The INBAR Working Paper Series

The International Network for Bamboo and Rattan (INBAR) is a network of scientists and development workers from universities, governments and, increasingly, NGOs, who are working on various aspects of bamboo and rattan. The princial objectives of the network are: to improve the well-being of small-scale producers and users of bamboo and rattan within the context of a sustainable bamboo/rattan resource base; to build skills and enhance capacity of national programmes; to expand/orient bamboo and rattan research consistent with the priorities identified; and, to strengthen national, regional and international coordination, cooperation,and collaboration.

INBAR seeks to accomplish its goals by identifying and supporting research consonant with the priorities identified by national programmes. There is a strong emphasis on collaborative approaches to address problems which have regional and international relevance. The network's research and development activities are organised according to five themes : Socio-economics Research; Production Research; Post-Harvest Technology Research; Biodiversity and Genetic Conservation (jointly with the International Plant Genetic Resources Institute (IPGRI) and Information, Training, and Technology Transfer.

Communication is vital to any network, INBAR uses a variety of fora, including a quarterly newsletter, the INBAR Technical Reports Series, and this, the Working Paper Series.

The INBAR Working Paper Series is designed to promote the rapid exchange of information on various aspects of bamboo and rattan science, and on the applications of research for sustainable development. The papers may be generated within INBAR research projects. However, other papers relevant to INBAR's mandate and objectives are welcomed, and will be given due consideration for publication.

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BAMBOO AND RATTAN PRODUCTION-TO-CONSUMPTION SYSTEMS:
A Framework for Assessing Development Options

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FOREWORD

Helping the rural poor improve their welfare through better use of the natural resources base that surrounds them and which they have to rely on is a challenge throughout the world. Improved management, conservation and utilization of bamboo and rattan is part of that challenge. It also is the challenge to and objective of INBAR.

This paper lays out a framework for assessing the opportunities to make improvements in existing bamboo and rattan production-to- consumption systems. It considers the dynamics of such systems, as groups of people move from the most elementary "hunting and gathering" systems to more intensive production and processing systems that result in increased incomes and value added in production.

The paper, which serves as a framework for INBAR supported socio-economics case studies, lays out a process which involves:

- defining the production-to-consumption system being assessed:
- mapping the various links in that system:
- defining and assessing the policy and institutional environments that. guide and constrain the system:
- assessing the knowledge, resources, and incentive constraints to be overcome, given the results of 1 through 3 above;
- defining the specific changes that, need to be instituted; and
- defining the policy and institutional interventions needed to achieve the changes:

This is a practical process and one that provides a logical overall framework for improving the contributions of bamboo and rattan to the sustainable development of tropical countries.

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Bamboo and Rattan Production-to-Consumption Systems: A Framework for Assessing Development Options

Brian Belcher

Introduction

Much attention has recently been focussed on the development of small-scale enterprises based on non-timber forest products (NTFPs), with the hope that these may provide a base for development that is accessible to poor people, that is sustainable, and that will provide an alternative to destructive uses of forests.

Bamboos and rattans are two of the most important groups oft he NTFPs. They share a number of characteristics with other NTFPs in terms of their renewability and accessibility to rural poor people. They also (unlike many other NTFPs) have large, well established markets, and a wide range of extant production-to-consumption systems. By improving our understanding of the social and economic aspects of these commodities we will be better able to realize their potential as entry points for development. Furthermore, we may be able to draw lessons from the bamboo and rattan sector which have relevance to other areas of natural resources management.

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. Wit.hin 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 objective will require a thorough understanding of complex biological, social, economic and policy contexts. Development, interventions will need to assist people to overcome constraints, and increase the benefit-s they are able to earn from their enterprises and resources. This discussion will highlight some of the kinds of constraints of knowledge. resources, and incentives which can thwart people's efforts, and will develop a framework for assessing these.

Furthermore, while there are constraints and opportunities particular to each production-to-consumption system, there are also many common elements. We need to seek out the general principles in a systematic way, and make recommendations as to how t.o apply those principles in designing development interventions. One important step in this effort will be to develop a conceptual framework of bamboo and rattan (and ot.her NTFP) production-to-consumpt.ion systems. This will 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, with some real cases to flesh out the bones of the conceptual framework, "typical" production-to-consumption systems can be identified, along with the constraints and opportunities common to them. The results of efforts to address these constraints can then be compared in a systematic way.

This paper develops the foundation of a conceptual framework of bamboo and rattan production-to-consumption systems, taking into account the enormous variety of bamboo-and rat tan-based systems. It goes on t.o discuss the use of the framework as a development tool, considering aspects such as the dynamic nature of the bamboo and rattan sect,ors, and the

important role of policy and institutional issues. It concludes with a brief outline of the socio-economics research programme of the international Network for Bamboo and Rattan (INBAR).

The Production-to-Consumption System

The term "production-to-consumption system" refers to the entire chain of activities, from the production of raw material (including the input market., where one exists), through the various stages of intermediate sales and processing, to the consumer of the final product. The "system" includes the technologies used to process the material, as well as the social, political and economic cnvironmcnt. in which these processes operate.

The Raw Material Production Continuum

We begin by considering the production of raw material. A range of approaches is employed, from collecting wild plants, with no management per SC, through to management-intense large-scale plantations (or even to synthesis where the desired product is a chemical). In between these extremes, along an axis of *'management intensity" (from extensive to intensive), lie any number of possible approaches.

The box in Figure 1 represents all possible production systems for bamboo or rattan.

Options open to producers range along a continuum of intensity of management. At one end of the spectrum is the common practice of collecting wild material from the forest or natural stands.

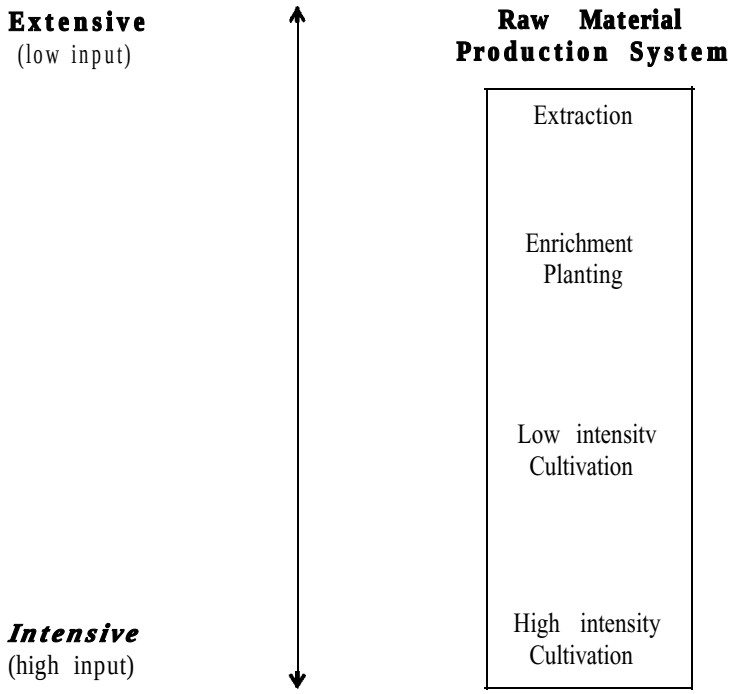

Figure 1. The Production continuum

with little management input (extraction). Moving along the continuum. this basic system might be modified, with effort to protect young plants, or selective cutting, to encourage re-growth for a subsequent harvest. Alternatively, some form of enrichment planting might be practiced, with seeds or seedlings planted in desired locations in a forest area. A more intensive intermediate approach is represented by the rattan gardens of Kalimantan (Weinstock, 1983) and China (Chen et al., 1993). where swidden farmers plant rattan in their fallow fields and harvest it when they prepare that field for the next cycle. At the other extreme of this continuum are plantation systems with intensive planting weeding, fertilization and harvesting.

The Transformation Continuum

People use raw material in numerous ways, processing it, buying and selling it, transporting it, transforming it. and ultimately consuming it in its final product form. This chain of operations may be long or short, sophisticated or rudimentary. At one ext,reme are very basic (often traditional) systems with a short chain of operations from raw material producers to final consumers; they may be within the same village or household, or may in fact be one and the same person. At the ot.her extreme, some products pass through many hands, and form the basis for many transformations and transactions before reaching the final consumer.

For any type of product there is a series of functions (transformations which must be performed). For a wicker basket the rattan must be grown, harvested, cored or split, and woven. Each of these operations can be performed at different levels of intensity. At the most basic (or

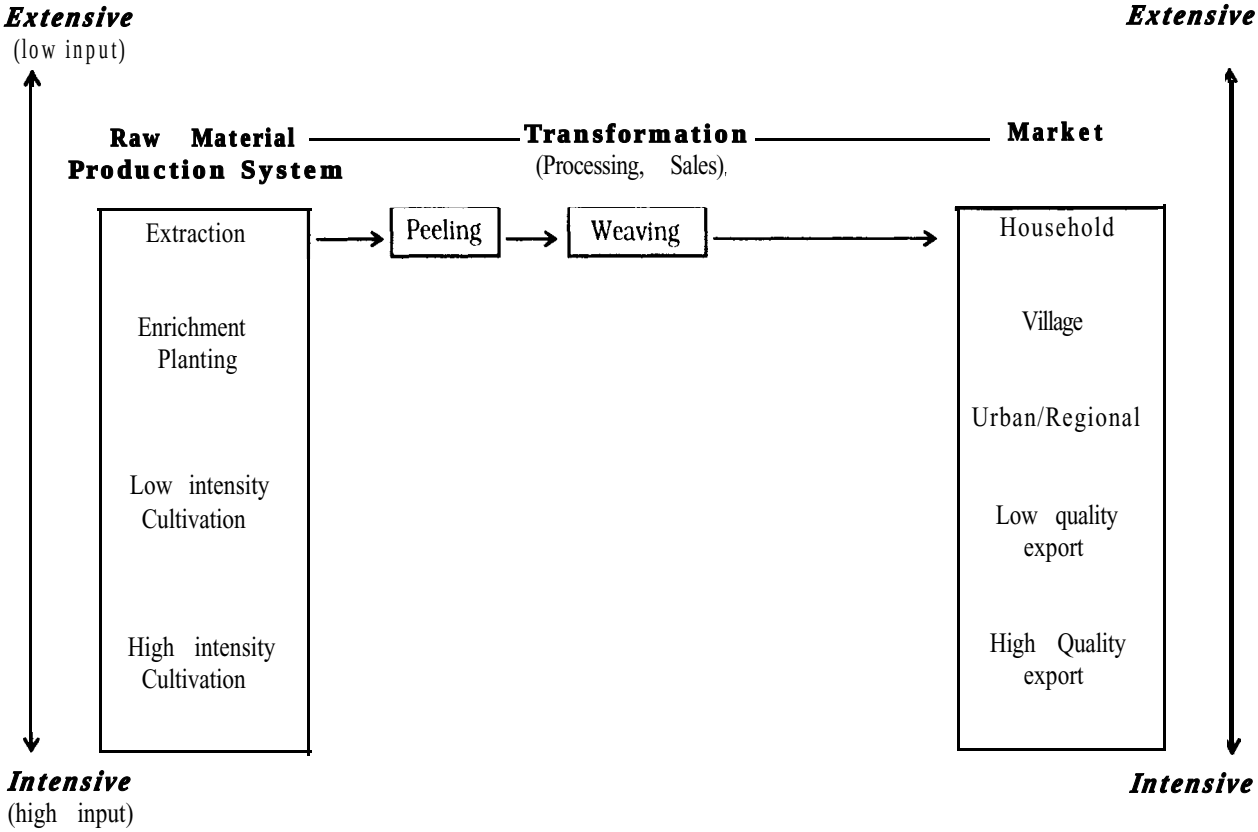

Figure 2. Low intensity production to consumption system

extensive) level, each of these functions could be done by a single individual using rudimentary tools. Figure 2 shows these transformation stages as boxes.

Alternatively, the material could be harvested using hired labour and perhaps mechanical aides, transported to a large factory. cored mechanically, and then woven and finished on an assembly line. These are essentially the same functions, but they are performed at a higher level of intensity, with different levels of labour, capita1 (mechanization), and even land (factory area) inputs to the process. Additional functions may also be added, with more specialized operations, more transactions as material changes hands, and transportation over greater distances. Figure 3 shows an idealized high intensity production-transformation system, plantation-based and highly mechanized.

In the diagrams there may be fewer boxes (transformations) than shown (e.g.. a person picks and eats a fruit on the spot) or many more. Boxes toward the top of the diagram represent relatively low-technology transformations, while boxes toward the bottom of the diagram (in the same vertical axis) represent similar functions performed using a more capital- or labour-intensive process. Transactions between transformations may be in the form of spot sales, contract. sales. or product movements between different functions of a vertically integrated firm. These are shown as arrows in the diagrams.

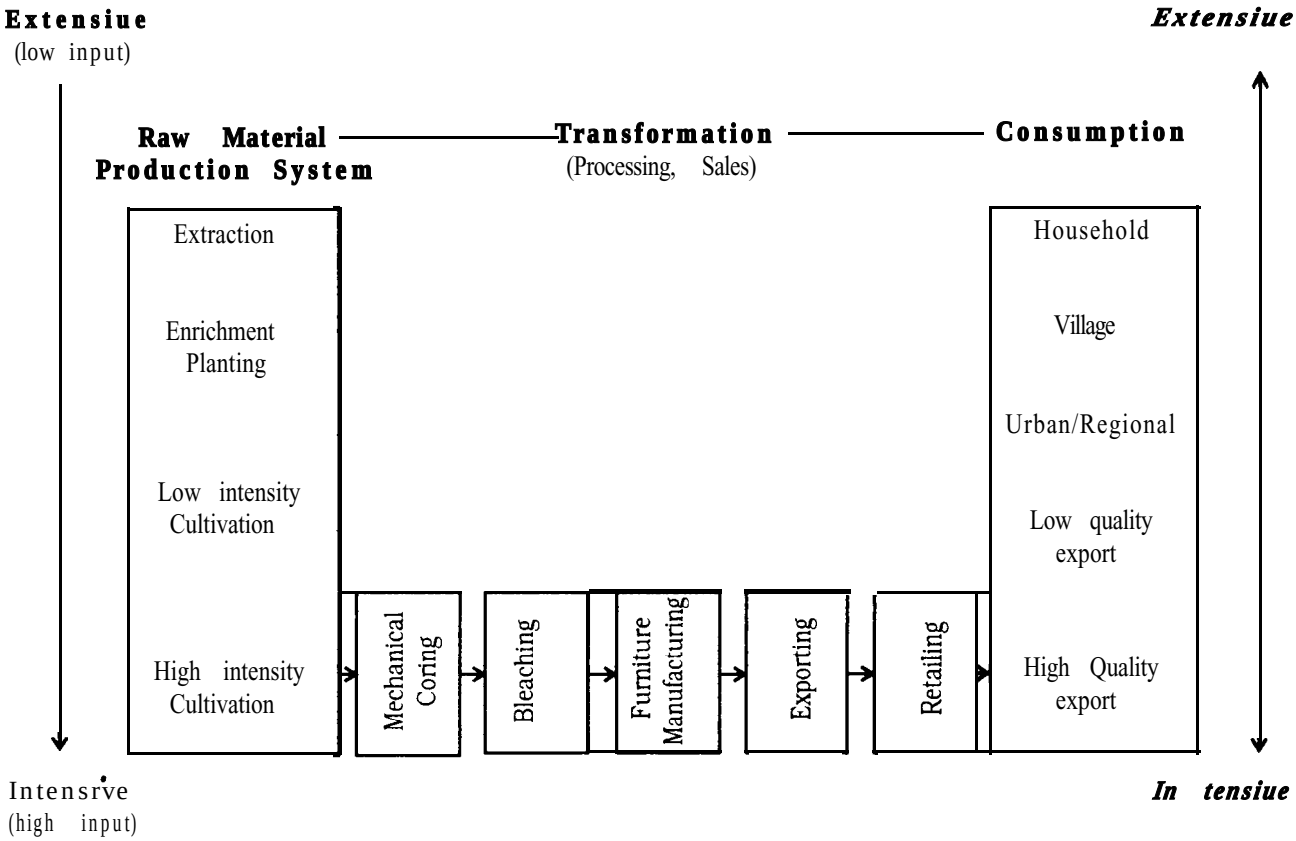

Figure 3. High intensity production to consumption system

The Consumption Continuum

Final products reflect the intensity of input in their manufacture in terms of quality, price, and market access. Generally speaking, it costs more to take a particular type of product to an export market than to a local market and it must therefore fetch a higher price to make it profitable. As with the other stages in the system there is a range of possibilities. At this stage the range is defined in terms of price per unit. In many cases the price per unit will correspond closely with the market. in which the product is sold, ranging from home consumption through village markets, regional markets, and low-quality export markets, all the way up to high-quality, high price, export markets. The consumption continuum shown as a box on the right sides of figures two and three illustrates the range of monetary values (value in exchange) for a given product type. However, it is important to note that the continuum represents increasing monetary value, but not necessarily increasing value-added.

Furthermore, with both bamboo and rattan there are a wide variety of final products. With rattan there is everything from food (fruits and shoots of some species), through utensils and handicrafts (bindings, baskets, fish traps, etc.), to high-priced furniture traded in the export (international) market. Bamboo has even greater variety in use with more than 150 uses recorded, including food, handicrafts, construction materials, and paper. The diagram can be adapted to include two or more types of final products. For example, the diagonal line in figure 4 represents a division of rattan products into two principal categories: 1) handicrafts: and 2) furniture. Much of the consumption of rattan at the upper end of the continuum is in the form of handicrafts/ utensils. There is some demand for these kinds of items as tourist-market souvenirs, and also as export goods (baskets, lamp shades, sports equipment), but the high end of the market is dominated by furniture. Clearly, this division is specific to rattan, but similar divisions are likely to be found with other NTFPs as well (e.g.. bamboo utensils vs. food vs. industrial raw material; traditional herbal medicines vs. crude extracts vs. processed pharmaceuticals).

The Policy Environment

Non-timber forest products, even the more important ones such as bamboo and rattan, have been largely ignored by governments. As such, there are relatively few policies in place in most countries which are specifically aimed at NTFPs. There are important exceptions of course: several Asian countries have imposed bans on the export of unprocessed rattan (IFAR, 199 1): Indonesia has granted a monopoly over the export of finished rattan products to the Indonesian Association of Furniture Producers (Dove, 1994); several Indian states have nationalized NTFP trade (Bajaj, 1994): and many countries use licenses and extraction fees and impose cutting rules to regulate and to capture revenue from non-timber forest product harvesting. These policies influence the management and utilization of the products and also influence the way benefits are distributed. Furthermore, the administration of these policies frequently results in conditions which encourage graft and corruption. and which discriminate against the poor (Bajaj, 1994: Leocadio. pers. corn.). However, there has been insufficient research on the impact of these policies. and their administration, on efficiency, equity, and sustainability in the bamboo and rattan sectors.

There are also many policies which have been designed and implemented for other purposes, but which incidentally exert a strong influence on the way NTFPs are managed. Land and resource tenure laws (e.g.. land ownership laws, forest concession arrangements, etc.) are particularly important. There are also any number of regulations, direct government. investments (infrastructure: even education), and incentive mechanisms (taxes, subsidies, etc.) which can, by their presence or by their absence, influence the way people use natural resources. The policies

themselves may have been designed to encourage agricultural development, industrial growth, or foreign exchange conservation. However, whether or not they achieve their intended aims, many such policies also have negative impacts on the NTFP sectors. An anecdotal example comes from Kalimantan. The Indonesian government has a laudable policy favoring forest plantation development on degraded lands. However, the definition of *'degraded lands" includes areas used for swidden agriculture, among them lands used for the swidden/rattan systems described by Weinstock (1983). Thus a seemingly beneficial policy is interpreted in a way that may negatively impact an apparently sustainable rattan management system.

Finally, there are important market distortions and market failures in the NTFP sectors which could be corrected with policy interventions. With better understanding of the way the policy environment influences people's decisions about how they use natural resources it will be possible to recommend policy interventions which will diminish negative impacts and increase positive impacts on the target groups.

The Institutional Environment

In addition to formal government policies (which may or may not be implemented at the village level), there are also many customs and habits and more or less formalized rules which guide people's actions. These institutions, defined as "the set of rules and constraints which govern the relations among individuals or groups" are important in determining how natural resources are used and managed. Such rules and constraints guide individuals with regard to which actions are permitted, required, or prohibited; theygovern relations among individuals and groups; and they provide an element of predictability inasmuch as the actions of others are governed by known rules and constraints as well. In the absence of clear government. regulations, and frequently prevailing over the "law", customs, traditions, and informal rules govern resource access, terms-of-trade in barter, credit terms, and so on. Understanding and accounting for these institutions is critical to the success of any planned intervention in the system.

The Framework as a Development Tool

The challenge from a development perspective is to use natural resource production-to-consumption systems as a basis for increasing employment and income generating opportunities for poor people, and to generally improve welfare. INRAR's focus is on the sustainable utilization of bamboo and rattan. Thus, we would select agroup of people to whom bamboo or ratt.an is relatively important (or potentially relatively important) in economic and/or social terms and look to the system in place for opportunities to improve it. Any development effort must recognize that the product in question makes up only a part of peoples' income. We would focus on a system in which the resource (bamboo or rattan) is relatively important to a large number of our target. group. This conceptual framework will provide a basis for assessing options for improving people's welfare through increasing the efficiency, sustainability and equality of bamboo and rattan production, transformation, and marketing.

The channels through which material flow are not necessarily horizontal (as depicted in the diagram). That is, products entering high value markets are not, necessarily manufactured from plantation-grown material. In fact., much of the rattan used in the high quality furniture market is harvested from the wild, or from low-intensity cultivation systems (e.g.. Figure 4) Similarly, material from intensive production systems may be used in the manufacture of low value products. There is nothing inherently better in supplying one type of market versus another type. The main commercial objective should be to supply the market which will yield the highest value-added. The

price per unit of product may be much higher as export-quality furniture than as a basket or chair sold in a local market. However, the lower cost of inputs to manufacture the lower value item, and a high demand for such products, may make it more attractive to focus on that market. In other cases there may be a high demand for a higher quality product, or for a different type of product, or for the same product in a different market. These cases must be identified, along with the constraints which prevent entry to the higher value-added market.

Increases in employment and income opportunities may come about in several ways. A target group could: 1. increase the efficiency of production / transformation (increase returns per unit of input): **2.** increase their volume of production (increase throughput.); 3. increase the quality of their product (increase the value of each unit of output); 4. increase the variety of their products: 5. gain access to better markets: and, 6. increase the range of act.ivities performed (backward and forward integration). In the diagram (Figure 4) this is symbolized by moving down and to the right.

Consider a group of people who collect rattan and sell it in an unprocessed form to middlemen, who then move the material downriver for sale to wholesalers. Various opportunities for increasing revenue to the ratt.an collectors include: 1) increasing the volume of (sustainable) production (increase management input. · move vertically down on the diagram): 2) improving the quality of

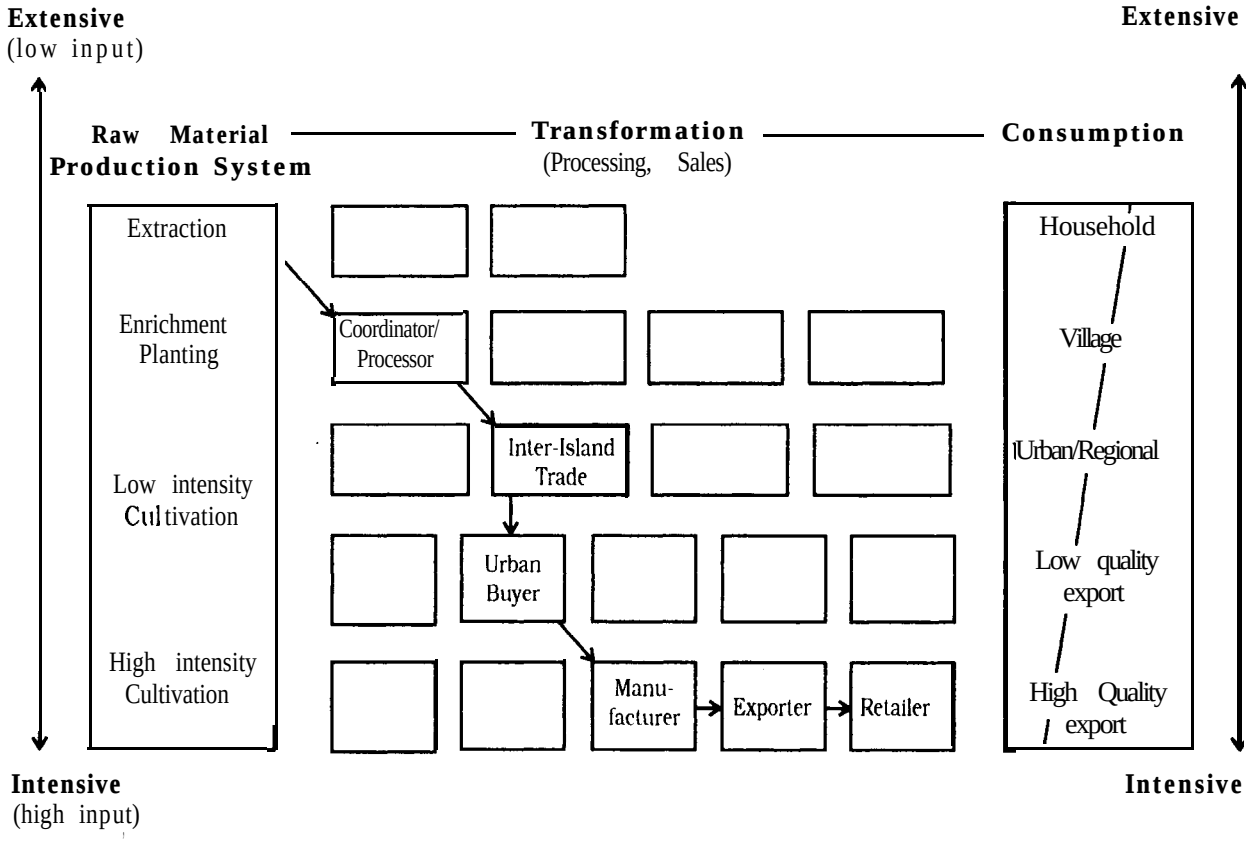

Figure 4. The production to consumption system

material produced (increase management input and sell into a higher-quality market, - move down and right): 3) taking over transportation, wholesaling, or other downstream activities (vertical integration - move right on the diagram).

Another target group might be small-scale urban-based furniture manufacturers. Options to increase their income include: 1) increasing quantity produced (improve management, increase capital invested move down on the diagram): 2) improving quality (gain entry into a higher value market - move diagonally down and to the right): 3) form a partnership or take over raw material supply and/or furniture marketing (expand right and left in the diagram).

Improvements in one part of the sector may also lead to developments in other parts of the sector. As the industry develops, increased opportunities will arise for providing supplies and services to the industry. For example, in rattan and bamboo, and in many other NTFPs. there is a nascent but potentially large input market. developing. To date input requirements have mainly been limited to low-skill labour. There has been some marketing of plant.ing material, but only on a small scale. Now, with the establishment of large plantations, there is a need for quality planting ma tcrial, agricultural chemicals. and management skills. With the provision of appropriate knowledge, resources, and incentives, poor people may be able to gain entry to this market.

Much of the non-timber forest products literature concerns target groups engaged in extensive raw material production, feeding into low value-added markets. Development strategies employing NTFPs typically involve a combination of approaches, but tend to place the strongest emphasis on moving diagonally down and to the right, into higher-value markets, with some forward integration. Projects pursuing an objective of biodiversity conservation through biological resource utilization have tended to avoid efforts to increase the intensity of raw material production (i.e., cultivation). The idea of the extractive reserve seems to have a very strong appeal. However, intensified raw material production may make economic sense, and conservation objectives may be rapidly overwhelmed by an economic imperative, whether or not development planners intend it..

The issue of the economic stability of extraction-based production systems is very relevant, with the many efforts currently underway to sumulate economic activities based on such systems. Some authors (e.g.. Homma, 1992; Browder, 1992) posit that extractive systems are inherently unstable in an economic sense. They feel that plantation-based production systems will displace other forms of raw material production. Dove (1993. 1994) goes further, cautioning that. effort.s to develop markets for forest products may result in a shifting of the benefits of those resources from local shareholders to richer and more powerful outsiders. Is this true in bamboo and rattan? Is there an evident trend? What are the implications for other actors in the production-to-consumption system? What are the implications for development strategies? These issues need much more consideration, with an emphasis on identifying interventions that will enable poor people to benefit from developments in the sector.

Furthermore. we must. keep in mind that people may not necessarily want to continue or to expand traditional, labour intensive, activities. As societies become more wealthy opportunities and expectations change. Development planning and management must be cognizant of what people want.

Implementing Change

Making changes in the system will require modifications in the decision-making environment of the stakeholders in the system. People do what they do for good reasons: if there appears to be

a better way, and people are not doing it that way. it is because they don't know how. can't afford it, or they don't want to do it that way. That is, a development intervention must change the combination of knowledge, resources, and incentives facing the target, group. This in turn will require extension of existing knowledge, research to generate new knowledge, investment. and/or policy changes to improve access to resources, institutional change to modify the incentive structure. and so on.

While considerable progress has been made in generating new knowledge, particularly of technical aspects of bamboo and rattan, that. knowledge is not always extended effectively to the people who need it . Furt hcrmorc. the technical information generated by research is not always appropriate to the needs of resource-poor people. Better mechanisms are needed in this area to ensure that the appropriate questions are asked. Increased stakeholder participation in research, and better understanding of production-to-consumption systems, will help researchers to ask the right questions.

Other areas of knowledge are every bit as important as the technical issues. For cxamplc. improved knowledge of market demands (styles, quality standards) and of prices would put small-scale furniture producers in much stronger bargaining positions. In the development of, and especially in the expansion of. small enterprises, managerial knowledge and skills may be more important even than technical skills, or capital constraints (Arnold. 1994; Wardana and Rolle, forthcoming).

There is also a range of resource and incentive constraints facing poor people involved in the bamboo and rattan sectors. Policy and instititutional issues are particularly important in this light.

Overcoming Constraints

Clearly. none of these issues - technologies, policies, or instittttions - can be considered in isolation. They influence one another strongly. As an example, Braadbaart (1994) shows how the absence of grading standards for chilies in the Indonesian market, as well as the perishability of the product, and the absence of reliable price information, puts sellers (the chili growers) at a disadvantage. Similar characteristics apply to the rattan market.. The introduction of grading standards. and/or improved preservation t.echnology. and/or an improved price information system could be very beneficial to producers.

Specific cases will require specific interventions. or combinations of interventions. For example, a community of small-scale rattan cultivators wishing to increase their output might need better silvicultural techniques (knowledge), planting material or investment capital (resources), and more secure tenure (incentive) in order to improve their current system to make it more productive. If the knowledge is available elsewhere, it might be transferred in an appropriate form through training workshops or the existing extension system. If there is a technical problem which needs to be solved. research may be required. If the growers simply can't afford to invest in a new approach they may benefit from better access to affordable credit. Or, if appropriate planting material cannot be obtained there may be a role for research to find/develop it and nursery establishment to deliver it. It may be that. growers do not. have the incentive to expand production becatise they do not enjoy secure tenure (and risk losing their investment), or perhaps are unsure whether they will be able to sell a crop. Some institutional modifications might help overcome these constraints, such as changing tenure law. improving common-property management systems, or organizing a commu-

nity marketing agency to help sell the produce. This example is shown in the form of a table in Figure 5. In a real case a much more detailed table would be developed. The needs would have to be carefully analyzed and priorities set for interventions.

Figure 5. A Simplified Constraints Analysis Matrix

	Need	Intervention
Knowledge	Silvicultural technology	Research: transfer of technology; training & ext.
	Market information	Market research: information dissemination.
Resources	Investment capital planting material	Low-interest credit. assist with nursery establishment.
Incentives	Secure tenure	revised tenure law; improved institutional framework.
	Improved security of sales	community marketing organization: institutional development.

The INBAR Socio-Economics Research Programme

The International Network for Bamboo and Rattan (INBAR) is a global network with a focus on research. INBAR's programme of work has a strategic focus on providing information and technologies which will facilitate sustainable development and which has broad relevance The INBAR socio-economics programme includes a series of studies designed to satisfy two principal objectives. First, the studies will identify constraints and opportunities for sustainable development within particular rattan and bamboo 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 the appropriate technical 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 (e.g.. nursery development). Still others will aim to improve incentives for particular courses of action through policy reforms and targeted rural development projects.

The second objective of the studies is to provide an empirical basis for t.he conceptual framework presented above. In order to satisfy this objective, cases have been selected to represent a range of systems. Studies will examine traditional systems, various intermediate systems. and plantation-based systems for bamboo and for rattan.

The studies aim to trace the flow of material through the various processes and transactions to the u1timate consumer. They will describe the social and economic factors which make up the

"decision-making environment*' of the people involved in the production-to- consumption system as fully as possible. Important elements of this decision making environment include (from Holtzman, 1986) commodity characteristics, consumption patterns, supply situation, price analysis, marketing system organization and operation, infrastructure, institutions, and policies. This knowledge will assist in the design of development interventions; that is, it will point to where there are insufficient knowledge, resources, or incentives for change to take place and suggest how to redress this.

Conclusion

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 objective will require a thorough understanding of very complex social, economic and policy contexts. Development interventions will need to provide assistance to people to overcome the constraints which limit the benefits they earn from their enterprises and resources. The discussion has illustrated some of the kinds of constraints of knowledge, resources, and incentives, which can thwart people's efforts.

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. Still, there are also many common elements . The conceptual framework developed here will 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 for this framework, it will facilitate the identification of typical production-to-consumption systems, and of the constraints and opportunities common to them. As development projects are undertaken to address some of these constraints, the results can be compared in a systematic way. Workers will be able to place a particular system within the framework, compare "their" system with others, and this will facilitate designing appropriate interventions.

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