levels have all come to realize the importance of bamboo in the many facets of life. On the government's side, it is time to

formulate a clearly defined policy on bamboo resources and once this is done, bamboo will be able to contribute more to the socio-economic development of the country in general and rural areas in particular. On the scientists' side, research needs to be focused on areas where gaps exist and on areas which will further the socio-economic development of the country. Bamboo is a non-timber product today but a good timber substitute for tomorrow; work for it today, or there will be nothing for tomorrow.

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Bamboo: a People-oriented Approach

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Abstract

Bamboo is an integral part of the lives of tribal people living in the Karjat Tribal Block of the Maharashtra state in India. Bamboo from natural stands is used, and two species are cultivated near villages. Bamboo is crucial as a material for a very large number of household and utility items, and also as a source of income (both in cash and kind) for some. For these reasons, bamboo is an ideal starting point for a people-centred development approach. A craft tradition is in existence in the area and the resource is available locally at low cost. There is a local market for bamboo articles and scope for expanding the market for these goods, Starting with a better definition of the resource base, indigenous knowledge about the resource, and an improved understanding of the opportunities and constraints in processing and marketing bamboo products, the project aims to use bamboo as a tool to strengthen tribal culture and provide a means to deal with market forces in a rapidly changing world.

Introduction

This paper is an attempt to see how bamboo can be used to strengthen tribal cultures, and provide them with a means to deal with market forces in a rapidly changing world. The ideas expressed in this paper have emerged from an ongoing project entitled: "Evolving a comprehensive strategy for the cultivation and use of bamboo in the Karjat region of the Western Ghats". The project is based at the Academy of Development Science, which is an educational trust working in the areas of traditional health practices, conservation of plant genetic resources and other development problems in the Karjat Tribal Block of Maharashtra, India. Financial support for this two-year project has been provided by the International Network for Bamboo and Rattan (INBAR).

This paper first introduces the region under study and then outlines the place of bamboo in tribal life today. Finally, it presents a critique on existing development strategies involving tribals, and tries to make a case for a more inclusive approach.

Background

The region under study is in the foot-hills of the Sahyadri Mountains, which form the northern limit of the Western Ghats (Figure 1). This is a high rainfall area (average rainfall is about 3 800 mm) and the forest is moist deciduous.

Of the three tribes living in the region, the Katkaris are the poorest having meagre or no land holdings. The Thakurs and Mahadeo kolis are somewhat better off.

All agriculture is rain-fed, and people take only one crop a year. June to October is spent planting, tending and harvesting rice, ragi and a few pulses. The rest of the year is spent gathering forest produce such as fruits, medicinal herbs, honey, resin, fibre and leaves, and cutting and selling

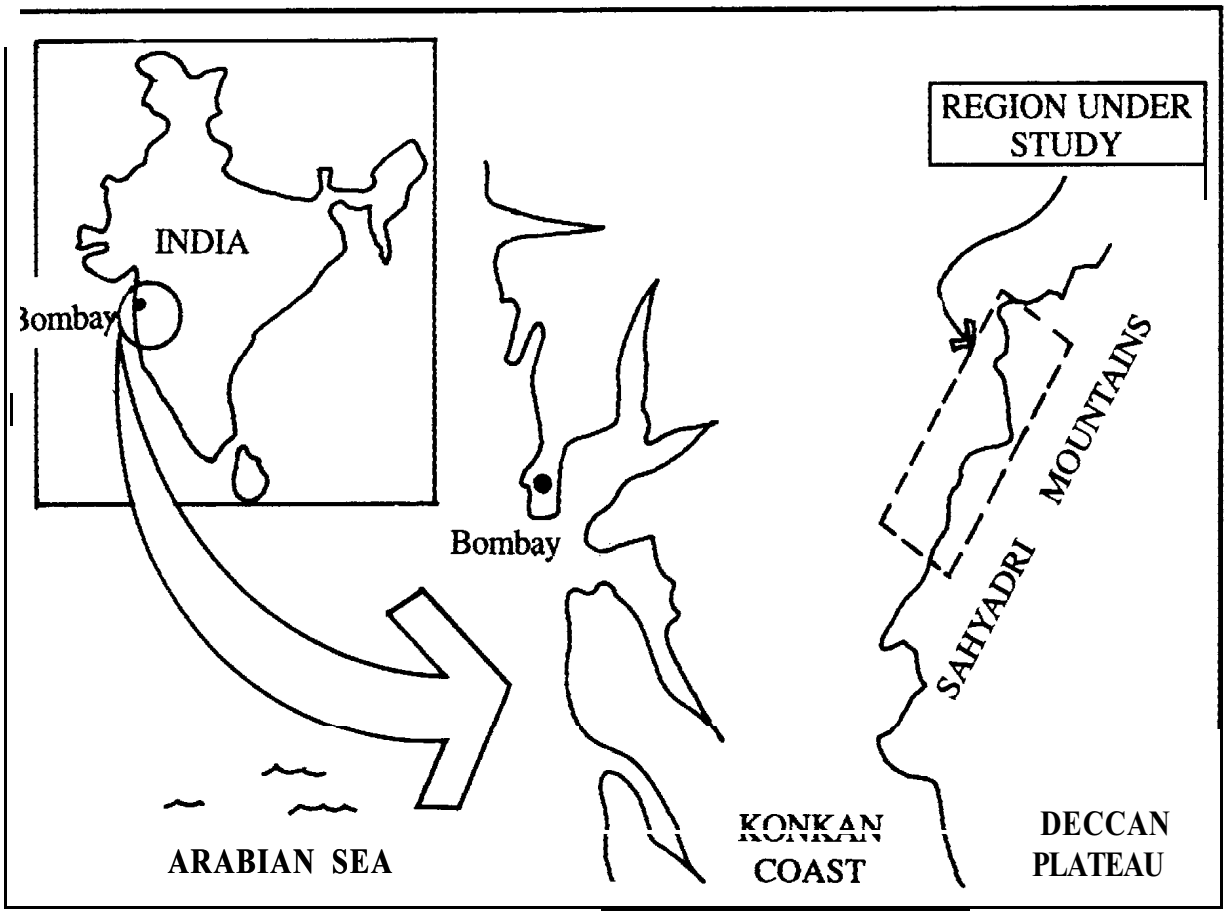


Fig. 1: **Location map** of the region studied

firewood. During the lean dry months, many people make bamboo articles and sell them locally. Engaging in a wide range of activities guided by natural cycles ensures their survival in a fragile forest-based economy. In recent years, owing to development in the region, tribals have started working in construction sites, road building projects and brick kilns for additional income.

Bamboo in Tribal Life

Apart from what is naturally occurring on forested slopes, there are bamboo stands in the backyard of almost every house. Four species of bamboo grow in this region: Oxytenanthera monostigma (Uda), 0. *stocksii* (Mes), Dendrocalamus strictus (Manya) and Bambusa **bambos** (Kalnk). 0. stocksiiand D. strictus are cultivated and seen around villages and hamlets, while 0. monostigma and B. **bambos** are found in the upper reaches of the forests (Figure 2).

Just as certain trees, animals, birds, insects are woven into the tribal religion, bamboo too features as a tribal *devak* (religious totem). Bamboo is mentioned in their stories, songs and proverbs. From providing a cradle for the new-born baby to a bier for the dead, bamboo takes care of shelter, daily use articles and tools.

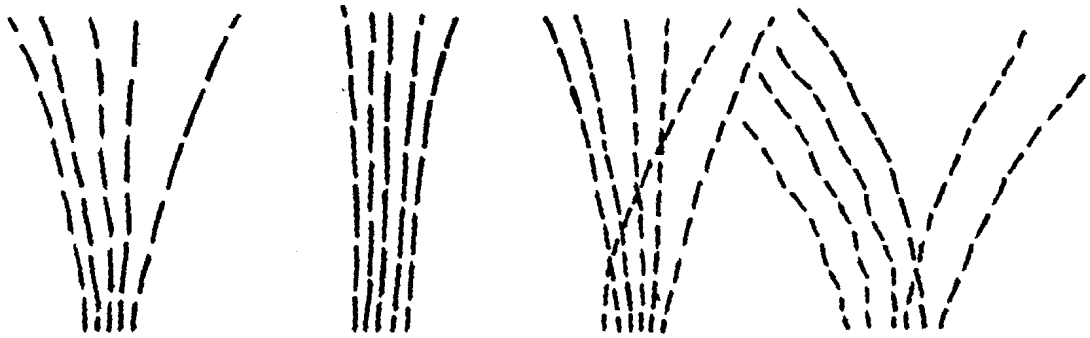
Being such a versatile material people have understood bamboo's potential and used it in a variety of ways (Figure 3):

- Articles used in and around the home, for example, *topli* (basket), *kirkinda* (vegetable basket), *kungi* (small grain storage bin), *kanga* (large storage bin) and cradle.
- Articles used for agricultural and related tasks, like *chaap* (basket for dry leaves), soop (winnowing fan) and *irla* (raincoat).
- Articles used for fishing, hunting and gathering activities, such as bodhad, ***usoo,*** satea, burdul(fish traps of various kinds), bows, bird traps, malai (crab traps), etc.

Unlike many other craft traditions, bamboo skills are not restricted to one particular tribe or community. Nearly every family has a member familiar with bamboo work, though the level of skill varies greatly from person to person.

Most articles are made for domestic use or for local consumption within the village and are bartered or made specially to order. Marketing is thus not organized and is at best extended to weekly bazaars, an institution that

CULM STANCE

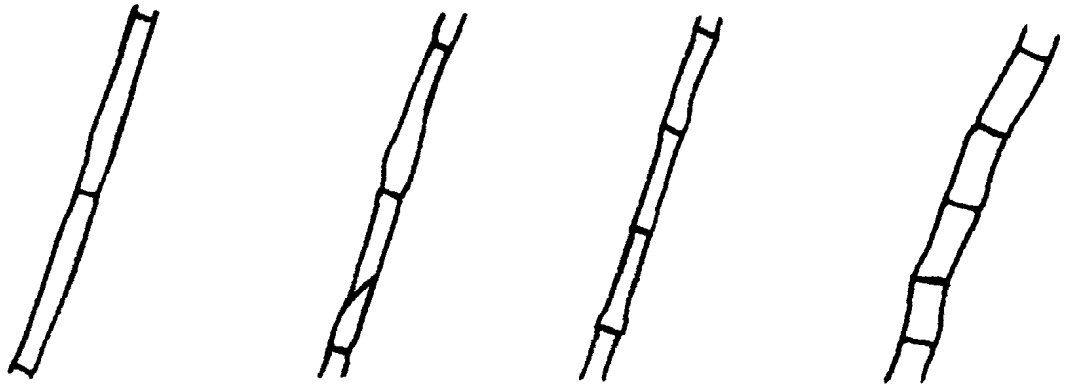


Uxytenanthera monostigma (Uda)	*0. Stocksii* (Mes)	*Dendrocalamus strictus* (Manya)	*Bambusa bambos* (Kalak)

MORPHOLOGY AND USE

Slender. soft, pale yellow culms, solid or with small cavity. Unarmed. Internode 10-12 inches, height 10-15 feet, diameter 1-1 5 inches. Used for tools, implements and construction.	Slender, green-gray culms, solid. Unarmed. Internode 10-12 inches. height 15-25 feet, diameter 1-2 inches. Preferred by craftsmen for basketry and intricate work for its soft, solid interior.	Medium-size, dull green culms, solid or with a small cavity. Unarmed. Internode 6-10 inches, height 20-50 feet, diameter 1-3 inches. Most common and widely used bamboo for baskets, winnowing fans, traps, bins, mats, etc.	Medium to large size, bright green and shining culms, with a medium-size cavity. Armed with recursive thorns. Internodes up to 18 inches, height up to 80 feet, diameter 3-5 inches. Not used much as culms are often crooked and armed. Used for fences and construction.

CULMS: A CLOSE-UP



Oxytenanthera monostigma (Uda)	*0. Stocksii* (Mes)	*Dendrocalamus strictus* (Manya)	*Bambusa bambos* (Kalak)

Fig. 2: Local bamboo species

groves) dedicated entirely to bamboo can still be found. Even today, people plant bamboo around their homes in a small, informal way. The owner of a healthy stand is happy to part with a rhizome or two to his neighbours. Often bamboo is planted on bunds between fields, wherever suitable protection exists.

Development Strategies for Bamboo

Most development programs for the underprivileged sections of society or backward regions concentrate primarily on income-generating activities. While formulating such an activity, the usual order of priority is:

1. A suitable technology is identified;
2. Training is imparted to the local people;
3. Infrastructure is built up for the establishment of a commercial production unit;
4. Markets and links are identified; and
5. Transportation and raw material procurement is planned.

This set of priorities is technology and market-driven, and ignores the local natural resource base of the people. Its intrinsic, industrial assembly line mode encourages division of labour, encourages 'experts' and is unable to mesh with the changing demands of annual agricultural seasons. This approach makes a particular technology a full-time activity, forcing tribals into a 9-to-5 routine, 365 days a year, and cuts people off completely from their previous diverse and sustainable range of activities.

Demands of distant consumers, whose needs are not fully known, and rate of production become the primary concerns. Transportation is heavily relied on and often is the most costly element: This cost is used to justify a high production target to reach a break-even point.

Such an approach, most often, deviates completely from the development goals of self-reliance – usage of local resources and local skills for satisfying the local needs. It finally ends up in obtaining raw material from distant places and selling products to far away markets to make the project survive.

In contrast, a more inclusive approach would focus on the people; their abilities and strengths, and the local natural resource base. In this context, bamboo is an ideal starting point to enter into a relationship with a region and its inhabitants. There is an existing craft tradition and bamboo is locally available. There is also a local market for bamboo articles which only needs to be supported and extended.

Plastics and metals are slowly replacing many bamboo daily use articles. This trend can be reversed by ensuring a plentiful supply of inexpensive bamboo articles, and restoring the weekly village bazaar tradition. As production is home-based and consumption occurs within walking distance or is a bus ride away, transportation and infrastructural requirements and overheads are minimal.

Such a home-based, decentralized activity allows the craftspersons full control over the design, quality and rate of production. In the assembly line mode, the worker is completely alienated from the finished product and the user. The small scale of activity allows for easy evolution of the craft and diversification of products.

Bamboo is not envisaged as a full-time activity alienating people from their way of life. It leaves the people with sufficient time to continue doing a variety of tasks, which include agriculture, rearing livestock, collection and sale of forest produce, etc.

Any attempt to design a strategy which involves people, natural resource base, technology (i.e., skill) and economic considerations must be based on an adequate knowledge of the region in all these respects. Such a strategy is strictly region-specific and relevant for only a limited period of time as society is constantly changing. To develop such a strategy, it is necessary to collect the following information.

Actual stock of bamboo

Places where bamboo is growing should be mapped. The number of culms in each stand, their flowering cycle (if known), the present yield and extraction pattern should be noted.

Records will need to be maintained village by village and separately for different species. For forested areas, the total area under each species in a particular tract can be estimated, and sample plots selected to find out the density of culms per unit area. Additional details like average height and diameter of culms, and growing conditions will also help. Thus, the quantity and type of bamboo available for different applications will be known.

Indigenous people's knowledge on bamboo

This is a record of the tribal people's knowledge on propagation, care, harvesting, treatment and use of bamboo. Such knowledge most often exists only in the oral tradition, being passed on from one generation to another.

Folklore, myths, taboos, rites and rituals associated with bamboo must also be recorded as they form part of the living condition. This information helps us understand the close relationships between the people, their religion, culture and bamboo use today.

Existing craft forms in bamboo

Information on the use of bamboo by the local people to produce daily-use articles and construction materials is of great value. Each product must be documented, and the records should contain information on the species used, age and size of culm, treatment given, hints on how to fashion the product, ways of using it and its effective life. Any variation in the product owing to tribal or community differences'must also be noted. This database will tell us the level of skill, innovation and productivity of the craft workers.

Economics of bamboo

Data related to bamboo as a commercial resource is also important. The resource flow and cash flow from the growing site to the point of consumption need to be traced and documented. This information will shed light on who gains or loses, at what stage, and by how much. Information can be collected by interviewing people who own bamboo stands and sell the yield, merchants who may buy bamboo and sell it at distant markets, and craft workers who buy bamboo for their craft. It will then be possible to put together a map of sorts showing resource flow, cash flow and the magnitude of transactions involving bamboo.

Compiling information under the four sections mentioned above will help us develop a strong understanding of the plant as raw material, the processing techniques the tribals have evolved, and the socio-economic environment in which the craft is practised today.

With the availability of such a wonderful renewable resource as bamboo, it is possible to develop and strengthen the prevalent craft traditions and ensure some economic benefit to the people, and, at the same time, maintain a cultural continuity in the tribal way of life.

Acknowledgements

The author wishes to thank Dr Cherla Sastry of the International Development Research Centre and Mr. Brian Belcher of the International Network for Bamboo and Rattan for the interest they have shown in this work.

The Role of Bamboo on the Social, Cultural and Economic Life of the Filipinos

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Abstract

Bamboo is a fundamental part of the culture of the Philippines. It plays an important role in many Filipino myths and legends, and in military history. It finds use as food and in innumerable applications as household and utility items, many with strong cultural significance. It is also gaining increasing importance for its ecological and environmental benefits, especially in soil and water conservation. It also has great potential in the. housing and construction industry. With millions of new low-cost housing units required in the Philippines in the next years, the demand for bamboo-based building materials will increase. Yet, there are several problems and constraints facing the bamboo sector. Resource assessments have not been undertaken; flowering regimes of important species are unknown; stand management is poorly developed; and investment capital in the sector is inadequate.

Introduction

The Philippine Archipelago is located from 5 to 20 degrees north of the equator. This region has climatic conditions most favorable for the growth of ***Bambusa,*** Schizostachyumand *Dendrocalamus* bamboos. Central and northern Luzon lie between 15 to 20 degrees north latitude – a region suitable for planting bamboo.

About a century ago, extensive bamboo stands were documented in many parts of the country. In 1910, Gamble reported at least 20 000 ha planted with bamboo. Today, the country is left with less than 8 000 ha.

There are 55 species of bamboo recorded in the Philippines, including introduced species, in the following genera: Yushania, Bambusa, Dendrocalamus, Gigantochloa, *Schizostacbyum,Tbyrsostacbys,* Leleba, *Phyllostacbys,* Cephalostachyum and Dinochloa.

This paper aims to: (1) document the multifarious uses of bamboo showing how it affects the social, cultural and economic life of the Filipinos; (2) show the potential uses of bamboo in the housing and construction' industry; (3) present the problems and constraints confronting the bamboo industry in the Philippines.

Bamboo in the Philippines

The quality and availability of a resource like bamboo have both causes and effects in the larger socio-cultural and economic dimensions of a community. According to Dr. Antonio Contreras (n.d.), the social, economic and cultural dimensions contribute to the evolution and maintenance of the communal meaning system. This comes in the form of symbols, rituals and commodities expressed through the language used in everyday life, which are deeply invested in the ideological and material processes that become foundations for the development and survival of the community; they define the capacity of the community to adopt or resist change and innovations.

Bamboo is a symbol and a commodity which plays an important role in the reproduction and transformation of a particular community. Reproduction here refers to the process in which the element in question helps to sustain the social formation by maintaining the current social relations, and by resisting forces of change which are usually externally generated. On the other hand, transformation refers to the process in which the element in question facilitates the re-structuring of the political economy. Bamboo is-considered the most frequently utilized material in the Philippines. The propagation and development of this material could have far-reaching effects on every aspect of Filipino life. Its degradation could result in irreversible losses for the country.

The Role of Bamboo in Filipino Culture

Bamboo was introduced during the Neolithic age. During the later ages, the bolo, a traditional all-purpose tool, was developed. With the use of bolo, bamboo became a workable material. Bamboo among all plants, has a distinctive status in the Philippine culture and history. One of the identifying marks of the Philippines as a nation is bamboo. Bamboo has deeply coloured the lives of Filipinos to such an extent that they can be called "the bamboo people".

Philippine literature – myths, legends and epics – mention bamboo. For example, the first Filipino man (Si Lalaki) and a woman (Si Babae) came

from a piece of bamboo, according to a Visayan myth, as first recorded by the Spanish soldier-encomendero in Iloilo City in 1582 in his *Relacion de las Lslas Filipinas.*

Maximo Ramos (n.d.) has related several myths on the origin of mankind; most of them have something to do with bamboo. Here are some interesting ones.

A paper written by Catalina Villaruz in 1920 and is now part of the H. Olley Beyer manuscript collection reports that the southern Luzon's Tagalog people believed that the first man started his life inside a bamboo pole. He grew, the bamboo cracked and out he came.

A Maguindanao myth reported by Najeeb Saleeby relates that Sitli Paramisuli, a lovely goddess of the sky world, married an obscure god and they had two children, Tabunaway and Mamalu. When she died, they found bamboo growing on her grave. Mamalu cut the culm and split it. There thev found inside a beautiful girl whom they called Putri Gunina. She married a mortal named Kabungsuwan and they settled in Mindanao. Their offsprings eventually became the Maguindanaos.

An Igorot version narrates that Lumawig, the chief god, descended from the sky world and cut many reeds. He divided them into pairs and scattered them in different parts of the world. The reeds became the couple in each place.

The Bukidnon of Mindanao say that during a severe drought, Manpolompon, a deity who came down from the sky world, could grow nothing on his clearing but a bamboo. When a strong wind broke it, a dog and a woman appeared which became the ancestors of mankind.

Mabel Cook Tale, in her book *Philiine Folk* Tales wrote that "a common fancy in Malay languages is the supernatural origin of a child in some vegetable, usually a bamboo."

Epics like Lam-an (Iloko), Ullalin (Kalinga) and Twooang (Bagobo) have given prominence to bamboo. Even folksongs like *Lawiswis kawayan* reflect the graceful and beautiful bamboo, as do the different proverbs, aphorisms and riddles recorded in the Philippines.

Philippine folk dance use unsplit bamboos. These are the world famous *tinikling* dance of Leyete, the singkil dance of Maranao, the subliof Batangas which uses the *kalatong* (bamboo gong) and a pair of bamboo castanets for each dancer, and the *magtuba* (coconut wine gatherers) dance.

Philippine folk games utilize bamboo. The palo sebo, a greased bamboo pole with a small bag of prize money or toys tied at the top end, figure

in every fiesta. The *baticobru* uses two bamboo sticks for hitting jackpot in the *bubasagin ang palayok game.* It is also a local substitute for the base-ball bat. *Luksong-kawayan* or high jump uses bamboo poles or sticks as hurdles. The *pabitin* laden with fruits, candies and other prizes is always the much awaited event during the Santa Cruzan Festival in May. Bamboo, was used for defence during the revolution. Bamboo, was constructed as *patibong* a trap dug in a hole to catch enemies- The recorded uses of the *patibong* include the attack of Juan de Salcedo in Majayjay, Laguna (l571), Tamblot's revolt in Bohol(1622), during Phase I (1896-97) and Phase II (1898-1902) of the Philippine Revolution in different parts of the archipel-ago, and as part of the guerrilla war against the Japanese (1942-45).

So vital were bamboos that General Miguel Malvar ordered his men, and even children **14** years old and above, to plant ten bamboos for every house burnt by the Americans, preferablv on the very site where the former houses stood. Because of the lack of arms and ammunition, the Filipino rebels had to resort to psychological warfare to fool their enemies. For in-stance, they used the *musikang bumbong* Nueva Ecija band in attacking the Spanish garrison in San Isidro, Neuva Ecija on 2 September 1896, un-der the leadership of Capitan Mariano Llanera of Kabayaw.

The Visayan defenders under General Aniceto Lacson and Juan Arneta used make-believe cannons made of rolled pieces of *sawali* (woven bam-boo mats used for walling) mounted on carts and guns of nipa (an East Indian palm) stems against the Spaniards in Bacolod, Negros Occidental, on 6 November 1898. Thousands of bamboos bundled together as baterias (battery), impenetrable to ordinary rifle shots, served as cover for the ad-vance of Filipino insurrectionists to the Spanish fortress located in the Morong Church in Rizal on **19** August 1898. This use was improvised on account of the open terrain caused by the previous burning of the vegeta-tion surrounding the area by the Spanish defenders. The *baterias* were rolled closer and closer to their objective in the evenings.

Bamboo was used for toys in the form of bamboo popguns such as *sumpakorpatas,* or as bamboo cannons *(kantyong bumbong)* to greet the New Year. But they were also deadly and potent when made into blowguns *(sumpit)* and even as cannons during times of war. During the Philippine Revolution in 1896 at Imus, Cavite, supply of metal, especially copper, was so scarce that Jose Ignacio Pawa (later to become the only Chinese general of that revolution) constructed numerous *lantakas* out of large bamboos reinforced by tying wires which were effective only at close range. The

trenches of the Filipino rebels constructed by Edilberto Evangelista in Cavite (Binakayan, Dalahikan and Noveleta), measuring 1500 m long and 2.5 m wide, used bamboo reinforcements and saw service during the battles of 9-10 November 1896. The trenches along the Cavite seashore had a height of about 2 m and a width of about 6 m.

The imperial Japanese Army organized the Bamboo Army or Bamboo Brigade called *palaak* in the guerilla-infested areas of Rizal and Laguna in *1943.* Serving as a paramilitary unit and civilian guards, they consisted of members (teenagers and 60-year-olds) of the enemy-sponsored neighbourhood associations. Armed with the bamboo poles, about two meters long and sharpened at one end, the bamboo army was drilled along the Japanese lines. Members were summoned by drumming on a large dried hollow bamboo called *batingaw* in Paete, Laguna, *kalatong* in San Narciso, Quezon, and Barili, Cebu, and *bahkatak* in Batangas. They have been used to communicate, particularly in the isolated forested and rural areas, a variety of messages, such as lunch call, distress signal and enemy attack warning.

Filipinos make a wide variety of bamboo musical instruments, be they wind, string or percussion type. Among the wind instruments are the kalaleng(tinggian flute), bansik(Zambales negrito flute), *lantay* (Visayan bamboo clarinet), *tulali* (Sulod flute), *sahunay* (Tausug flute), *diwdiw-es* (Abra-Tinggian panpipe), nose flutes called *baliing* (Apayao) or *kipanaw* (Abra Tinggian), and *budyong* (Hanunoo Mangyan flute).

The string instruments include the bamboo guitar called *tabungbung* (Batan Negrito), *kulit-en* (Tinggian), *kungkong* (Pangasinan) and *pas-ing* (Igorot). The bamboo zither with separate strings is called *kolitong* by the Kalinga, while the same instrument with two parallel strings connected with a platform is called *serongangandi* by the Maranao and *tambuko* by the Manobo. The bamboo violin is called *gaet-gaet* among the Kalingas (Medina 1977).

8amboo in the Social lifeof the Filipinos

Fiestas, rituals and gatherings

Perhaps the piece of bamboo material that gained social prominence not only in the Philippines but over the whole world is the famous bamboo organ of Las Pinas built by Fr. Diego Cera de la Virgin de1 Carmen in 1816.

An important social activity where bamboo figures prominently is the fiesta, a day to celebrate the feast of the patron saint. There was a time when fiestas were lavishly celebrated. Every home is decorated with costly curtains, bed covers and table cloths. The precious china comes out of the cabinet to be used by guests. Houses are repaired and repainted. Every home is open to friends, relatives, or even strangers.

In many places, people have traditionally celebrated fiestas this way. One such place is in Lucban, a province south of Manila, where *pahiyas* (annual thanksgiving to San Isidro Labrador) is a tourist attraction. Every house along the streets which the procession of San Isidro Labrador, patron of good and abundant harvest, will pass is decorated. The event that collects the largest crowds of spectators is a giant farmer and his wife, made from large bamboo cages draped in cloth.

Food and food preparation

Bamboo is used in the Philippines in many ways for food and food preparation. Bamboo containers are used to steam rice, the staple food of the Filipinos. It is considered a special method of cooking because it maintains the flavour of rice, especially the indigenous varieties. A variety of food is cooked the same way-vegetables, and fish topped with coconut milk.

Puto bumbong, a type of rice cake cooked in a bamboo stem, plays a special part in the celebration of Christmas in the Philippines. The young and the old alike look forward to the fun that the tradition of *simbanggabi* (novena masses before Christmas) brings. After the mass, at about 5 AM, whole families,groups of friends and young couples gather around small makeshifts where *puto bumbong* and hot chocolate are sold – a perfect way to warm hungry stomachs on chilly December mornings.

Bamboo shoots are used as food either cooked or pickled, and is a delicacy in many places. Although, not yet developed as an industry, it could generate livelihood for quite a number of people.

Bamboo is split, woven and laminated to make plates. Kitchen utensils are also carved out of bamboo.

In the rural areas, *banggeraban* or paminggalan (extensions made from windows) serve as cupboards where the dishes are dried and kept. Tables and benches are also made of bamboo.

Bamboo skewers are commonly used in cooking lechon (roasted pig) and thinner sticks for meat and vegetable barbecues. Dried fish *(tuyo)* and meat *(tapa)* also use bamboo sticks.

Economic Uses of Bamboo

Agricultural and forestry uses

As forest resources became depleted, agricultural activities were expanded to the upland areas which were formerly covered with tropical rainforest vegetation. Today, these areas are denuded hills and mountains, with very few trees and mostly covered with grass. The soil has lost fertility, and outcropping of rocks and eroded gullies have become the major land features (Anonymous 1992). It is estimated that about 17.8 million Filipinos live in the upland areas, and 5.95 million of them are indigenous peoples.

The Gregorio Araneta Social Development Foundation Inc., a non-stock, non-profit organization, has successfully developed a bambusetum on its 16-ha property in San Jose del Norte, Bulacan, a province 30 km north of Manila. This area, formerly a denuded forest where cogon and other grass thrived, is now lush with bamboo.

The ecological benefits of bamboo are tremendous which make it a suitable reforestation species. According to research, bamboo is the fastest growing canopy for the regreening of degraded areas. It generates plenty of oxygen, lowers light intensity and protects against ultraviolet rays, and is an atmospheric and soil purifier. Furthermore, it conserves water and greatly reduces soil erosion. In the Philippines, bamboo is used intensively in soil and water conservation (SWC) technologies.

Check dams, which stop gully erosion by slowing down water flow, use woven bamboo strips between the pegs while bush or stones are pIaced against the dam's upper side. In the establishment of contour lines, which is considered a central element of soil conservation on sloping lands, bamboo is used to construct an A-frame. This device is a simple and practical instrument used by many upland farmers in the country.

In protecting river/stream banks, bamboo could be planted to stabilize water courses by holding the soil in place and reducing erosion. The Rauhbaum Method is a temporary measure used to protect the bank from the-direct impact of water. Bamboo is tied and anchored by a strong peg with the butt ends pointing upstream.

A similar mechanism called "Temporary Groyne" uses a series of temporary structures, usually made of bamboo placed upstream, perpendicular to the flow of water, and downstream to direct the flow of water, thereby reducing its velocity and trapping the sediments.

Bamboo is widely used for agricultural purposes. In early agriculture, it was used for fetching water from rivers, artesian wells or surface wells. Some of these water carriers measure 7-9 feet and had a capacity of two gallons. In 1960, the Ardel bamboo pump was invented for drawing water using a bamboo tube. This was used in small irrigation projects, gardening, washing and bathing, salt making, and for drawing safe drinking water.

Bamboo is also used for weeding. A bamboo pole, about six inches in diameter and six feet in length, is tied with a rope two feet from both ends. The farmer holds the rope with both hands, and the pushes the pole with one foot along the ground horizontally, using the body weight to keep the pole firmly pressed to the ground. Weed runners decay and die within one month after this operation.

Filipinos still use the bamboo dibble sticks in planting. The Hanunoo use the bamboo tube test in selecting the exact location of their *kaingin* (cultivation site). The test consists of driving a bamboo tube,. with an internode two palms wide, into the ground. The amount of soil that enters the tube decides whether the location is good for swidden farming. Farmers still use bamboo sleds and carts in transporting their goods. They are also used as trellises, props and fences.

The coconut toddy *(tuba)* gatherer builds bamboo bridges from one coconut tree to another to facilitate climbing each one. He carries a large bamboo tube for collecting the coconut sap.

A long bamboo pole *(sungkit)* with a hook at one end is still the favorite tool for picking fruits like coconuts, mangoes and papayas from tall trees. Flowers like the ilang-ilang and orchid are also picked with a *sungkit.*

Davao has been called the city of tribal wars, wild drum beats and ritual fires. It was originally occupied by the Maguindanaos, but in the 19th Century the Manobos came and lived in the area. Today, the majority of the inhabitants are Visayan migrants who were beneficiaries of the government's early resettlement programs and were given up to 10 ha of fertile agricultural land per family.

The major economic activity in Davao is agriculture, with 40% of households (74 384) listed as farm households. The total cultivated land area is 383457 ha, inc1uding those that are classified as forest lands.

The Davao Bamboo Development Cooperative (DBDCI) was formally established in 1989 with 231 initial members who saw the opportunity of supplying the banana plantations with bamboo props instead of poles made from young trees and saplings.

The species planted by the farmers is *laak (Bambusaphilippinensis),* which is sturdy but light for easy manoeuvering. It is best suited for use as propping material in banana plantations, and can be harvested three years after planting with yields of up to 25 000 poles per hectare in flat land and river banks.

As of January 1992, DBDCI had 12 accredited cooperative Chapters. The Chapter presidents or chairpersons serve as the Board of Directors of the cooperative which represent the highest layer in the organizational set-up. The second layer represents the cooperative chapters. In the third layer are the clusters composed *ofpurok* or buranguy(the smallest political unit in the country).

The farmers found a lucrative business by shifting resources to bamboo farming. As of 1992, the total area planted with bamboo was 2 000 ha. It is estimated that 6 000 ha of bamboo have to be planted to satisfy the requirements of the banana plantations in Davao of 12 million poles per year.

The farms established in 1988 have grossed P15 million (US$600 000) in 1992. While 200 000 ha of land is awaiting rehabilitation in Dauao, only 7 000 ha have been planted by the bamboo growers (1994 data).

In the beginning, the bamboo growers of Davao had a unique economic advantage because large quantities of propping materials are used by the banana plantations. However, these banana plantations have started to establish their own bamboo plantations to internalize the profits, and in the near future may dislocate the small bamboo growers. Banana plantations were set up in southern Mindanao where rainfall is evenly distributed throughout the year and destructive typhoons hardly occur.

The Department of Agrarian Reform is actively supporting the bamboo program by providing capital and the technical assistance to the beneficiaries of the Comprehensive Agrarian Reform Program.

Bamboo is also used in different fishing methods. The fish barriers include the *baklad* (fish corral) with some 45 different styles, and traps like the bubo(torpedo-shaped trap) and *salakab* (basket-like trap). Other bamboo fishing implements are the bamboo spear and the bamboo bow and arrow. Drying is the most popular method of preserving fish in the Philippines. The fish is either dried whole or split at the back. After removing the intestines, the fish is washed thoroughly and then salt is applied to on the flesh to suck out moisture. Fish is strung on bamboo sticks and are either air-dried or sun-dried. When this is completed, dried fish are piled in

baskets made of woven bamboo. In fishing communities where there is no electricity, about 70% of the total catch is dried.

Construction

In the 1570s when the Spaniards came, the typical Filipino house was built with a framework of bamboo poles and walls of split bamboo woven like a mat *(suwali).* It was basically a rectangular room raised from the ground which served as the living room, dining room and bedroom. The steep roof was made of leaves of nipa palm reinforced by bamboo and wood. The body of the house was made of wood and bamboo, and the floor out of its slats. Domestic belongings consisted of papag (built-in bamboo benches), a few mats, a table, some pots, crockery and utensils.

The principal use of bamboo by Filipinos is as construction material. The potential for use in this area is tremendous considering that the government should build 1.12 million houses by 1998. This represents only 36.23% of the total housing needs for the same period.

On the other hand, there are about 2.75 million ha of land to be distributed to farmer-beneficiaries in the next five years. A total of 924 485 ha of forest plantations will be established during the same period (Philippine Medium Term Development Plan, 1993-98). If at least half of this area could be planted with bamboo, about 3.6 billion poles of bamboo could be harvested after five years, most of which could easily be used for housing programs.

The National Livelihood Support Fund provided P5 million in July 1988 for the Man Program located in Abra (Northern Philippines), with a 'ply-bu' (plywood made of bamboo) factory as its centerpiece.

Architect Bobby Maiiosa, named by Asiaweek magazine as one of the seven (and the only Filipino) visionary architects in Asia, has used bamboo extensively for the bahay kubo (basically a square, one-room country house).

Architect Maiiosa considers, the bahay kubos as the epitome of Philippine architecture. The *bahay* kubo deals comfortably with the heat, the humidity and the country's wet and dry seasons, withstands earthquakes, is ecologically designed using local materials, incorporates motifs that are distinctly Filipino, and takes into consideration family unity and socializing needs.

Despite the problems and difficulties in implementing the project, the 'ply-bu' factory still operates, though on a limited scale. The major earth-

quake of 1990, and the strong typhoons that followed devastated the upland communities of Abra and destroyed the minor roads that were there linking the factory to the buho *(Schizostachyum lumumpuo)* plantation. In 1991, when the plantation flowered in Lamao-an (a 2 OOO-ha buhostand) and Is-is (a 1 000 -ha *buho* stand), the people could not even salvage the poles, which were left to rot in the fields. The government did not have the funds to repair the roads.

The factory, which uses manual equipment and machinery, has a maximum capacity of 100 panels per day. This requires 800 poles of 12-feet buho, which the upland communities could adequately supply if the bamboo stands were properly managed after it flowered and if the roads were repaired in time for harvesting. Neither were done and therefore, the project has to source its raw materials from Ilocos, a province 30 km away from Abra.

This project has produced excellent products made of bamboo that could be used for floors, walls, ceilings, doors and furniture.

Indigenous Uses of Bamboo

The Mangyans of Mindanao, the Palawans, the Tinggians of Abra, and other indigenous peoples in the Philippines have used bamboo in their dance, music and even in the communication system.

The Mangyans of Mindanao have a traditional way of writing developed centuries ago and effectively passed on from generation to generation. The children copy the incised characters from the bamboo containers of their parents, relatives or older friends. With bamboo for paper and the sharp point of a small knife as pen, the young pupils practice the angular symbols, memorizing them. Thus, to this day, the Mangyans are able to retain their traditional folklore literature – poems, chants, folktales and riddles – written on bamboo and copied by the following generation.

In the mountain habitat of the Mangyans, one will frequently notice inscribed bamboo letters left conspicuously along the trail that leads to the house of the addressee. Any Mangyan could take the letter to the person concerned. or leave it in a spot closest to the address indicated (Pontina 1977).

The blowgun or blowpipe is a weapon used much by the tribals in Southeast Asia. Among the Palawans, a cultural minority group who inhabit the southern part of Palawan Island, the blowgun *(sapukan)* is made out of different species of bamboo. To this group of people, the blowgun

is an object of daily use, having a certain exchange value. It is an indispensable device in the quest for food, an instrument loaded with a traditional significance, a distinctive symbol of being a Palawan.

Problems and Constraints

There are several problems confronting the bamboo industry in the Philippines. The major ones are the following:

- Although bamboos occur almost throughout the country, an accurate resource survey is not available to indicate what species are available, where and to what extent. Similarly, information on total areas planted per province is available, but the density and stocking are not known.
- The flowering of bamboos is not monitored. In Abra, a 3 000 -ha stand of Schizostachyum lumampao flowered during 1991-93. Although this species was successfully propagated by seeds (Caleda 1964), seeds were not collected after flowering for future use.
- Natural stands of bamboo are not managed. In Palawan, the clumps were observed to be so congested that the culms were getting smaller and smaller in diameter. It is also known that these stands are burned almost every year before the planting season. It is obvious that the potential economic value of bamboo has not been fully tapped in this area. In most provinces of Mindanao, where the demand exceeds the supply, over-harvesting and premature harvesting are major problems.
- Lack of capital. Marga Farms, a local corporation, spent millions of pesos to develop a product that could compete with plywood in price and quality. However, it does not have the equipment and facilities for a commercial-scale production since most of its resources were exhausted by research and development. The case is similar to small entrepreneurs who cannot borrow funds for capital from banks or lending institutions.

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The Role of Schizostachyum brach Ycladum Kurz in the Dayak kenyah Community

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Abstract

The bamboo *Schizostachyum bracbycladum* (Bulo' Ian) has *an* important role in the daily lives of the Dayak Kenyah community in the Upper Bahau River, East Kalimantan, Indonesia. The species is used to cure bruises, ulcers and sprains in human beings, and wounds in dogs. Besides its medicinal uses, *S. bracbycladum* is a source of food, and is also utilized for other purposes such as containers, handicrafts and building materials. During ceremonies, it is used as a vessel to cook food. It is also used as a cook-and-carry food container for those who work in the fields or travel.

Introduction

In the field, *Schizostacbyum* is easily recognized by its thin-wailed culms. There are about 22 species in the genus, and they are distributed in Thailand and the Maiesian region. Most of these species grow gregariously and wild in forests, along roadsides or near villages (Dransfield 1980). This is probably the reason why most *Schizostachyum* species are wideiy used by local people for making rafts, flooring, roofing, baskets, handicrafts. One of the important species of the genus is *S. brachycZadum(Bulo'* lan, meaning "the real bamboo"), which grows wild or is raised in plantations in Southeast Asia.

The dependency of people like the Dayak Kenyah community – who live along the Upper Bahau River, East Kalimantan, Indonesia -on natural forest resources for medicinal plants, food and other commodities is very high. Therefore, they live in very close relationship with the tropical rain forest. An understanding of how people in this traditional society use bamboo in their daily lives can be very illuminating.

Bamboo is a major natural resource of Indonesia and plays a very important role in the livelihood of several communities (Sulthoni 1994). *S. brachycladum* is one of the bamboos used by the Dayak Kenyah.

Study Area and Method

This study was conducted in January-March 1992, April-June 1994 and July-August 1994, in the Long Alango, Long Apan Bar-u and Apauping villages in the Upper Bahau River area. This area belongs to Pujungan District, Buiungan Regency, East Kalimantan Province (Figure 1).

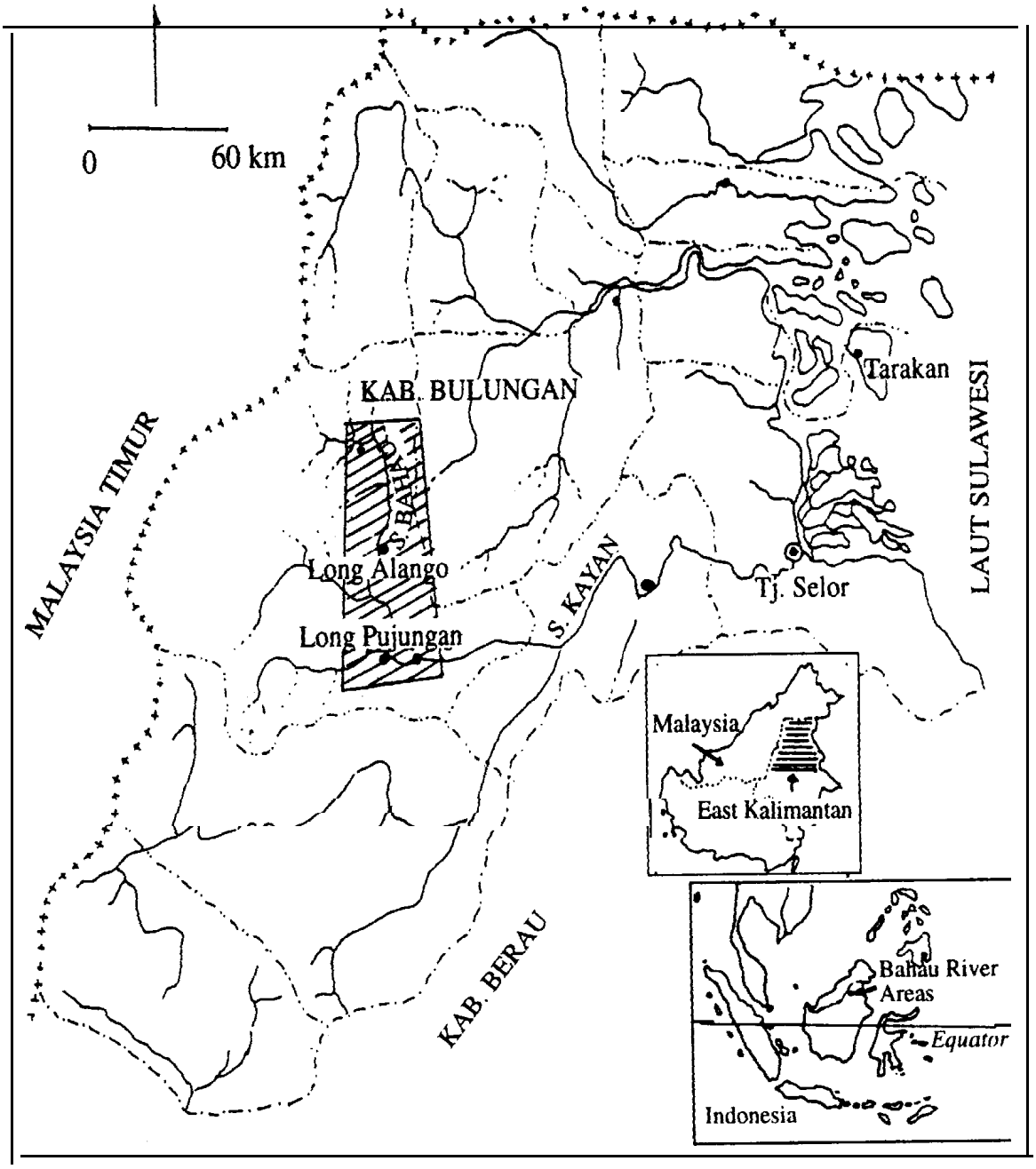

Fig. 1: Map of the Upper Bahau River area, East Kalimantan, Indonesia.

The Upper Bahau area has several sub-ethnic groups, about 12 of which are Dayak Kenyah people, such as lepo' Bakung, lepo' Maut and lepo' Ke.

The study involved interviewing about 30 people and observing bamboo plants in the field. Vernacular names of the plants, parts of the plants used and methods of preparation were noted. Plant samples were collected and taken to Herbarium Bogoriense at Bogor and identified.

Discussion

Medication

In Long Alongo, Long Apan Barru and Apauping villages, about 190 species of plants, including *Schizostachyum brachycladum,* were found to be in use as medicinal and poisonous plants (Susiarti 1994). It is known that several genera *-such* as *Bambusa, Gigantochloa* and *Schizostachyum* – are used in Malesia for medicinal purposes (Burkill 1935; Zuhud et al 1994). *Schizostacbyum,* in particular, seerns to be a much-used genus: its shoots are used with Cymbopogon *citratus* to make a decoction for treating kidney trouble in Pahang, Malaysia (Burkill 1935); its leaves are burnt and used by the Dayak community in Apokayan, East Kalimantan, to treat wounded dogs (Leaman et al 1991); and in Sunda Kasepuhan, its roots are employed as a remedy for many other ailments (Nizma 1995).

S. brachycladum can be made into a *tapok,* a tool that functions as a needle. The split culms of bamboo are cut approximately 20 cm long, 1 cm wide and 30-50 mm thick, with the top end L-like, pointed and wrapped with cloth. *Tapok,* a valued possession in any household, is used to discharge blood from bruises and blood clots. Bamboos also play an important role in Indonesian traditions (Widjaja 1980). For instance, in the severance of the umbilical cord of a new-born baby, as well as in the circumcision ceremony of a male child, the sharp edge of a freshly split bamboo or sembilu is traditionally used in place of a knife.

S. bracbycladum shoot, lime and meat of siput(a kind of mollusc, Cor*bicula* sp.) are crushed and put on ulcers to cure them. Crushed S. *brachycladum* shoot mixed with sand is applied on legs to cure muscular sprains..

Cooking and storage containers

Several types of conta .iners are made out of S. *brachycladum,* which is usually obtained by the Dayak Kenyah people from the edges of the

village. The bamboo is cut at internodes to make tubes of about 50 cm in length, and used as an easy-to-carry water container. When workers leave for fields in distant and hilly areas, they carry several such tubes filled with water and placed in a *kiba* (traditional carrier bag).

The local people in this area work in groups which cooperate with one another – a system called senguyun. For example, before they go to the field, they share work in cleaning the trail, preparing bamboo tubes for cooking rice in, etc. They also work together in the field. Such cooperative work is very common among women folk, especially during the preparation of rice in bamboo. A mixture of rice and taro are put into bamboo tubes made from internodes, and the tubes are laid sideways in fire to cook the mixture inside. This forms a typical meal of Dayak Kenyah. They prefer to cook food in open fires, much like the village people in other areas.

During harvest time, only some field workers commute every day between their village and the field, whife others stay back at the field. Once the rice is harvested, all people gather at the field to have different ceremonies, including a harvest ceremony. They perform traditional dances and partake in their typical meals and beverages. Before a ceremony starts, people work together to prepare a special meal made from a glutinous rice variety called lu ko, using the internode tubes of *S. bruchycladum.* This bamboo is also used to cook another glutinous rice variety called lemang (Dransfield *1994).* The beverages are made of fermented red rice and served to each guest in vessels made from *S. bracbycladum* internodes.

Transportation to the Upper Bahau River area is quite difficult because of the rough terrain conditions. Sometimes, a small airplane like Cessna is pressed into use. But usually, the travel is undertaken across the river which takes a few days. During the travel along the Upper Bahau River, people carry their food, such as roasted fish, in vessels made of *S. bracbycladum* internodes. Before eating, the food is warmed in the internode itself, and then the internode is split open and the food consumed.

Handicraft/housing materials

Many kinds of handicraft items are made in this area. Although most of them are made from rattan, there are some useful artefacts made from bamboos such as S. *brucbycladum.* For instance, *ke'dan,* the container to keep seeds, is made of *S. bracbycladum.* There are also items made from rattan and *S. brucbycladum,* such as the appliances *tapan* and sayan for winnowing rice.

Other uses

In the Upper Bahau River area, *S. bracbycladum* is used mostly for making containers to cook and store food or drink, since the Dayak Kenyah people have a wide choice of natural materials at hand for use as housing material or firewood. But in other areas, bamboo is widely used for many purposes, including as housing material and firewood. *S. brachycladum* shoots are also used as a vegetable.

Conservation

In the Upper Bahau River area, S. *bruchycladum* is planted on the boundaries of the fields, but rarely on the edges of the villages. Planting of the bamboo is undertaken not only because of its crucial role in the daily activities of Dayak Kenyah people, but also to ensure a sustainable supply of the material. Ex *situ* conservation efforts have been conducted in the area, and the bamboos have been planted at the Bogor Botanical Garden.

Acknowledgements

The author would like to express his sincere gratitude to Dr E.A. Widjaja and Dr Mien A. Rifai for their review of the paper.

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Bamboo in Balinese Rituals

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Abstract

Bamboo is very important in Balinese Hindu ceremonies such as penjor, temple offerings, cremations and house siting. An inventory has shown that at least 49 artefacts used in such ceremonies are made from bamboos. The bamboos for these purposes have to be cut down on certain auspicious days oniy. Several species of bamboos such as *Gigatttochloa ridleyi, Bambusa blumeana, B. uulgaris, Schizostachyum bracbycladum* and S. *irraten* are used in these traditional ceremonies.

Since 93% of 2.7 million Balinese are Hindus, and the frequency of ceremonies is high, the demand for bamboo is on the increase. Hence, it is necessary to motivate people to cultivate and conserve bamboos.

Introduction

There are 21 species of bamboos cultivated or growing wild in the island of Bali. Balinese use for bamboo for many purposes. It is used for houses, furniture, equipment, storage boxes, drinking cups, musical instruments, as vegetable (young shoots or *embung),* and for Hindu ceremonies.

Bamboo is very important in Balinese Hindu ceremonies, as it is used as one of the three pillars along with banana and coconut (Eisman 1992). The culm is commonly used, and so is the culm sheath and leaf. The artefacts of ceremonies are either made by the people themselves or are bought in the market.

The banboo supply in villages is usually enough for local use. But sometimes, especially in the city, bamboo would have to be bought. It is envisaged that the demand for bamboo will increase in the future because of the increasing population and the consequent rise in the number of ceremonies. Therefore, cultivation and conservation of bamboo is very important for continuing the traditional ceremonies of more than *2.5* million Hindus in Bali.

Rituals

The majority of Balinese (93% of 2.7 million) are Hindus, who regularly offer ceremony in the "thousand temples". The frequency of ceremonies offered is every day, once in 5,15,30 or 210 days, or once in 1,5,10,100 years. Ceremonies are also offered for new buildings, cars, equipment/tools, and in the case of events such as accidents and deaths.

Balinese Hindus have five important ceremonies called pancayadnya: *dewayadnyu* or offerings for God *(dewa), pitra-yudnya* for ancestors, *rsi yadnya* for sages *(rsil, manusya yadnya* for human beings *(manusya)* and *bhutu yudnya* for spirits. Offerings consist of holy water *(tirtha),* various plants, animals, fire and the chanting of sacred verse *(mantra)* by the priest *(pedanda)* (Wiana 1987).

As mentioned earlier, bamboo is an important plant for Hindu ceremonies in Bali. In preparing for the ceremony, a bamboo house for working (called salon or *rerdmpok)* is first built for making offerings *(jejhitan* or *banten)* and for equipment storage. The male worker makes several artefacts of bamboo such aspancak, satay sticks, baskets and strings, especially from *Gigantochloa apus* (Tiing tali) . The woman uses sewn bamboo items *(semat* or *biting)* for making offerings. Semat is made from bamboos such as *Sclbizostachyum* sp . (Tiing kedampal) S. *brachycladum* (Tiing tamblang) and *S. irraten* (Tiing buluh).

Sanggah, a special place for God and all manifestations *(sanghyang widhiwasu),* is made using bamboo culm. It is made up of one small bamboo stalk *(sanggah cucuk)* for the *pancak* and four strong bamboo stalks (sanggah surya) for support. The roof, made of culm sheaths, is called *sanggah durga.* In the highlands such as Bangli Regency, many temples have roofs made from the culm of G. apus and G. *atter* (Tiing santong). Beside the temple is usually built an asagan of 1.25 m height for placing offerings, and in front of the temple a small house *bule pemujaan* for the priest *(pedanda)* who leads the ceremonies.

Penjor, which symbolizes the mountain as a holy place and the river that bring the life-giving water to the Balinese, is usually found at the ceremonies. It is made from a bamboo culm with leaves, and decorated with ornamental young coconut and *Arenga pinnata* leaves and many fruits. The big *penjor* uses a strong bamboo, such as G. *upus, G. atter* or *D&drocalamus* asper(Tiing petung). The small *penjor,* employed at the Caru ceremony, is made with the small and thin bamboo S. *irraten.* The

ceremonial flag *(bendera* or *lelontek)* has a pole made of bamboo culm on which a long cloth in white, yellow or black is hung. The royal umbrella *(tedung)* uses split bamboo to support the cloth. During major ceremonies in the temple a sunari, a wind instrument made of thin culm of bamboo with holes, is used for inviting the Gods to the ceremony. As the wind blows through the holes a pleasing sound is produced.

During ceremonies, many artefacts and tools made of bamboo are offered. Components of offerings include ngaad(knife), kulkul(bell), *ilih* (fan), *kukusan* (a rice steamer), tungked (stick), *sate* (stick of satay), and *the tetimpug or peminpug* burned at the beginning of the ceremony (Surayia *1992).*

The holy water *(tirtha)* of the ceremony is put into cups made of bamboo sujangand it is covered with the leaf of *Cordyline fhicosa* or Codiaeum *variegatum.*

One of the ways offerings are made to the fire are with *dupa* stick. The stick is made of thick bamboo and it is believed that while burning it, the vapour rises upwards and serves as a bridge to God. The light is witness to the ceremony (Wiana *1987).*

The yellow varieties of the bamboos *Schizostachyum brachycladum* (Tiing tamblinang gading) and Bumbusa *vulgaris* (Tiing ampel gading) are used during the cremation ceremony. The corpse is bathed and put on the bamboo bier *(pepaga)* kept in the courtyard, with the head placed on a bamboo internode (urung) to fill in the *tirtba.* The roof of the bier has a white cloth hanging on-four small bamboo poles (lelur). Water for bathing the corpse is supplied through a l-m-long bamboo tube (bonjor). Swab sisiror *petat* is the bamboo comb used for combing the corpse's hair and wadah or *bade* is the frame used to carry it to the cemetery. The frame is made with a strong bamboo such as G. atter or G. basskarliana(Tiing putih) and strung with G. upus. It must go in the night and the first person on the groups takes a light made of bamboo *(oncor* or *obor).* The cremation place is enclosed with a bamboo fence *(ancak saji)* Bamboo leaves are used to wrap and cook rice dishes, such as keresekanand *tipat pesor.*

An inventory made has shown that there are *49* bamboo artefacts of various functions used in various Balinese Hindu ceremonies. Most of these can either be made or bought ready-made at shops. Balinese believe that Sunday *(ingkel buku)* is a good day for planting node plants like bamboo, but an inauspicious day for cutting them.

Of the **21** bamboo species in Bali, **12** are used for various ceremonies. Among these, G. *apus* finds different uses in a variety of rituals, while *S. bracibycladum* occupies a special place in ceremonies. B. vulgaris var. *maculata* (Tiing tutul) is forbidden to be used for offerings as it is considered "dirty" (*mithos).*

From the above account, it is obvious that bamboo is very important in Balinese rituals. Thus, it is imperative that bamboos in the area should be conserved. A first step towards this would be the setting up of bamboo foundations and museums.

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Vth International Bamboo Workshop & IVth International Bamboo Congress

Ubud, Bali, Indonesia, 19-22 June 1995

RECOMMENDATIONS'

1. Enhanced production has a number of policy implications related to land tenure, use and market controls which should be suitable for long term commitments. Such considerations are essential to promote bamboo production and provide financial opportunities to farmers and comparative policy studies should be carried out. The results would identify bottlenecks, successes and constraints and help to develop policy proposals.

2. Continuing attention should be paid to establishing standards and quality control measures for the range of bamboo products.

3. Bamboo production and industrial statistics should be made available on a regular basis.

4. Technology transfer particularly in relation to processing, and training to improve skills is needed.

5. There is a need to raise the profile of bamboo as a quality commodity. This requires on the one hand attention to the development of new products and designs and the availability of promotional literature for producers, industry and consumers/carry out information campaigns. In particular the image of bamboo as only a poor man's timber should be avoided.

6. INBAR should expand the scope of its directory of researchers to include NGOs, crafts people and other resource people who may be called upon to advise and assist in development activities.

7. On the issue of socio-economic research, a case study approach is appropriate and fonns the current basis of the INBAR socio-economics program. This program was strongly endorsed.

8. It is recognized that bamboo plays an essential role in attempts to achieve sustainable development but more attention needs to be given for enhancing

• Covers recommendations made at the Special Session organized on the role of NGOs in bamboo and development.

opportunities for income and employment generation and the benefits to specific target groups. The focus should continue to be improvement in the well-being of poor people. The role of bamboo in village-based enterprises is central to this focus and an approach should be taken to promotion in which natural and social sciences are integrated.

9. Notwithstanding recent initiatives to document and understand the bamboo economy the social dimensions impinge on the ecological balance of rural communities – including continued availability of resources and their conservation – and new studies should involve a degree of ecological assessment.

10. NGOs participating in the workshop stated the very great need for expert inputs, at both the strategic and technical levels, into their work on all aspects of bamboo cultivation, production, selection, treatment and further processing, marketing, management, and product development and design. There is a great need for appropriate education and training.

11. NGOs further stated that traditional schools of architecture, engineering and design fail to service their needs. This situation should be assessed and a framework developed to facilitate NGO action in this area.

12. NGOs working in the bamboo sector need a communications systems to act as a forum to share experiences, constraints and bring their needs to the attention of research and development organizations so that a database of NGO resources – committed consultants and volunteers in appropriate areas of expertise needed by NGOs along with key NGOs in each country – can be organized, and individuals called upon for advice. The database should include bamboo scientists, projects, donor resources, etc.

13. It was recognized that INBAR is strategically placed to address the issues of NGOs in relation to technology transfer and the need for expert advice, as well as helping build capacity through administering a strategic support program.

14. INBAR was requested to help access funding by writing and submitting proposals in collaboration with national/local NGOs and government extension services and similar agencies for purposes such as regional training for NGOs in bamboo technologies.

15. INBAR's Newsletter can be expanded to include an NGO page to provide a network for information and resource sharing.

16. NGO sessions should be formalized at the next Congress.

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