EPTD DISCUSSION PAPER NO. 16

POLICIES AND MARKETS FOR NON-TIMBER TREE PRODUCTS

Peter A. Dewees and Sara J. Scherr

Environment and Production Technology Division

International Food Policy Research Institute
1200 Seventeenth Street, N.W.
Washington, D.C. 20036-3006 U.S.A.

March 1996

ABSTRACT

Markets for non-timber tree products (NTTPs) are widely viewed with great promise because of their potential for achieving a range of development objectives. Markets can, of course, be influenced by policy, but in order to do so, market information is needed to better inform the policy process. There has been increasing concern that few market studies have been adequate for doing so. There has been ambivalence at the policy level because these markets are highly diverse and difficult to characterize, and because governments tend to view NTTP markets as a threat to the conservation and management of forests and woodlands. Perhaps most importantly, however, there has been a failure to link the design of market studies with the potential for policy change. We argue in this paper that policies *per se* can be used to influence the operation of these markets, and that good market research should be more carefully designed to reflect explicit policy objectives.

Policies toward the operation of NTTP markets have generally been designed to meet one or more of three objectives: to bring about the conservation of tropical forests and woodlands, to improve household welfare, or to support economic growth and development at the regional and national levels. These objectives are not necessarily compatible with each other. The link between market information and the development of policies toward the operation of NTTP markets poses considerable challenges for market research. Increasingly, market researchers must be brought into the policymaking process. In particular, market analysts must be encouraged to continually stretch their conceptual framework, to expand the ways of collecting relevant data, to broaden their use of analytical methods, and to consider more carefully the links between markets, the environment, household production, and household welfare.

CONTENTS

List of Boxes

POLICIES AND MARKETS FOR NON-TIMBER TREE PRODUCTS (NTTP)

Peter A. Dewees[*] and Sara J. Scherr[**]

1. INTRODUCTION

[*] **Natural Resource Management Specialist of the Africa Department, Agriculture and Environment Operations Division at the World Bank.**

[**] **Research Fellow, Environment and Production Technology Division, International Food Policy Research Institute.**

The views expressed here are those of the authors. The authors would like to thank Peter Hazell and Steve Vosti for their valuable comments on earlier drafts of this paper. We are grateful for financial support from the Overseas Development Agency (ODA) of the United Kingdom to IFPRI for this project on "Market for Non-Timber Tree Products."

Non-timber tree products (NTTPs) provide an enormous range of inputs into both rural and urban economies. These products are often collected by rural households for home consumption, but are also traded in local markets, or are exchanged with other traders for sale in urban areas. In some instances, NTTPs are exported regionally or become more widely traded on international markets.[1]

GLOBAL TRANSITIONS IN TREE PRODUCT MARKETS

Broad and significant transitions in markets for tree products are underway in many developing economies. Most areas of the tropical world find themselves in the midst of one or more of three major transitions with fundamental ecological and economic characteristics.

The first has to do with the transition in the principal source of supply of many NTTPs from natural stands to domesticated production systems, for example, from forests to farms. In other cases, land pressures have resulted in more intensive land

---

[1] This paper considers tree products which are produced or processed by communities or on an individually small-scale. While markets for timber from large-scale logging operations, for instance, are not discussed, the paper does examine markets for farmer grown construction poles, or timber produced from communally managed forests or woodlands. We have also excluded from this discussion markets for associated forest products, such as for game meat, mushrooms, thatch, and honey, which are all dependent on habitat management more generally, rather than on tree management specifically.

uses, across all categories of land, including forests, pastures, and fallows. One aspect of this intensification has been that woody biomass has been more actively cultivated and managed to meet a wide range of needs. Some have speculated that there is a `woody plant revolution' in the making, which could eventually parallel the `green revolution' (Leakey and Newton 1994; Newton, Moss, and Leakey 1994). Along with this transition has come a need for new marketing structures and infrastructure, as well as a change in the nature of the products which are being supplied and in the way production systems are managed. Quality, seasonality, and the degree of processing are all typically modified as tree products are domesticated.

The second major transition has to do with the control of forest product supply. Governments, which had nearly universal control over forest resources in the colonial and post-colonial periods, are finding it increasingly difficult to allocate the resources needed effectively to maintain this control. This has led, in turn, to a dismantlement of the apparatus of state control, and to changes in tenure regimes and in the regulatory environment. New management institutions have emerged, with significant implications for markets and the marketing of tree products.

Thirdly, the potential scale of markets for NTTPs has undergone a significant transition. While some products were formerly found predominantly in local markets, increasingly demands for the same products are developing at the regional and national levels, and in some instances, in international markets. This transition is partly the result of increased urbanization and regional economic integration. To meet the needs

of distant and urban consumers, more efficient marketing systems are needed. Changes in product quality may be necessary, coupled with new techniques and strategies for product processing, transport, and storage. Information systems spanning large areas and multiple producers, consumers, and traders may be needed.

It is unsurprising that proactive policies have been called for to ease these transitions. Changing market conditions for NTTPs can have important consequences for the welfare of urban and rural populations, as well as for the environment. As most NTTPs are not monitored in official statistics, there are currently no reliable estimates of the aggregate value of international or even national non-timber tree products which enter markets, with the exception of high-value export products.[2] However, scattered evidence suggests that the magnitude is significant. In India, for example, nearly 15 million people are estimated to depend on income from tendu leaf collection, bidi processing, resin, sericulture and bamboo-based craft industries (Tewari 1982). A substantial part of the entire small enterprise sector in developing countries is comprised of small-scale forest-based activities (Liedholm and Mead 1993; Iqbal 1993).

POLICY INTEREST IN TREE PRODUCT MARKETS

We can identify a range of natural resource, agricultural, and land-use policy objectives which could all affect to varying degrees the operation of NTTP markets,

---

[2] Data on fuelwood marketed in developing countries, in urban centers, are more widely available, and show a level of economic importance similar to that of major agricultural products

and indeed which can help explain why governments choose to intervene in them. Policies which have been used to influence the operation of NTTP markets generally fall into three categories:

Firstly, policies toward the operation of NTTP markets be designed to bring about the *conservation of tropical forests and woodlands*,

- **by restricting their use,**
- **by encouraging their sustainable utilization, increasing their value and promoting their management, or**
- **by developing alternative sources of NTTP supplies from farms and by introducing incentives in order to encourage shifts in production from forest to farm.**

Secondly, policies may be directed toward *improving household welfare*, for example:

- ***increasing household income and employment*, by increasing participation in these markets,**
- ***improving security of tenure to land and/or to trees*, for instance, with the impact of increasing the income earning possibilities from common resources, and encouraging the development of local institutions more able effectively to manage these resources,**

- ***increasing household access to tree products*** **for household use and for sale on the market,**
- ***increasing the productivity and economic contribution of marginal lands,*** **by providing a broader range of income sources either as a result of markets for on-farm NTTPs or for NTTPs collected from woodlands,**
- ***promoting environmental stabilization*** **at the household level by incorporating trees into farming systems,**
- ***improving food security*** **by increasing the range of income sources on which households may depend, and by developing (or conserving) other NTTP-based food supplies,**
- ***protecting both rural and urban consumers from price fluctuations*** **for widely-used NTTPs, or otherwise seeking to ensure future access to NTTPs in the face of growing pressures on limited forest and woodland resources,**

Finally, policies may be geared toward *supporting economic growth at the regional and national level* by

- ***providing incentives to adopt NTTP production systems*** **which supply markets, either locally, regionally, or for export,**
- ***encouraging the development of new markets*** **for NTTP producers,**
- ***improving the efficiency and operation of existing NTTP markets,*** **and**
- ***supporting infant industries*** **based on NTTPs.**

Policy objectives may be incompatible. For instance, price controls on woodfuels, which may be introduced with the objective of protecting urban consumers from price fluctuations are incompatible with policies which encourage tree planting by rural households in response to scarcity-driven higher prices for NTTPs.

Interventions in the marketing system may not be the most effective means of achieving these types of policy objectives. Investments in improved road and communications, for example, could help to reduce transportation and distribution costs, achieving the objective of keeping delivered prices down, and avoiding the need to introduce less efficient price controls or government marketing monopolies.

The argument for policy intervention often derives from the view that markets, more broadly, have failed to allocate resources in socially optimal ways. Particularly, the problems of property rights and tenure regimes, and the problems of environmental externalities and biodiversity conservation, are areas where governments commonly intervene to correct what are perceived to be market failures. With respect to trees and tropical forests, can policies correct for the failures of markets? How can NTTP markets be encouraged, while failures in these or other markets are corrected?

The development of policy instruments to correct for market failures presupposes that governments (and society) *know* how much forest, woodland, or on-farm tree cover is `optimal.' This, in turn, is dependent on knowing all the costs (for instance, in terms

of income from crop production or timber harvesting foregone) and benefits (for instance, in terms of biodiversity, downstream impacts, carbon sequestration, sustainable production of outputs, etc.) of maintaining land under tree cover. Market failures arise in part because the costs of conserving forests are usually incurred by individuals and communities in their immediate vicinity, while the benefits (with the exception of sustained production of outputs) are global, regional, or downstream benefits—not, for the most part, recovered by those incurring the costs of conservation.

NTTP markets provide one means for articulating the costs and benefits of forest management and tree cultivation. When there is a significant gap between financial and economic values of NTTPs in the market, then there is scope for policy change to reduce this gap. Valuation studies *when coupled with market studies* can contribute importantly to understanding the conditions under which NTTP markets operate efficiently. These types of studies, however, do not feature significantly in NTTP market literature.[3]

There has been growing interest in the role of NTTP markets among planners, policy makers, and donors, as well as among rural producing and marketing households and urban consumers dependent on the market to provide needed

---

[3] Valuation studies assess the economic value of NTTPs to society. Typically, these have been carried out in the absence of an understanding of how and under what conditions NTTP markets operate. Peters *et al* (1989) take this approach for the Peruvian Amazon. Campbell *et al* (1991) report on a number of valuation exercises of trees on farms and in woodlands in Zimbabwe.

commodities.[4] The promise of the market has been of special interest to environmentalists who are seeking to encourage the conservation of tropical forests: it is argued that, if markets can be tapped, tropical forests will be more highly valued and there will be a greater incentive for their conservation. Other analysts are encouraging the development of these markets as a means for diversifying rural income and increasing employment, and for providing an incentive to incorporate improved land-use practices (such as agroforestry strategies) into farming systems.

OVERVIEW OF THE PAPER

[4] See for instance, Gregersen *et al* (1992); Falconer (1990); Ribbans (1992); Richards (1993); Salafsky *et al* (1993); Townson (1994); and Raintree and Francisco (1994).

This paper examines how and why market information is needed to inform the policy process. While there is a growing literature about NTTP markets, its policy content is weak. The perspective in much of the literature is on economic botany, on the social and cultural role of forest products in local economies, or on issues of economic valuation. The private sector has other views about the value of market information, and uses it to inform investment decisions. The view that policy instruments *per se* can be used to influence the operation of these markets, and that good market information should provide the basis for understanding how policies can be used to accomplish this, has not been widely articulated.[5]

The following section of the paper explores why policies and market studies have been only weakly linked. Subsequent sections discuss specific policy objectives related

---

[5] Townson (1994) carefully examined much of the literature associating forest-based NTTP markets with household incomes. Much of the literature is `grey' material, and there is little which has been published which addresses market formation, structure, and efficiency in an empirically rigorous way. Falconer (1990) reviewed the role of NTTPs more generally (with a strong focus on West Africa), and market considerations were secondary concerns. The collections of papers in Redford and Padoch (1992) and Plotkin and Famolare (1992) begin to address the relationship between markets and resources in Latin America. A recent important contribution is Raintree and Francisco (1994) which summarizes the results of a number of studies about the marketing of NTTPs in Asia.

to environmental conservation, household welfare, and economic growth, and illustrate through case material from the literature how market studies can provide an input into policy formulation. The final section examines the role of research in helping to improve our understanding of the areas where policy can most actively influence the operation of NTTP markets.

2. WHY DO WE KNOW SO LITTLE ABOUT NTTP MARKETS?

Although there is a growing recognition of the need for good market studies, NTTP market research appears to have had a low priority among policy makers, much has been poorly carried out, and has been inadequate for substantively addressing policy concerns. We examine in this section several reasons why this situation has prevailed, mainly due to:

- **Lack of interest in market studies, due to policies antagonistic to market development;**
- **Complexity and diversity of tree product markets;**
- **Lack of basic information on tree product markets; and**
- **Weak linkages between market study design and policy issues.**

POLICIES WHICH RESTRICT TREE PRODUCT MARKETS

Part of the problem has been related to the fact that many forest policies have been fundamentally *restrictive*, rather than *enabling* and have been designed to limit the development of NTTP markets. This has been particularly so when there have been concerns about forest conservation. In these instances, governments have actively sought to limit the extent to which tree resources are tapped instead of encouraging their use for the market.

Environmental externalities have been widely used to justify government intervention in markets. Issues with regard to the conservation of biodiversity have given new impetus to finding ways of limiting environmental damage associated with markets for NTTPs. The instinct to intervene, however, is often stronger than the desire to find sustainable alternatives which can tap the power of markets, instead of restricting them. A colonial legacy of legislation and policy can reinforce this instinct (See Box 1).

From the late 1800s, the earliest colonial impacts on woodlands in Zimbabwe were a result of the mining industry. Miners' rights to timber superseded all other legislative controls, and resulted in the widespread removal of timber in many parts of the country to supply mining props. Legislative controls on woodland use were first established with the Native Reserves Forest Produce Act in 1928, and subsequently with the Natural Resources Act (1942) and the Forests Act (1948) (McGregor 1991). Legislation reflected the declining influence of mining interests, and the growing influence of the agricultural lobby which strongly supported a racially derived legislative framework dependent on strict regulatory control over the African population, and on voluntary regulation in white farming areas. Much contemporary legislation reflects this inherited dualism, with an emphasis on the regulation of land-uses in Communal Areas (Scoones and Matose 1993).

Much discussion about the breakdown of customary systems of resource management accepts the assumption that common property management systems are being increasingly replaced by open access exploitation, which is followed by a deterioration in the resource base. Strengthened systems of common property management depend on communities holding greater control over woodland resources.

There are, however, real constraints, rooted in legislation, land usage rules, and policies, to giving communities greater control over woodland resources. Much legislation which affects woodland use remains fundamentally restrictive, rather than enabling. The Communal Land Forest Produce Act of 1987, for instance, recognizes the right of inhabitants of Communal Lands to exploit for their own use any forest produce, but makes a number of important exceptions. People in Communal Areas are not allowed to use forest produce which some other person has been licensed to exploit; with few exceptions, to use any valuable timber tree except by special permit or special license; to sell any forest produce collected from woodlands in Communal Lands (except as licensed); or to provide any forest produce to anyone not an inhabitant of Communal Areas. Technically then, all trade in woodland-derived products (and hence, markets for honey, fruit, insects, leaf litter, firewood) is illegal unless households hold permits to exploit for sale. This also applies to small-scale industries.

Much of the Act was designed to strengthen the rights of concessionaires to commercial timber species, and the rights of District Councils to revenues from them. Legally, revenues generated by the felling of timber trees such as Zambezi teak (Baikiaea plurijuga) and *mukwa* (Pterocarpus angolensis) which are harvested from Communal Areas revert to District Councils. Concessionaires can remove trees from garden plots or from common lands such as grazing areas, but are not at all accountable to anyone immediately dependent on these resources. At the same time, however, the Act goes on to guarantee Communal Area households the right to cut down *any* tree on allocated lands, but only in the course of land clearance for cultivation (Bradley and Dewees 1993).

A recent policy review recommended that legislative reform should give communities greater rights over production from woodland areas, particularly with regard to revenues generated by the sale of forest produce. The recommendation is based on the view that, by enabling communities to become involved in markets for NTTPs, rather than by restricting them, there will be a greater incentive to manage these resource long into the future (Bradley and McNamara 1993).

Largely because of the regulatory and restrictive nature of many forest policies, NTTP market studies have had a low priority. There has been little interest in the structure and operation of NTTP markets when a principal policy objective has been to shut them down. The fact that trade in tree products may be illegal has meant that studies of the operation of the market are only undertaken on an informal and *ad hoc* basis, and are seldom supported by time series data, or by the range of methods of analysis open to agricultural economists with a rich data base. Where policies have been more concerned, however, with *encouraging* production, governments have shown more interest in developing a view of how NTTP markets operate.

COMPLEXITY AND DIVERSITY OF NTTP MARKETS

In reviewing the broad range of studies of NTTP market literature, a recurrent concern of ours has been, how are these markets really different from other markets? Of course, tree products and their uses are hugely different, but basic characteristics of these markets are generally not. There is a rich literature about how markets, more generally, operate, and how various elements of the market can be addressed in market studies (See Box 2). What is more unique is the *bundle of characteristics* of these markets, reflecting a range of aspects of production and demand. Table 1 summarizes some of the production and demand characteristics of NTTP markets that need to be considered in designing policy-oriented market research.

Markets for NTTPs link production of tree-based products with consumptive sectors through a process of exchange and specialization. Market analyses are typically geared toward understanding the structure and efficiency of the market, and its ability to create and to communicate `incentives to producers and consumers that are consistent with resource availabilities and long-run structural transformation' (Timmer *et al* 1983, pp.164-5). Market studies usually focus on several variables, such as the channels which are used for marketing particular commodities, participants in the market, aspects of production, costs, margins, and profits at different stages in the marketing process, the level of market development, qualitative studies of how people and products move between markets, and what all these mean with regard to the process of price formation.

Timmer *et al* (1983) argue that market efficiency can be assessed by asking if the elements of a competitive market are present, such as whether:

- **items of the traded commodity are interchangeable and divisible;**
- **buyers and sellers are economically rational;**
- **firms are small and numerous enough that their decisions have no impact on price;**
- **all participants have equal access to markets on the same terms; and**
- **everyone has complete knowledge about the forces influencing supply and demand.**

Probably the best studied and most well-documented NTTP markets have been for urban woodfuel (cf. Conway 1979; Hyman 1983b; Dunkerly and Gopi 1985; el Faki Ali 1985; Kinyanjui 1987; van Buren 1990; Leach 1993). Although few of these studies have specifically considered market performance and efficiency, they generally have examined,

- **sources and costs of supply (whether from farm or forest);**
- **means of, and margins for, rural sale;**
- **transportation and distribution network, costs, and margins;**
- **urban wholesale and retail structure, costs and margins;**
- **segmentation of urban consumption by type of end-user.**

All of these aspects of urban woodfuel markets are typically those which should be considered more generally in NTTP market analysis. There are also important seasonal aspects to these markets. Price analysis can contribute importantly to understanding seasonal dimensions of supply and demand. Comparisons between seasonal price fluctuations and the cost of storage (at prevailing interest rates) give further indications of competition and efficiency in the market.

The analysis of price structures and marketing margins are common means of assessing whether markets are operating monopolistically. `Normal' profits and `excessive' profits are evaluated by considering a merchant's return to capital invested in an NTTP enterprise and comparing this with the expected return, given prevailing interest rates. Other considerations in market analysis include the role of subsidies, trade restrictions, the marketing of substitutes, and income and price elasticities of demands for NTTPs. Where NTTPs are exported, characteristics of international supply, demand, and the operation of the markets should also be considered.

Table 1—Variables to consider in assessing markets for non-timber tree products

Production/Supply Characteristics	Demand	Policies and Interventions in the Market
Property rights regimes for land and trees	Distance of centers of market demand from sources of supply	Government involvement in marketing; costs and benefits of government intervention in the market; rationale for interventions (externalities, infant industry arguments)
Single or multi-output production systems	Structure of linkages between supply and market demands	Policy impacts on the market Natural resource policies Other land-use policies
Externalities; environmental services	Income levels of consumers and intermediaries; relationship of income to demand	Potential for encouraging shifts in production from forest to farm: when is this possible, and when is it not (partly product dependent); domestication of forest/woodland products
Impacts of production and harvesting on the resource base (more intensive forest management; transitions from forest to farm)	Elasticities of demand; substitute products in the market	What constraints must be removed (through policies or other active interventions) to encourage farm production of NTTPs (transition in supply from forest to farms)
Changes in production system in response to price; price elasticities; substitution in supply	Concentrations of centers of demand (for example, diffused rural or concentrated urban)	What policies can encourage market development: supply and demand sides
Seasonality of production; relationship to other seasonal variables	Size of demand in relationship to supplies of NTTPs	Encouraging transitions in public policy from regulation to enablement
Household factor allocation (capital, land, and labor); relationship to other allocation processes	Access to credit in the market and its impact on demand	
Income levels of producers	Familiarity of consumers and potential consumers with the product	
Access to credit; impact on production of NTTPs and other outputs	Scope for increasing consumption; market development	
Scope for production of new NTTPs	Scope for developing markets for new NTTPs	
Perishability Quality/grading variables	Quality/grading variables	
	Extent that structure of demand and sources of supply create fragmentation or vertical integration in the market	

NTTP markets rely on systems which produce, process, and deliver vastly different commodities: fruit, charcoal, medicinal products, vegetable oils, water soluble gums, building material, fodder, household implements, firewood, and so on. Partly because of this, it is not always immediately straightforward how a study of markets for NTTPs should be undertaken, particularly if it is to have a substantial policy content at an aggregate level.[6]

Market operations are seldom easily characterized. Diversity in NTTP markets is encountered in the way they operate, particularly in the way supplies are produced, distributed, and sold, for example, in:

- ***Sources of supply*. NTTPs can be produced from a range of sources with hugely different production characteristics. For instance, NTTPs can be cultivated on farms, or can be collected from woodlands and forests, or may be produced from both sources. Different production systems can respond quite differently to price signals. For example, farm tree systems may increase with price increases (that is, more tree planting)**

---

[6] For a closer look at issues of research methodology related to "NTTP Markets Research," readers are referred to the forthcoming proceedings of an IFPRI-CIFOR-ICRAF workshop held December 12-14, 1994. Vosti and Witcover (1995) provides a summary overview of the workshop.

whereas there is more mining of open access resources (see von Amsberg 1994). el.

- ***Range of impact on the resource base*. The harvesting of some products may badly affect the ecological integrity of forests and woodlands from which they were extracted. In other instances, the impacts may be negligible, or even positive in terms of increasing the total productivity of the farming system or forest ecosystem.[7]**
- ***Tenure regimes*. Rights of tenure to tree products may be held individually or communally. Rights to trees on farms, for instance, are often privately held. Rights to NTTPs from woodlands and forests may be communally managed, though often these are open access resources. The state may claim rights of ownership to woodlands on state lands, and sometimes on private and communal lands as well.**
- ***NTTPs are often fungible joint products*, that is, a single product is valued and marketed differently depending on how it is used (that is, as firewood, construction poles, pulpwood). Its use can change over time, or multiple uses can be derived at a single point in time.**

---

[7] Examples of externalities related to woodfuel markets are discussed in Dewees and Floor (1994); discussion of theoretical application of externality analysis to NTTP is discussed in Dixon (1994).

Good market studies require that each of these characteristics be carefully examined and related to other characteristics of markets. In fact, these same characteristics also influence markets for other commodities, such as fish, some commercially-established nuts, minerals, etc., and specialized market analysts have developed tools to address them. For example, methods exist to analyze multi-product and joint production systems, although their use may be constrained by lack of information on market dynamics (Vosti and Witcover 1994; Renkow and Vosti 1994). But these are not widely disseminated nor used in developing country rural economics, and in any case, considerable adaptation is needed for specific NTTPs.

The markets in which rural households more commonly participate (and which analysts more commonly assess), particularly those for agricultural commodities, are much more straightforward. Commodity market studies tend to focus on single crops, maize for instance, which may be grown and marketed by a large number of farmers. The marketing of maize is similar to the marketing of many other grain crops. The bulk of production comes from farms in a limited range of ecozones. There is a relatively discrete season for production, harvesting, and marketing where the production of a single crop predominates. Externalities of maize production have a limited immediate impact on ecosystem productivity. The right to grow maize is relatively well established within prevailing tenure regimes. Maize is primarily a food crop, and has a limited number of alternative uses.

From a policy perspective, it is essential to understand how these markets operate. Methodological issues with regard to market heterogeneity do seem surmountable. But researchers must draw upon theory and practice from a wide range of sources, and pay clear attention to these issues in research design.

LACK OF TREE PRODUCT MARKET DATA

The quality of tree product market research is also seriously constrained by the lack of existing information about most such markets. In the case of major staple foods and export commodities, with which many powerful economic interests are involved in producing, marketing, and consuming these products, data on market factors are regularly collected and analyzed. In the case of NTTPs, basic information on supply, demand, prices, marketing channels, etc., is usually unavailable. Thus, any market research aimed at informing policy must either initiate a large-scale effort of survey data collection, or rely upon rapid appraisal methods that limit analytical options (for example, modelling results of policy change). For selected NTTPs, recognition of their growing national or regional importance will likely lead to greater investment in market data collection (for example, urban fuelwood price series are now widely available), for the plethora of minor products, researchers will probably continue to depend on weak datasets and will need to develop more effective and validated rapid appraisal methods, tailored to the specific characteristics of the product market and market context.

WEAK LINKAGES OF MARKET STUDY DESIGN TO POLICY ISSUES

Finally, one of the greatest weaknesses of most NTTP market studies has been that they generally fail to make any connection between the information which is being collected, and the potential for influencing policy objectives, or the design of specific policy instruments as a result. This failure to link the operation of NTTP markets with a range of policy choices has been widespread, and has been highly problematic for policy making.

The following sections of this paper consider the scope for influencing policy objectives through policy instruments addressing tree product markets, and the role of market research in assessing the proper role for policy.

3. MARKETS FOR NTTPS AND THE CONSERVATION OF FORESTS AND WOODLANDS

The conventional view of NTTP markets, long held by Forest Departments and national conservation agencies alike, is that markets which are dependent on extracting products from forests will eventually result in their degradation. Much highly restrictive forest legislation in developing economies grew out of this view, which was often a cover for far more destructive commercial ventures (such as logging and mining interests), and which was designed to ensure longer term access to forest resources for these interests, ignoring the role of markets for NTTPs in the local economies.

A contrasting, and increasingly articulated perception, argues that, if NTTP markets can be supported and developed, they will indeed contribute to tropical forest conservation by increasing the real, financial value of standing trees (Hecht *et al* 1988; de Beer and McDermott 1989; Clay 1988; Clay and Groenveld 1994). Efforts which have sought to inventory, and then value, extractive resources, have suggested that tropical forests are far more valuable in the long run if they are sustainably managed to produce NTTPs for the market (Peters *et al* 1989).

Others, still, are critical of this view, especially when it leads to an emphasis on exports of NTTPs, rather than on market development which is geared more toward local and regional self-sufficiency.

> **`... (W)henever a forest product becomes valuable in international markets, elites are likely to appropriate it and leave only products of little value to the forest dwellers. Marketing rainforest products is not only trying to protect the trees from the wrong people; it perpetuates the process of leaving to the forest dwellers the resources of least interest to the broader society. The focus on `green shopping' is a dangerous distraction from the political and economic changes that must be made to encourage conservation of the world's tropical forests and improve the lot of the people who live there.' (Dove 1994).**

The search for a balance between the objectives of restricting forest use or of encouraging their management at the local level has been a considerable policy challenge. We consider each of these objectives in turn, along with some of their policy implications.

RESTRICTING THE USE OF TROPICAL FORESTS FOR MEETING NTTP MARKET DEMANDS

The protection of specific, listed, forest trees features prominently in much national forest-related legislation in the developing world. Usually, no one is allowed to fell protected trees or to use other forest products without a license, which can only be issued after payment of royalties to state forest departments. Revenues revert either to the state or to district governments. Restrictive policies figure especially prominently in forest legislation through much of Africa and Asia, and usually were derived from colonial legislation which took the view that the resources on which commercial interests depended needed to be protected (See Box 1).

This is not to say that colonial legislation, with its emphasis on protection, was without local precedent. Indigenous natural resource management strategies often relied on local prohibitions against tree cutting (See Box 3). Among the Kikuyu of Kenya, for instance, small groves of valuable trees were protected and managed by customary authorities specifically for timber production (Leakey 1977). Throughout India, the right of local authorities to protect trees, by declaring them to be royal or

sacred trees, was widely recognized. In southern Niger, the rights to use specific baobabs is defined by very old traditions (FAO 1985). Fortmann (1985) noted that, in Western Sumatra, the decision to cut a valuable tree was usually made by the extended family.

What often made colonial legislation (and its contemporary successors) different, was that rights to define who had access to particular trees and forests were removed from local people or customary authorities, and placed in the hands of a remote, central authority. Local interests became secondary to the interests defined by

In Zambia, long before Independence, land ownership was vested in the hands of the traditional Barotse leader, the Litunga, who also assumed responsibility for woodland management. In 1936, woodland management practices were drawn up in the Barotse Forest Orders. These laid the basis for woodland use and management into the 1970s. Under these Orders, the Litunga and his administration was entitled to revenues from forest management (mostly from the extraction of Zambezi Teak) and could reserve woodland areas for management. Outside of reserved areas, the Litunga encouraged bush clearance for crop production, but made special orders for the preservation of fruit trees. The Barotse National Government Forest Service was created to undertake woodland management, and skilled foresters as well as lineage authorities were responsible for the implementation of the Forest Orders. This reliance on lineage authorities to undertake woodland management was highly successful, and revenues from the forests provided a significant proportion of total government revenues.

The Forests Act of 1973 withdrew all rights of the Litunga to own land and to provide land-use guidance. The impact has been severe:

> **... The withdrawal of the Litunga's rights to claim royalties from the forests and to preside over land matters drastically changed the peoples attitudes towards the forests. They no longer felt that the forests were for their own benefit. Chances for employment in the forestry sector became remote. They could no longer easily acquire farmland, they had to pass through a lot of Government bureaucracy... (The repeal of the Barotse Forest Orders) drastically transformed the people's attitudes towards the forests and forest conservation began to suffer (Matakala 1986).**

Though the Barotse Forest Orders provided the basis for the Forest Laws of Zambia, the lack of an effective and locally respected means of administering local management planning has meant that management standards have badly deteriorated.

the state, which were often timber or other commercial concerns.

In Kalimantan, for instance, rattan had been locally gathered and traded for centuries. The market experienced an export boom in the early and mid-1980s, and, in

an effort to increase the value-added component of exports, government in 1989 placed a ban on the export of unfinished or half-finished rattan (Peluso 1992). While this step was welcomed as a means for increasing local income from the rattan trade, subsequent initiatives, which placed the export of all finished rattan under the control of the Indonesian Association of Furniture Producers subordinated local management to large, commercial interests (Dove 1994).

Controls over the extraction of marketed NTTPs are often viewed as an easy solution to problems of deforestation. In Mala_i, for instance, the government has, for some years, attempted to intervene in woodfuel markets, because of the view that they have been one of the leading causes of deforestation (see Box 4). It has been politically far more difficult to address the more fundamental causes of deforestation: agricultural land clearance and the expansion of the tobacco estate sector. Dubious interventions in energy markets have been coupled with subsidies for woodfuel production, both of which have been unlikely to have had much of an impact on overall rates of deforestation. Other non-woodfuel markets for NTTPs have suffered more as a result of market control initiatives, arguably because the commercial interests behind these are small and local, as opposed to woodfuel markets, which are large, organized, and well-financed. The Mala_i case emphasizes the considerable contradictions which may arise when governments seek to meet multiple policy objectives.

While we have suggested that the protection of commercial or political interests has been one reason why governments have introduced restrictive policies affecting the

operation of markets for NTTPs, broader concerns about deforestation, the loss of biodiversity, and other externalities which result, have also been voiced. The introduction of restrictions on the uses of forests, however, presupposes the state is in a position to regulate. This is indeed the exception. The fact is, most developing economies lack the resources and the manpower adequately to enforce restrictions on forest use, either through the market or otherwise. The search for alternative means of limiting forest degradation and managing forest use has gained momentum, as this

Wood energy policy in Mala_i is characterized by a number of basic contradictions, which reflect the dilemma of finding effective ways of responding to multiple policy objectives. Government wants to encourage smallholders to plant trees to meet woodfuel market demands. With World Bank support, it has heavily subsidized tree planting in order to do so, in some instances even providing lucrative bonus payments to farmers with the intention of making tree planting financially attractive relative to other crops (Government of Mala_i 1987).

realization has taken hold.

In urban markets, consumers have been hit by higher woodfuel prices partly as a result of Government's efforts to limit woodfuel trafficking and to control woodfuel flows, creating artificial scarcities and higher prices, particularly in Blantyre. Efforts at control have succeeded mainly in driving the market underground. Recent records of roadblock confiscations indicated that the much of what was being confiscated was comprised of non-timber forest products such as baskets, brooms, mats, and curios -- the harvesting of which is arguably placing few pressures on woodlands.

Concerned about the impact of higher prices on the urban poor, Government has sought to limit price rises by selling woodfuel from Government plantations at prices below the price of woodfuels from private and customary lands -- in fact *discouraging* farmers from producing for the market. In an attempt to cover its production costs, Government has increased its plantation firewood stumpage prices, but on an *ad hoc* basis, sometimes more than doubling its value on-the-stump. The result has been to introduce tremendous volatility in the urban firewood market.

Higher woodfuel prices have done little to reduce consumption. Recent studies suggested that urban woodfuel consumption was around 2 m^3 per capita, amongst the highest rates of woodfuel consumption in Africa (Ng'ong'ola 1992).

Most of these interventions were likely unnecessary. Surveys undertaken before the impacts of World Bank-financed tree planting investments had been felt showed that fully 29 percent of rural households surveyed had planted trees during the previous year (Energy Studies Unit 1981). Around 87 percent of households which had planted trees (other than on the National Tree Planting Day) had obtained seedlings from sources other than from Government nurseries. Firewood scarcities have had little influence on encouraging people to plant trees. Only 3 percent of rural households questioned in recent surveys reported planting trees through the National Tree Planting program solely for firewood. The tree planting bonus program, similarly, had little impact. Administration costs were more than double the cost of the bonuses themselves. Only 10 percent of households which had participated in the bonus scheme indicated that their principal reason for planting trees was because of the bonus scheme (Nyirongo and Mhango 1993).

Most of these interventions were justified, at least partly, on the basis of a concern about the impacts of woodfuel consumption on deforestation. In fact, the principal causes of deforestation have been related to the clearance of woodlands for the expansion of the tobacco estate sector and to provide firewood for tobacco curing. These sectors have been virtually unaffected by Government's interventions in woodfuel markets (Dewees 1995b).

NTTP Markets, Extractive Reserves, and Forest Conservation and Management

Rather than restricting forest use, critics argue, NTTP resources could be more effectively managed if markets could be tapped to encourage their conservation. This notion has developed wherever governments have been looking for viable alternatives to the state control of forest access and use. The use of the term "extractive reserves" has been most common in the Amazon, and refers to the setting aside of an area of existing forest for low-impact use by residents in the forest or on the periphery who would otherwise have had long term claims to the resources of the forest (Peluso 1992).

In other regions, different terms have been used to describe the changed rights of access and use to what had, usually, been forests under state control. In India, for instance, the concept of `joint forest management' has emerged, in which responsibilities for forest management have been transferred to and assumed by local communities. In southern Africa, `resource sharing' is the preferred term, and has been used to describe the potential for the management of the extensive dry woodlands which are found throughout the region. The relationship between these types of tenure regimes, and the scope for improving household welfare through tenure change is discussed further in Section 4 of this paper.

Changed tenure relations feature prominently among efforts to introduce or support community-based forest management. Experience has increasingly shown that the success or failure of NTTP markets to contribute to forest conservation in these circumstances will greatly depend on the success of the institutions which have been charged with controlling rights of access and use (Ndoye 1994).

In Brazil, extractive reserves have been established to support the production of rubber and other products. Rights of use are granted to rubber tappers for a minimum of 30 years, though the state retains land ownership. Other important extractive products from the Amazon include babassu palm kernels (from which an oil is extracted), and Brazil nuts. The success of these reserves has been dependent in part on there being a means for settling local land-use conflicts.

Stanley (1991) documented the emergence of collective strategies in Honduras undertaken to ensure communal access to sources of pine resin. Success has been problematic because of conflicts over tenure, the fluctuating profitability of resin extraction, and the organizational stability of cooperatives. Where local groups have been able to resolve these issues, resin tapping has supported the conservation of biodiversity, protected watersheds from soil erosion, and wildlife habitats from further degradation. In Costa Rica, Kent (1994) documents an on-going process of researcher-supported NTTP development on the forest margins.

In West Bengal, the Forest Department initiated an effort to transfer control over *sal* (Shorea robusta) forest resources to communities in the late 1970s. Within a decade, the Department had supported the establishment of over 1300 community-based Forest Protection Committees (FPCs) which had largely assumed responsibility for local forest management. The experience with FPCs has shown that *sal* forest degradation can indeed be reversed, provided the right incentives are in place to encourage management (Chandra and Poffenberger 1989; Poffenberger 1994).

The role of NTTP markets in encouraging forest conservation in West Bengal, and their contribution in increasing rural incomes, has been considerable. The Forest Department has been mainly concerned with increasing revenues from poles and firewood production and retains 75 percent of the value of these products, while returning the balance to local FPCs. On average, this works out to a daily income of

around Rs 1.4 per ha of protected *sal* forest. In contrast, the collection and marketing of other NTTPs can generate anywhere from Rs 7 to 10 per ha on a daily basis.

While the experience in West Bengal and other parts of India with joint forest management has been encouraging, success has in some respects been by default. Though the Forest Department worked hard to encourage local participation in the scheme, there was (and remains) an almost complete absence of information about the operation of NTTP markets and their role in supporting forest management.

Even in Latin America, where there has been considerably more experience with the operation of extractive reserves, most research about these schemes tends to focus on quantifying the potential value of NTTPs, and on the ecologic dimensions of NTTP production, rather than on the structure and operation of markets *per se* (cf. Peters *et al* 1989; Hecht 1992). There are, of course, a number of useful exceptions (Clay 1992; May 1992; Mori 1992).

Most experiences with the establishment of extractive reserves have suggested that the success of extractive reserves, from both ecological and economic perspectives, has been greatly enhanced where common property management systems have been effective. Such systems share a number of characteristics, for example,

- **there are functioning criteria which define who will belong to a resource user group;**
- **no single individual has exclusive rights to the use of the resource;**

- **group members have secure expectations that they can gain access to future use of the resource;**
- **there are communally defined guidelines for resource use; and**
- **there is an enforcement mechanism for correcting infractions of user guidelines (Bromley and Cernea 1989; Arnold and Stewart 1991; Scoones and Matose 1993).**

This theme is developed further in Section 4, in the context of improving household welfare through tenure reforms.

<u>Limitations to the Use of Extractive Reserves for Sustaining Tropical Forests</u>

The success of extractive reserves in encouraging the conservation of tropical forests has been dependent on the stability and resilience of the prevailing tenure regimes, and on stability in the market. Both of these conditions have been very tough to meet, particularly when new tenure systems have been introduced, and when markets have been small. Particularly when forest products are highly valued, several processes may eventually undermine the market. Dove (1994) suggests that the rights to highly valued forest products will always revert through political processes to the elite, rather than to forest dwellers.

There is some evidence that markets for highly valued extractive products typically go through several stages of expansion, stagnation, and decline (Homma

1992). The contraction of markets for extractive products typically happens because supplies are inelastic, because of overharvesting, because of the domestication of forest products, and because cheaper industrial substitutes are eventually developed. For instance, the production of rubber in West Africa and from extractive reserves in Brazil has been significantly undermined as a result of rubber production from plantations in southeast Asia (Richards 1993). The establishment of large plantations of Brazil nuts threatens to destroy this extractive industry in the Amazon (Mori 1992). Cheap substitutes for oil from babassu palm are pushing this product out of the market (May 1992). The market for gum Arabic from Sudan has dwindled first because of huge, government-sponsored export price increases and then because of the development of cheaper substitutes on international markets in response to these price increases (Larson and Bromley 1991).

The domestication of forest products features prominently among policies designed to encourage the adoption of agroforestry strategies. Commonly, it is argued that agroforestry or social forestry initiatives can reduce rates of deforestation by providing on-farm sources of forest resources which would otherwise be produced by forest clearance. There is little evidence for this: farmers' primary incentives for on-farm tree planting are to *mitigate* the effects of deforestation, and have little relationship to the process itself, which is primarily driven by demands for agricultural land. Agroforestry may *indirectly* reduce deforestation by increasing household income, thus reducing the need for agricultural expansion. But, as we have suggested,

on-farm tree planting may also undermine other policies intended to encourage forest conservation through the harvesting and marketing of extractive resources.

There are significant questions about whether or not markets for extractive NTTPs can ever be successful at conserving large areas of tropical forests (Browder 1992; Pendelton 1992). To start with, the most productive tropical forests for individual extractives are those with low biodiversity which are often manipulated by extractors to increase production. These are not the ones which, conservationists argue, need to be conserved. Extractives are unlikely to provide the sole source of income for rural people, and most will only produce an important supplement.

In this respect, then, markets for extractive NTTPs should be encouraged on forest margins—rather than in the forest itself. As with agroforestry, increased household production from these types of activities can indirectly reduce rates of deforestation by increasing the income of margin dwellers, reducing the incentive to clear new areas for cultivation. Browder (1992) suggests that there is a need to take a closer look at how extractive reserves operate in the first instance, who benefits from them, and how well they serve the goal of forest conservation.

A final argument against expanding markets for extractive NTTPs has to do with the impact of such initiatives on local economies. In his discussion about markets and local plants in Oaxaca, Martin (1992) points out that,

> **`Overexploitation is damaging not only to the local economy and ecology, but also to the culture and folk knowledge of the local people..**

> **When thinking of plants that may have an international market potential ... the fragrant flower of Quararibea funebris -[which is a component of the local drink *tejate*] comes to mind... If we were to promote its commercialization in the United States, would it and *tejate* still be found in marketplaces fifty years from now?... *Tejate* consumption might become a thing of the past... Local plants and diet are inextricably linked, and in many cases greater affluence has led to poorer nutrition for indigenous communities.' (Martin 1992, pp.220-221)**

The above discussion suggests that the environmental and socioeconomic benefits of NTTP market development are highly dependent on market characteristics. Region-specific market research is needed to determine appropriate policies towards expanded markets in these circumstances.

4. ENHANCING RURAL HOUSEHOLD WELFARE THROUGH PARTICIPATION IN NTTP MARKETS

While some policies toward markets for NTTPs may be influenced by conservation and economic development objectives, others are oriented toward improving rural household welfare. Welfare objectives feature strongly with regard to policies in support of the primary production of tree products through agroforestry, as well as in support of local management of woodlands and forests.

Policy interest in the links between rural households and NTTP markets stems from two motivations. First, there is concern for how specific interventions in NTTP supply, demand, or marketing systems will affect rural households. Second, policymakers may seek to identify policy instruments which will successfully promote smallholder involvement in NTTP markets, in order to expand sources of supply or address environmental concerns.

UNDERSTANDING THE ROLE AND EFFECTS OF NTTP MARKETS ON RURAL HOUSEHOLDS

There is a rich, and growing, literature on the subject of tree planting and forest and woodland management, and related policy issues, with regard to household welfare, broadly defined. Household uses of tree products, the contribution of trees to local environmental stability, the role of tree and forest products in household nutrition, urban and rural woodfuel use, and property rights and tenure regimes, are all subjects of extensive and ongoing research initiatives (cf. Fortmann 1985; Rocheleau 1989; Campbell *et al* 1991; Plotkin and Famolare 1992; Redford and Padoch 1992; Bradley and McNamara 1993). Very little of the literature, however, is specific to NTTP *markets* and their influence on household welfare.

NTTP markets can influence household welfare in various ways:

- ***improved livelihood security*, directly because of increased production and marketing of tree and forest-derived food, energy, construction and**

other products; and the development of tree assets that can be used to meet contingencies; and indirectly as a result of increased income;

- ***improved rural environment,* as NTTP markets make it economic for farmers to grow more trees and shrubs, and establish agroforestry and farm forestry systems on farms; and provide incentives to protect forests; and**
- ***increased rural employment and returns to labor,* by more actively involving farm and landless households in tree cultivation and management, or in small industries based on the use of NTTPs.**

<u>Livelihood Security and NTTP Markets</u>

The development of local markets for NTTP products is often seen as a way to increase availability and reduce risks in access to critical subsistence products, such as food, fuel, construction materials, medicines, while also providing income to local producers (Raintree and Francisco 1994). The actual effect of market development will depend on overall scarcity or abundance of naturally-growing and/or publicly available sources of supply in the area, and the integration with national markets for these products. Policy action can be used to overcome bottlenecks of information, infrastructure or inappropriate regulation in market development, but not basic conditions of supply and demand (Scherr 1992).

The design of market interventions also needs to consider the role of trees as farm or community savings and assets. For some products, accumulating physical volume because of tree growth translates directly into increased asset value. More often, markets are highly differentiated to reflect supplies and demands for different products in a tree's life cycle. For example, short rotation stick wood is often of high value on a cubic meter basis, while longer rotation pole wood and timber is of lower value.

Asset value can enable households to meet contingencies or can provide security to obtain loans (not entirely unlike the provision of goods by local traders against future production of NTTPs). In Ethiopia, for instance, an NGO, CARE, reports that it monitors activity in NTTP markets as a prefamine indicator, because households which are food insecure are more likely to sell forest and tree products. Chambers and Leach (1989) provide the most comprehensive overview of trees as contingencies, and find it a little researched but apparently common theme of rural tree management. In coastal areas of east Africa, for instance, they cite Parkin's (1972) study regarding the sale of palm trees to generate capital for marriages, funerals, or during illness. Caplan (1975) similarly recounts the sale of trees in Kenyan coastal areas during famine years as an important coping strategy. Hartmann and Boyce (1983) report the sale of farm trees in Bangladesh to generate cash in emergencies. In some instances, trees have been used as collateral to obtain credit. See Box 5.

One type of informal credit is the redeemable sale of crops or other assets. Sales are redeemable when the seller has the option of rendering the transaction reversible. The reversible aspect gives these transactions a `future' element, in addition to their `spot' characteristic. These types of transactions are seldom common when marketing arrangements are well-established, but appear with greater frequency for commodities which are irregularly sold.

In Murang'a District of Kenya, trees grown on farms are sometimes sold under this type of arrangement. Payment would be advance to a seller against standing trees when they were young, giving the buyer the right to harvest them whenever he wished, usually 7 or 8 years later. The seller could buy back the standing trees at any time, at current market prices for an agreed upon product mix. For the most common trees subject to this type of arrangement, Black Wattle (Acacia mearnsii), this would include charcoal, bark (for tanning extracts), building poles, fence posts, or any combination. Several entrepreneurs have further refined this type of sale. A number of agreements have been made with wattle producers that they will continue to maintain their woodlots in exchange for agreed upon annual payments (particularly in anticipation of higher urban charcoal prices). In most cases, annual payments have eliminated the redeemable feature of the sale.

When options for the development of formal credit mechanisms were being considered in the early 1950s in Kenya, trees were recognized as a possible form of security against loans. Wattle bark prices reached historic highs between 1948 and 1952, prompting the observation of a committee charged with exploring ways of providing credit that, `in high wattle areas ... a man's potential profit from the sale of his wattle bark could be considered to guarantee his loan.' During the land reforms of the early 1960s, lengthy schedules were prepared which determined how much land owners had to be compensated for trees transferred to other owners as a result of the consolidation of holdings.

Source: Dewees (1991)

NTTP Markets and Incentives for Environmental Protection

Agroforestry technologies are often promoted as approaches which can increase farm output, and improve farm and watershed environment, with low levels of inputs (cf. Swaminathan 1987, p.30). But in the face of the household's other constraints, agroforestry intercropping can be quite labor intensive if it is to yield the various benefits for which it has been promoted and for which management systems have been developed.

Partly because of this, markets for NTTPs have been increasingly promoted as a means for improving returns to household investments in agroforestry. A recent

review of the economics of agroforestry activities in Central America and the Caribbean, for instance, noted that farmers seldom viewed improved production of associated crops or environmental effects of the main benefits from tree planting, and far more often considered income potential from tree products to be important (Current *et al* 1996).

Indeed, in the absence of markets for NTTPs, depending on the technology, returns to tree planting can be quite poor. One of the more typical and widely promoted agroforestry technologies involves the planting of Leucaena leucocephala in rows between crops. In the usual management recommendation, Leucaena is intensively trimmed several times a year and leaves and trimmings are used as `green manure.' Yield increases of 20 to 150 percent have been reported, but at some considerable labor cost. A recent analysis of Leucaena intercropping in Malawi, for example, found that economic returns were consistently negative, even at low discount rates principally because of the intensity of management (Dewees 1995a).

In contrast, where other management regimes and objectives prevail, Leucaena can be lucrative. The cultivation of Leucaena has in fact long been considered a traditional farming practice in Malawi (Malindi 1977), particularly in the lower Shire valley, where Poulson (1981) reported widespread small-scale commercial production of Leucaena fodder. The point of comparing these practices is that returns to labor for Leucaena are dependent in large part on the intensity of, and on markets for, production. Where markets for fodder in Malawi can be assured, returns to labor are

relatively much higher than returns to labor for increased crop production. Similarly, as discussed in Section 3, the existence of forest-based NTTP markets can provide the incentives for private or community protection of forest resources.

Increased Rural Employment and Returns to Labor

Tree growing and forest management, to meet the demands of NTTP markets, are conventionally assumed to create jobs.

> **`... Social forestry can give rise to significant employment opportunities for farm families and the landless. These income-earning opportunities are not only in seedling production and in planting, tending, and harvesting trees, but also in complementary activities, such as processing and selling wood and other parts of the tree... In situations of high chronic unemployment, this aspect of social forestry can be critical in a strategy for sustainable development.' (Gregersen *et al* 1989)**

In terms of employment and income, the role of primary processing industries, and the distribution and sale of NTTPs in developing economies is also substantial. Arnold (1994) reviewed much of the literature on forest-based enterprises and concluded,

> **`In all developing countries, even those with little in the way of forest resources, small forest-based enterprise activities form one of the largest**

sources of rural nonfarm employment. Most such activity constitutes just one of several activities carried out by the household, part of a diversified livelihood system that enables them to adjust to seasonal or intermittent fluctuations in agricultural income.' (Arnold 1994, p. 23)

The converse, which is less commonly acknowledged, is that tree and forest-related activities can sometimes *contribute* to unemployment. Agricultural land which is planted with trees takes far less labor to cultivate and to manage than if it were planted with more labor intensive annual crops. When labor costs escalate there may be a significant incentive to plant land under trees (or to maintain land under forests instead of opening it to cultivation). Structural constraints which limit the efficient allocation of land and labor resources suggest a number of market failures, which are largely exogenous to the markets which can be influenced by natural resource and environmental policies.

Natural resource policies, including NTTP market promotion, almost never consider the structure and operation of markets for land and labor. Yet policies toward rural labor, land and capital markets, may have a greater impact on tree planting or forest management than natural resource or NTTP market policies *per se*.

For example, in efficiently operating markets, the use of land for growing lower-value trees on farms is less likely, as `surplus' land (defined as the land which a household is unable or unwilling to cultivate intensively because of capital or labor

constraints, or because the household's need for income are lower) can be sold or rented out. In practice, intergenerational concerns may limit the household's willingness to sell land which would otherwise be passed on to the next generation. Rental markets may be poorly developed because security of tenure to the original right holder may be jeopardized by renting out. All of these features of land use and tenure favor the planting of trees on land which households are otherwise unable to use instead of renting it out or selling it. Tree planting to meet NTTP market demands may be seen as a low cost, labor extensive means of keeping land productive.

PROMOTING SMALLHOLDER INVOLVEMENT IN NTTP MARKETS

Four main policy instruments have been used in the past to promote smallholder involvement in NTTP markets: provision of special lines of credit, technical extension, tenure reform, and promotion of local organizations which perform marketing functions. Experience and issues in each are discussed below.

Credit for NTTP Production

The development of special credit programs to promote NTTP production among smallholders has been justified on two grounds: either that customary arrangements are inadequate or of such high cost as to impose serious burdens upon households dependent on them, and/or that subsidized credit will help to establish an

"infant industry" activity among farmers unfamiliar with NTTP production or marketing.

Credit for Tree Planting

There are a growing number of examples of initiatives where credit has been provided specifically to plant trees to meet market demands.[8] The Paper Industries Corporation of the Philippines (PICOP), for example, provided credit to smallholders to plant stands of Albizia falcataria for pulpwood. Arguably, its success was more because of secure markets and good prices than it was because of the provision of credit (Hyman 1983a). PICOP was also successful because of its ability, albeit as a benevolent monopsonist, to explicitly provide credit for tree planting for a particular market -- *its* market. There was little risk of default in the absence of other markets for Albizia falcataria pulpwood in the project area, or as a result of falling prices from

[8] There are no cases which we could find in the literature where credit has been provided specifically to enable individuals to manage forests or woodlands. Management is often an *outcome* of small-scale industrial forest utilization, and credit might be provided through this channel, rather than for management *per se*.

overproduction (because it fundamentally *controlled* production).[9] Such a situation seldom obtains among more competitive and spatially-diffused NTTP markets.

Another initiative in the Philippines provided credit and extension advice to small farmers to grow trees to meet the demands of local markets for firewood for tobacco curing. In subsequent evaluations of the project, low levels of farmer participation were linked with deficiencies in the project's publicity, extension, and marketing programs on the grounds that they failed to address the farmers needs adequately (Hyman 1982). Closer examination, however, showed that the faults were more basic.

> **`The project had been intended to produce fuelwood for tobacco curing, yet no prior evaluation had been made of the real demand for this wood. In fact, farmers in the area had already planted a large number of woodlots on their smallholdings to supply this market, and were hesitant to change their successful management practices. The existence of these woodlots had largely gone unrecorded.' (FAO 1985, p.37).**

---

[9] There are similar models for providing credit for inputs through, for example, coffee cooperatives. Parastatal marketing boards sometimes operate as monopsonists through cooperatives, and try to ensure loan repayment by deducting loans from crop payments.

Wiersum and Veer (1983) noted that these woodlots appeared to be very productive. They usually consisted of mixed stands of Gliricidia sepium, which, planted on deep soils and coppiced yearly, have been shown to yield as much as 40 cubic meters per ha annually. Their point was that the provision of credit can have virtually no impact on production when supplies are already abundant.

While credit may not be necessary to encourage people to plant trees, it has in some instances, accelerated rates of planting. Current *et al* (1994) reported that in Hojancha, Costa Rica, credit was useful principally because it greatly accelerated rates of planting, thus increasing supplies for producers.

Ricardo Godoy (1992) has raised a number of objections to the idea that smallholders need formal credit before they will plant trees. He argues that smallholders have been able to adopt many new perennials without credit by integrating them into traditional farming practices. Despite the arguments of forestry policy analysts and planners, Godoy points out that many surveys confirm that farmers do not generally share the view that credit is a constraint to tree planting. Finally, he points out that smallholders have a high capacity for self-financing, and that the adoption of most major perennial crops has been accomplished without relying on credit.[10]

---

[10] For example, the spread of smallholder tea in Kenya since 1968 has been accomplished without significant reliance on credit, after a change in planting practice from stump to vegetative propagation. Similarly, the adoption of cocoa in Ghana took place without a reliance on formal credit. Godoy (1992) particularly emphasizes the responsiveness of smallholders to producer prices.

There are indeed many instances where trees have been readily and widely adopted as a farm crop in the absence of credit, rather than as an outcome of its provision. If we accept this view, the need for credit then becomes most evident when markets have failed for one reason or another. Where markets for capital are constrained, or have not captured the positive externalities associated with tree planting, there may be scope for providing credit (subsidized or not) or for other forms of subsidies. Experience advises significant caution in implementing either of these approaches.

Credit for Harvesting

Credit may be far more necessary for *harvesting* tree products, than for planting trees. This was one area where PICOP was especially successful. The original plan was to stagger plantings so that supplies would be uniform from year to year. The scheme, however, was so popular, that most of the farmers involved planted all their property in the first year or so. Labor for harvesting an entire stand had to be hired, and finance to do so was a critical constraint. The strength of the credit program was that it was flexible enough to target the timing of loan disbursal to reflect the timing of capital and labor requirements for harvesting (Hyman 1983a).

The provision of credit in advance of harvesting is a recurrent feature of informal lending arrangements. In Sudan, for instance, one of the most significant constraints to harvesting gum Arabic from sometimes remote, naturally occurring stands

of Acacia Senegal, is water. Gum tappers will often negotiate a loan to pay for water transport with *sheil* merchants, against future production of crops, as well as gum Arabic. *Sheil* merchants charge high rates of interest, reportedly between 60 and 200 percent annually (Wilmington 1980; van Dooren 1990). Because of this, the parastatal Gum Arabic Corporation (GAC) sought to improve credit terms by finding ways of bypassing local *sheil* merchants, and providing credit directly to gum harvesters. Kevane (1993) points out, however, that rural credit markets in Sudan rely on the complexities of Islamic law, kinship relations, and the willingness and ability of *sheil* merchants to accept risk in the marketplace. Arguably, returns to *sheil* lending are in line with the returns to capital a merchant might expect to see by investing in his own business. Such programs as the GAC's attempts at rural credit reform can lead to

> **`... hurried, expensive, overextended, and ultimately ill-conceived credit programs that amount to little more than one-time subsidies to select groups of farmers -- those who are most able to take advantage of the subsidies as a result of wealth or political connections.' (Kevane 1993, p.530)**

In the Amazon, informal credit against the production of NTTPs, mainly rubber and Brazil nuts, is widely extended through the *aviamento* system. A highly regressive system, it links rubber tappers to the market through rubber merchants or other owners of rubber trails (*patraos*). The *patrao* provides food and supplies on credit

against production of rubber, often keeping tappers in a state of perpetual debt. The system has been most effective where rubber trails are remote and where there is no alternative access to inputs (Richards 1993). Similarly, in the rattan market in Indonesia, traditional marketing arrangements relied on ties of debt and patronage between collectors and rural traders. As remote areas have opened up through improved transport, this system has broken down (Peluso 1992).

A common element of all of these systems linking credit with the harvesting of NTTPs, is that they depend to varying degrees on monopsonistic arrangements between rural traders on the one hand, and collectors and producers on the other. These arrangements are partly a function of poor infrastructure and communications. This is an important finding for programs which seek to provide or introduce credit to encourage production for the market.

<u>Extension Services for NTTP Producers</u>

Public and NGO-sponsored extension services are an increasingly common policy instrument to promote smallholder integration into NTTP markets. Such programs focus on introducing new production techniques or planting materials; educating farmers about market opportunities; and sometimes assisting in local organization for marketing activities. We will not review here the burgeoning literature on forestry and agroforestry extension, but it should be noted that well-run extension programs do appear to be an effective means to integrate poorer rural

producers into newly developing NTTP markets, or in the transition from collection to production as the principal source of supply.

Strengthening Tenure Rights of NTTP Producers

As discussed briefly in Section 2, household incentives to become involved in NTTP production for the market depend upon secure access to natural sources of supply, or to the land for tree production. In the latter case, long-term rights are needed for the establishment and maintenance of perennial tree species, particularly those with medium- to long-term production cycles. Even on privatized farmland, for example, the terms of rental agreement may preclude tree husbandry, or restrict renters' harvest of products from standing trees. We will not discuss here the extensive literature on property rights in farming, or farmland titling as a policy to promote NTTP production (although this has been done mainly in areas of high-value export tree crops). The design of tenure policy over forest and woodland, however, has had significant effects on NTTP market organization and function and will be briefly addressed here.

The state typically has had the most dealings with timber and wildlife interests in terms of assigning the right to use NTTPs from state lands to institutions other than itself. While there are sometimes arrangements made which allow people living in peripheral areas around state lands to engage in the nondestructive extraction of NTTPs, it is far less common to find these arrangements so extensive as to allow

commercial exploitation. Similarly, large scale commercial farmers more commonly seek to exclude anyone who represents a threat to their long term rights as landowners and see the collection and sale of NTTPs from their land as `poaching.' Finally, local authorities sometimes retain rights to revenues from forest or woodland exploitation on customary lands, even if trees are found growing on land which has been allocated to a household.

In some instances, the state maintains that it has the sole right to revenues from any trees growing on any land. This has resulted in the creation of large and expensive bureaucracies devoted to licensing, revenue collection, and regulation. Resource constraints prevent these bureaucracies from operating effectively. Even if they were able effectively to do their job, it would drive NTTP markets underground, and reduce any

Saxena (1992) considered the economics of eucalyptus production in Uttar Pradesh in India, which became an enormously popular land-use in the mid-1980s. He found that eucalyptus cultivation and management required relatively little labor, taking 50 to 70 man-days of labor per ha annually, compared with 250 to 300 man-days of labor per ha, annually, for annual crops. Households which planted eucalyptus were more likely to be experiencing considerable labor constraints. These were primarily absentee landowners, and households which operated large holdings, both of which were constrained from supervising a large labor force for cultivating annual crops. In the face of these types of labor constraints, the highest returns to labor and to agricultural land were for eucalyptus planted for eventual sale in NTTP markets.

interests user groups might have in long-term sustainable forest management.

Between 1981 and 1988, farmers in India were reported to have planted around 8.6 *billion* trees on private lands, covering around 2.5 million ha. Farmers anticipated huge profits because of a widespread perception of serious shortages of woodfuel and of other types of wood (Bowonder *et al* 1988). The promise of the market failed, in the end, to provide the riches the vast number of tree farmers had anticipated. Prices for fuelwood began falling by the mid-1980s, as early producers started selling on the market. Overproduction, combined with a number of other factors, caused the market to collapse in many areas.

A similar study in Kenya evaluated the household labor characteristics of black wattle (Acacia mearnsii) woodlot planters in Murang'a District (Dewees 1991, 1993). Wattle first came to be widely planted in Kenya in the 1940s. Grown on a relatively short 8 year rotation, its bark was sold for tannin extraction and the wood would be sold as firewood or poles, or converted into charcoal. The contemporary situation is quite complex, but is consistent with the view that woodlot growing households are more inclined to manage their holding extensively, partly because of labor constraints. The likelihood a household will establish a woodlot increases as the household ages. The labor constraint develops because older households have fewer residents, and a smaller labor pool on which to draw (as children age, they marry and move off the farm). There are also fewer *needs* for intensively cultivating a holding, because capital requirements of older households are lower.

A final point has to do with the quality of the land endowment. Woodlot growing households in Kenya were found to operate holdings which, in general, were significantly steeper than other holdings. The labor intensity of cultivating tea, for instance, on a steeply sloping parcel, is considerably greater than on a more level parcel. This fact, coupled with the labor composition of these households, provided an even greater incentive for adopting a labor extensive land use on steeply sloping parcels.

The clearest conflicts over the right to use forest resources have arisen when different user groups have placed claims on forests or on the land on which they are found. The right to market NTTPs often features prominently in these conflicts. The most obvious conflicts are found between governments and the people living in, or adjacent to, state-owned forests. They are also found between long-term residents and more recent settlers, between households in customary lands and local councils, and between residents of different communities dependent on the same resource. `Resource sharing' is the term which is increasingly being used to describe the resolution of these conflicts by developing management strategies where all user groups can benefit, and where specific rights to harvest and market NTTPs have been allocated.

Forest reserves and national parks are almost universally places where local people attempt to exercise rights of use, despite the state's statutory claim to the land and the trees. State forests are often surrounded by heavily settled areas, and conflicts usually arise between the state and local people who have encroached into the forests

for a variety of reasons, such as for hunting, the unlicensed grazing of cattle, NTTP collection and sale, and the clearance of trees for cultivation.

Forced evictions and criminalization of people who use and sell NTTPs collected from state lands have increased local and political support for the redistribution of state lands. Governments, in an increasingly defensive position, are now experimenting with programs of "resource"-sharing, allocating long-term usufruct and harvest rights to local communities in exchange for a commitment to "sustainable" management, and/or protection from outsiders' poaching or forest clearance (for example, new community forestry programs in northern and central Honduras).

There are, however, real constraints to giving communities or individuals control over the management of forest resources. These constraints are firmly rooted in legislation, land usage rules, and other practices and policies. While legislation may recognize the rights of people living in customary lands to use NTTPs, they are usually not allowed to use products which someone else has been licensed to exploit, to use `reserved' trees, or to sell anything collected from protected areas. Strategies for resource sharing in customary lands must focus on finding ways for the benefits of forest use to be returned to the communities responsible for their management. This applies to the exploitation of commercial timber species, as well as to the other NTTPs which may be sold, or on which households are otherwise dependent.

Because much customary land in developing economies is held communally (at least in theory) the idea that common property regimes can be used to manage

communally-held forests has much appeal. Experience has been mixed. Far less active strategies may be more effective, particularly in areas of long settlement (cf. Fairhead and Leach 1993a, 1993b). It can be very difficult to bring about the conditions for effective common property management, especially when markets for NTTPs increase differentiation among user groups.

Local Organization for NTTP Management and Marketing

Management of community forest-based NTTP resources, NTTP marketing efforts, and other smallholder NTTP market-related activities may call for cooperative group efforts. Governments and NGOs have, in a number of places (for example, several agroforestry projects described in Current, *et al*. 1996), worked to organize or strengthen local organizations for smallholder involvement in NTTP markets.

The effectiveness of such organizations is influenced by the quality of internal management and governance, government recognition and support (for example, in honoring resource-sharing agreements, or protecting community tenure rights for NTTP supply), mechanisms for natural resource management and investment, and the degree of risk and uncertainty in the NTTP markets themselves. Local organizations which produce for specialized export markets may become critically dependent upon personal contacts with project staff who locate and make commercial arrangements with buyers. Considerable research remains to be done, to assess the conditions under

which community-based smallholder organizations can successfully manage NTTP marketing tasks.

5. FACILITATING THE OPERATION OF NTTP MARKETS FOR LOCAL AND REGIONAL ECONOMIC DEVELOPMENT

Rapid urbanization, and development of the formal and informal sectors in developing economies have both strongly contributed to the development of market demand for NTTPs. In many instances, the emergence and development of these markets has had significant impacts on local production systems, as well as on shortages of supplies and higher prices in traditional markets. Governments have a number of interests in improving the operation of the marketing system. These include,

- **avoiding politically volatile scarcities of NTTPs or higher prices for basic goods in the urban sector;**
- **removing constraints to industrial growth because of raw material scarcities;**
- **generating rural and urban employment as an element of a broader growth strategy; and**
- **promoting new sources of economic growth, by adding value to primary products, identifying new groups of potential consumers, or generating new types of demand for existing products or tree species.**

Policy measures which have been taken to address these objectives fall into two major groups: promoting new NTTP markets, and improving market efficiency. We should add that the other major policy objectives discussed in Sections 3 and 4, forest conservation and household welfare, can also be supported under particular circumstances when markets are developed and promoted. Because of this, efforts to improve the operation of markets are most likely to achieve the broadest range of complementary policy objectives. Policy instruments and key policy concerns relating to these measures are discussed in this section.

PROMOTING NEW MARKETS FOR NTTPS

Policies to promote new non-timber tree products, as well as processing industries based around them, have generally had one or more of three objectives: firstly, promoting or developing demand for new products; secondly, encouraging the creation of new sources of supply as these demands develop, and; thirdly, establishing a supportive institutional framework for new market development. Government intervention in these areas is typically justified using arguments in favor of "infant industries."

Developing Demand for New Products

Ethnobotanists have contributed importantly to identifying the untapped potentials of new tree products. There is indeed an extraordinary range of food, fiber, fodder, medicinal, chemical, and other products already found in local markets, and clear potential for dramatic increases in yield, quality, stability and consistency, using existing techniques for germplasm improvement (Cannell 1989; Leakey and Newton 1994). The question is rather one of where to allocate scarce research and development resources.

In the past, priorities were often set according to scientists' views of biological potential. Technical experts have been increasingly persuaded by people in the private sector, as well as by economists, to set research priorities to reflect market potential. Considerable market research is underway to examine the nature of demand for tree products. Much work has been carried out on urban woodfuel markets, but the potential of other tree products in the marketplace is far less clearly understood.

There are efforts underway to identify quality, production and processing characteristics required for successful entry of new NTTPs into existing markets for substitute goods (for example, Sangkul 1994). Market analyses for small-scale tree production are also being undertaken for specific regions, to guide the thrust of development activities (for example, Carandong 1994). At the same time, farmers in areas which are already producing certain NTTPs for local markets, are seeking to investigate opportunities for larger scale marketing.[11] In general, these types of analy-

---

[11] **See particularly, papers presented in, Raintree and Francisco (1994).**

sis can be used to identify areas for priority investment in production, post-harvest processing, and marketing, as well as the role of farmers' organizations, NGOs, and public agencies.

Encouraging the Development of New Sources of Supply

Policymakers may also be concerned about increasing supplies of NTTPs to meet new or growing demands. A number of outgrower schemes for NTTP products have been well-documented. These often operate in a manner which is similar to outgrower schemes which were developed in support of markets for some of the more traditional export crops, such as rubber, palm oil, coffee and tea. In many cases, these systems have only been effective when trees have been planted in large blocks, or when there have been monopsony buyers although there has been increasing experiences with commercial production from agroforestry systems.

As we suggested in the previous section, the provision of timely credit facilities may play an important role, especially in conjunction with other inputs, in encouraging people to increase supplies of tree products. Ghosh (1994) described a private sector initiative to promote wood supplies in north India. This successful plantation scheme integrated several key features which included the provision of bank credit to farmers who participated in the agroforestry scheme. The private sector played a critical role, providing extension services, fast growing species of improved genetic stock, and guaranteeing floor prices. The private sector also assisted farmers in applying for bank

loans. While farmers were free to sell production to any buyer, in practice, the scheme was successful because of the monopsony position of the main agent.

The development of supplies of NTTPs to meet dispersed market demands has been less well-documented. Mussak and Laarman (1989) identified key factors which constrained farmers with merchantable stocks of trees, growing in and around their fields, from participating in timber markets. These constraints included the potential for damage to intercropped cash crops during harvest; perceived incompatibilities with current farming practices; inadequate methods of grading and pricing farm trees; and insufficient knowledge about the market on the part of farmers and agricultural extension workers.

On-farm trees in Pakistan are providing the main sources of supply of wood to meet industrial demands (Leach 1993; Hatch and Naughton 1994). Returns to investments in farm forestry could be increased if the industry were brought more actively into the production process, and particularly if user-producer linkages were strengthened. NGOs could play an important strategic role in encouraging collaboration between producers and the industry.

Much of this discussion has focused on the production of NTTPs from trees in plantations or on-farms. There is a considerably less well developed understanding of the scope for improving supplies of NTTPs from forests and woodlands. Most silvicultural research is geared toward to the production of timber, rather than more broadly-defined NTTPs. The most critical and important changes in systems of

production have involved broadening the management system to include people living in the forest and on the periphery. As we suggested in Sections 3 and 4 of this paper, this type of management requires significant institutional and tenure reforms.

Providing a Good Institutional Base for NTTP Market Development

The role of the state in NTTP market development does not only, or perhaps even primarily, lie with interventions in pricing, marketing, or transport. A fundamental role of the state, in all types of marketing systems, involves the establishment of the basic institutional framework within which open markets function.

In developing economies, this role is especially critical. The basic institutional framework includes the establishment of quality standards, standard measures and descriptions for products, market information systems which are publicly accessible, and legal systems for the legitimate and timely resolution of contractual conflicts. For many NTTPs, particularly those newly entering national or international trading systems, investments in institutional development by the state are a prerequisite for the effective development of private marketing systems. Recognizing this, dialogue at the national, regional, and international levels has accelerated in order to identify priority issues with regard to NTTP markets and to develop plans for their implementing programs for market development (FAO 1995; Spears *et al* 1994).

IMPROVING MARKET EFFICIENCY

For NTTP markets which are already well-established, policy interventions may instead focus on improving marketing efficiency, often to reduce product prices or to improve social equity. Key strategies have been to reduce marketing costs, to improve market information systems, and to support small-scale tree and forest- product processing industries.

Reducing Marketing Costs

Some of the most common interventions in NTTP markets have been highly restrictive ones aimed at traders and middlemen blamed for high consumer prices, low producer prices, and product scarcities. The formation of parastatals and marketing boards to replace the middleman was a common practice. In Sudan, for instance, the parastatal Gum Arabic Corporation was established partly with this objective in mind. More often, governments found that the ability to outlaw all other trade in tree products, except that managed by the government, was a highly lucrative means of generating additional revenues for the state.

Careful market research has increasingly challenged the view that middlemen have been highly exploitative. Saxena (1994), for example, examined margins for merchants involved in the eucalyptus pole trade in India, and found that they were comparable with other crops. Principal constraints to market development were related to commercial interests and the monopoly position of the state as a major producer of industrial timber.

After reviewing a series of case studies about the Asian experience with NTTP market development, Raintree and Francisco (1994) concluded that,

> **"... The myth of the `evil middleman' was called into question by one case study after another in which an empirical analysis of the actual marketing costs and margins showed that middlemen often perform necessary marketing services that cannot easily or efficiently be performed by the producers themselves. The social-embeddedness of many rural middlemen was contrasted with the aloofness of government marketing agencies, and the role of the middleman as a foil to the obstacles of corrupt policemen and other highwaymen was noted. What this shows is not that exploitation by middlemen does not exist, but that such exploitation cannot be simply assumed without a careful analysis of marketing services and margins."**

Where the `evil middleman' is not the principal constraint to effective market function, alternative investments may be needed in transport and communications infrastructure in order to reduce marketing costs. These investments are seldom made *specifically* to improve the market for NTTPs, but are rather a feature of more general improvements in rural infrastructure. Nonetheless, their impact on the operation of NTTP markets in terms of reducing transportation costs, for instance, can be very significant.

Market Information Systems

The development of good market information systems is an extremely useful means of improving market integration and efficiency. The National Wastelands Development Board of India is setting up a scheme to improve market intelligence related to NTTPs, utilizing All-India Radio, television, newspapers, and state marketing boards. Issar (1994) identified key problems which must be resolved in establishing such services, including choice of priority tree species, standardized measures of the product whose prices will be described, identification of the most important marketplaces, mechanisms for regular supply of information from the markets, and estimates of the size of the population interested in market information.

Community-based market information systems are also under development in the Philippines. Simple surveys and other tools are used by villagers to carry out an initial assessment of market information needs, local sources of market information, and the potential for institutionalization. Complementary components include the provision of training in marketing for government and non-government extension workers, village-level training in marketing, and technologies for harvest, storage, and transport reflecting market needs.

There are a number of arguments in favor of institutionalizing marketing services through existing forestry and agriculture extension services. Such a process would allow smallholders to establish more effective links with agribusinesses

(Pabuayon 1994). These services could include the provision of market and price information, assistance in obtaining credit, promoting systems of production and marketing which are consistent with stabilizing supplies and prices, delivering post-production technologies to farmers or others interested in processing NTTPs for the market, and assistance in organizing farmer groups and cooperatives for collective marketing of farm produce.

Support for Small-Scale Tree and Forest-Based Industries

Finding ways to explicitly encourage small-scale NTTP-based industries has been especially challenging. Much industrial policy in developing economies is geared toward larger scale firms. Bureaucracies are seldom capable of handling small-scale demands for financial and managerial inputs, and there is an in-built bias against small firms. Arnold (1994) points out that the primary constraints of small-scale forest and tree based industries are related to finance and to supplies of raw materials.

If this is indeed the case, then support for the development of small-scale NTTP based enterprises needs to be channeled through institutions which are better able to meet their financial, technical, and supply needs. Much support could be channeled, for instance, through organizations which were established to support small-scale enterprises more generally.

There are very few instances where government intervention has specifically sought to support small-scale forest and tree based enterprises. Tenure reform

(discussed in previous sections) has in many instances been absolutely crucial for guaranteeing raw material supplies. More often, interventions succeed more in removing control and income from primary producers (as with rattan production in Indonesia). Licensing and training people in improved harvesting practices for extracting allspice and *xate* (an ornamental palm used in the floral industry) in Guatemala have been proposed as a means for limiting overharvesting and ensuring future supplies (Nations 1992). The formation of rubber tappers' producer cooperatives has been a partly effective means of channeling support toward the conservation of extractive reserves in Brazil. The active involvement and support of NGOs has encouraged governments to back intensive conservation and management programs such as the Chimane Conservation Program in Bolivia, and the Rio Bravo Conservation and Management area in Belize (Dudley 1992; Burley 1992).

The focus of these initiatives has primarily been on building *institutional structures*, and has not been specifically oriented toward the market. This, in itself, is an important observation in that it suggests reform in these areas may be more successful than initiatives which are geared toward specific market interventions.

Finally, there are legitimate concerns about the impact of market development on the resource base. It has been repeatedly shown that, despite the potential for increasing income and employment through these markets, sound mechanisms have to be in place which will prevent overexploitation and degradation. Policy initiatives

which are designed to improve market efficiency and to increase demands for NTTPs must be developed closely in conjunction with the means for better management.

6. SUMMARY AND CONCLUSIONS: PRIORITIES FOR NTTP MARKET RESEARCH IN AN ERA OF TRANSITIONS

This paper has sought to explore the operation and function of non-timber tree product markets from the perspective of policy. We have argued that NTTP market research has had a low priority among policy makers, that much has been poorly targeted or poorly carried out, and has been inadequate for substantively addressing policy concerns. We further argue that use of market research in the policy process has been limited because governments often view NTTP markets as a threat to the conservation and management of forests and woodlands, because these markets are highly heterogenous and difficult to characterize, and because there has been a failure to link the findings from market studies with the potential for policy change.

A range of policy objectives related to natural resources, agriculture, economic development, and household welfare can be affected to varying degrees by the operation of NTTP markets, and explain why governments intervene in them. These generally fall into three categories. Policies may seek to bring about the conservation of tropical forests either by restricting their use, by encouraging sustainable management for the market, or by shifting NTTP production from forest to farm. Policies may be directed toward improving household welfare, for example, by

increasing income and employment, by improving the productivity of marginal lands, or by promoting environmental stabilization, all as a result of working with NTTP markets. Finally, policies may be oriented to support growth and market development at the local, regional and national levels, for instance, by providing incentives to adopt NTTP production systems in support of markets, developing new markets for NTTPs, and improving the efficiency and operation of existing markets.

Market-related research which is strategically designed to find ways of meeting these policy objectives is a significant priority (Scherr and Dewees 1994). In the area of *forest conservation and management,* research with a strong policy content should be oriented toward a number of specific areas. Policies could be better informed if we know:

- **who is actually using and marketing NTTPs from forests and woodlands, for what purposes, and through what different marketing channels;**
- **what property rights regimes prevail in particular areas, and how primary suppliers fit into these regimes;**
- **how market participation actually affects forest management, and what are the likely effects of changes in product prices or of changes in marketing arrangements;**
- **what are the primary competing sources of supply, and how these supplies will similarly be affected by price changes;**
- **what are the potential substitutes for NTTPs;**

- **to what extent new markets are likely to be captured by local people, new residents, or people from outside the area.**

With regard to NTTP market policies oriented toward addressing *household welfare objectives*, research should carefully consider,

- **what is the likely impact of factor availability on the ability of households to enter into NTTP markets;**
- **what components of a market development strategy are needed to ensure the more active involvement of the rural and urban poor;**
- **in terms of targeting specific markets for production from particular types of strategies, what is the role of joint products in encouraging their adoption (for example, what are the respective roles of income generation and the improvement of soil fertility in encouraging households to adopt agroforestry strategies);**
- **what elements of factor availability have strong seasonal dimensions; how do NTTP markets respond as a result;**
- **how involvement in production of NTTPs for the market improves or worsens food security;**
- **whether trees are recognized as household assets which can be used to generate capital;**

- **how risky it is for farmers to become involved in the production of NTTPs for the market; what is the wider role of risk aversion in terms of the household's productive strategies;**
- **whether tenure rights to land and tree resources are secure; and if not, how could they be clarified or made more secure;**
- **whether local institutions have the capacity to manage, plan, tree resources in a way which enables them to become more involved in market development.**

To address policy objectives with regard to facilitating the operation of NTTP markets for *local and regional economic development,* market research can help by investigating:

- **existing market structures, which reflect the role of different sources of supplies, marketing channels, and sources of demand;**
- **the extent to which production, distribution, and marketing are vertically integrated, that is, controlled by single or by multiple entrepreneurs;**
- **how demands for NTTPs might change, in the face of changing tastes, the availability of substitutes, and so on;**
- **what is the structure of competition, and where competitive advantage lies;**

- **what is the spatial distribution of competitors;**
- **what opportunities there are for the development of local processing capacity and for adding value;**
- **to what extent market development is constrained by infrastructure, prices, or institutional factors;**
- **what would be needed to broaden the market from the local or regional level to the national level;**
- **what are the key marketing links between producers and the retailers, and how marketing costs could be reduced in a way which reduces the delivered price;**
- **what is the role of quality control, and how these types of measures could be introduced;**
- **how accelerated market development can best be complemented by improved resource management, in a way which will limit the risk of overexploitation.**

If policymakers are to respond effectively to the on-going transitions in tree product supply and demand described in Section 1, they require much more systematically available information about markets and the changes that are occurring. They must also learn to use this information more effectively in the decision making process.

This link, between market information and the development of policy toward the operation of NTTP markets, poses perhaps the most considerable challenge for market research. Increasingly, market researchers must be brought into the policymaking process. In particular, market analysts must be encouraged to continually stretch their conceptual framework, to expand the ways of collecting relevant data, to broaden their use of analytical methods, and to consider more carefully the critical links between markets, the environment, household production, and human welfare.

REFERENCES

Arnold, J.E.M. 1994. ***Nonfarm employment in small-scale forest-based enterprises: Policy and environmental issues*****. EPAT/MUCIA Working Paper No.11. Madison: University of Wisconsin.**

Arnold, J.E.M., and W. C Stewart. 1991. ***Common property resource management in India*****. Tropical Forestry Paper No.24. Oxford: Oxford Forestry Institute.**

Beer, J.H. de, and M. J. McDermott. 1989. ***The economic value of non-timber forest products in southeast Asia, with emphasis on Indonesia, Malaysia and Thailand*****. Amsterdam: International Union for the Conservation of Nature.**

Bowonder, B., S.S.R. Prasad, and N.V.M. Unni. 1988. Dynamics of fuelwood prices in India: Policy implications. ***World Development*** **16(10):1213-1229.**

Bradley, P.N., and P.A. Dewees. 1993. Indigenous woodlands, agricultural production and household economy in the communal areas. In ***Living with trees: Policies for forestry management in Zimbabwe,*** **Technical Paper No.210, ed. P.N. Bradley and K. McNamara, 63-137. Washington, D.C.: World Bank.**

Bradley, P.N., and K. McNamara, ed. 1993. ***Living with trees. Policies for forestry management in Zimbabwe*****. Technical Paper No.210. Washington, D.C.: World Bank.**

Bromley, D.W., and M. M. Cernea. 1989. ***The management of common property natural resources: Some conceptual and operational fallacies*****. World Bank Discussion Papers, No.57. Washington, D.C.: World Bank.**

Browder, J.O. 1992. The limits of extractivism: Tropical forest strategies beyond extractive reserves. ***Bio Science*** **42(3): 174-182.**

Buren, A. van. 1990. The woodfuel market in Nicaragua. The economics, sociology, and management of a natural energy resource. ***Latin American Studies*** **52.**

Burley, F.W. 1992. The Río Bravo Conservation and Management Area of Belize. In ***Conservation of neotropical forests,*** **ed. K.H. Redford and C. Padoch, 220-227. New York: Columbia University Press.**

Cannell, M. G. R. 1989. Food crop potential of tropical trees. ***Experimental Agriculture*** **25:313-326.**

Campbell, B.M., S.J. Vermeulen, and T. Lynam. 1991. ***Value of trees in the small-scale farming sector of Zimbabwe*****. Ottawa: International Development Research Center.**

Cannell, M.G.R. 1989. Food crop potential of tropical trees. ***Experimental Agriculture*** **25: 313-326.**

Caplan, A.P. 1975. ***Choice and constraint in a Swahili community: Property, hierarchy, and cognatic descent on the East African Coast.*** **Oxford: Oxford University Press.**

Carandong, A. P. 1994. Market analysis for small-scale MPTS production. In ***Marketing of multipurpose tree products in Asia,*** **ed. J. B. Raintree and H. A. Francisco, 23-28. Proceedings of an international workshop, Baguio City, Philippines, December 6-9 1993. Bangkok: Winrock International.**

Chambers, R., and M. Leach. 1989. Trees as savings and security for the rural poor. ***World Development*** **17(3):329-342.**

Chandra, N.S., and M. Poffenberger. 1989. Community forest management in West Bengal: FPC case studies. In ***Forest regeneration through community protection*** **proceedings of the working group meeting on Forest Protection Committees, Calcutta, June 21-22 1989, ed. K. C. Malhotra and M. Poffenberger, 22-46. Calcutta: West Bengal Forest Department.**

Clay, J. W. 1988. Indigenous peoples and tropical forests. Models of land use and management from Latin America. ***Cultural Survival Report*** **27.**

_____. 1992. Buying in the forests: A new program to market sustainably collected tropical forest products protects forests and forest residents. In ***Conservation of neotropical forests,*** **ed. K. H. Redford and C. Padoch, 400-415. New York: Columbia University Press.**

Conway, F. J. 1979. A study of the fuelwood situation in Haiti. Unpublished report to the United States Agency for International Development. USAID, Port au Prince.

Current, D., E. Lutz, and S. Scherr. 1995. ***Farmer adoption and economic benefits of agroforestry: Project experience in Central America and the Caribbean.*** **Environment Paper No. 14. Washington, D.C.: World Bank.**

Dewees, P.A. 1991. *The impact of capital and labour availability on smallholder tree growing in Kenya*. Unpublished D. PHIL. thesis. Oxford: University of Oxford.

_____. 1993. *Trees, land, and labor*. Environment Paper No.4. Washington, D.C.: World Bank.

_____. 1995a. Trees on farms in Malawi: Private investment, public policy, and farmer choice. *World Development.* Accepted for publication.

_____. 1995b. Forestry policy and woodfuel markets in Malawi. *Natural Resources Forum*. Accepted for publication.

Dewees, P., and W. Floor. 1994. Environmental externalities associated with woodfuel production and the role of market intervention: Lessons from the Malawi and Niger woodfuel energy projects. Paper presented at the Non-Timber Tree Product Market Research in Annapolis, Maryland, December 12-14. International Food Policy Research Institute, Washington, D.C.

Dixon, J. 1994. Methods for assessing environmental externalities in NTTP production and their policy implications. Paper presented at the Non-Timber Tree Product Market Research in Annapolis, Maryland, December 12-14. International Food Policy Research Institute, Washington, D.C.

Dooren, P. J. van 1990. Partnership contracts as an alternative to falling agricultural credit? Sudan's rural credit experience. *Africa Insight* 20(2):87-92.

Dove, M. R. 1994. Marketing the rainforest: `Green' panacea or red herring? *Asia Pacific Issues* 13. East-West Center.

Dudley, L. C. C. 1992. The Chimane conservation program in Beni, Bolivia: An effort for local participation. In *Conservation of neotropical forests*, ed. K. H. REDFORD and C. PADOCH, 228-244. New York: Columbia University Press.

Dunkerly, J., and K. N. Gopi. 1985. Fuelwood markets in Hyderabad. In *Agricultural markets in the semi-arid tropics.* 109-118. Proceedings of an international workshop held at ICRISAT, 24-28 October 1983. Patancheru (India): International Crops Research Institute for the Semi-Arid Tropics.

Energy Studies Unit. 1981. *Malawi rural energy survey*. Lilongwe: Energy Unit, Ministry of Agriculture.

Fairhead, J., and M. Leach. 1993a. ***Contested forests: Modern conservation and historical land use of Guinea's Ziama Reserve.*** **Working Paper 7. Conakry, Guinée: Connaissance et Organization Locales Agro-ecologiques.**

_____. 1993b. ***Degrading people? The misuse of history in Guinea's environmental policy*****. Paper presented at the African Studies Association meetings, Boston, December.**

Faki Ali, G. el 1985. ***Charcoal marketing and production economics in Blue Nile.*** **Khartoum: National Council for Research (Energy Research Council).**

Falconer, J. 1990. ***The major significance of `minor' forest products: The local use and value of forests in the West African humid forest zone.*** **Community Forestry Note 6. Rome: Food and Agriculture Organization of the United Nations.**

FAO (Food and Agriculture Organization of the United Nations). 1985. ***Tree growing by rural people*****. Forestry Paper No.64. Rome: FAO.**

_____. 1995. Report of the International Expert Consultation on Non-Wood Forest Products, Yogyakarta, Indonesia, 17-27 January. Rome: FAO.

Fortmann, L. 1985. The tree tenure factor in agroforestry with particular reference to Africa. ***Agroforestry Systems*** **2:253-72.**

Ghosh, S. 1994. WIMCO's experience with smallholder produce marketing systems. In, ***Marketing of multipurpose tree products in Asia,*** **ed. J. B. Raintree and H. A. Francisco, 179-184. Proceedings of an international workshop, Baguio City, Philippines, December 6-9 1993. Bangkok: Winrock International.**

Godoy, R. 1992. Determinants of smallholder commercial tree cultivation. ***World Development*** **20(5):713-725.**

Gregersen, H., S. Draper,, and D. Elz. ed. 1989. ***People and trees: The role of social forestry in sustainable development.*** **Washington, D.C.: Economic Development Institute of the World Bank.**

Gregersen, H., P. Oram, and J. Spears. 1992. ***Priorities for forestry and agroforestry policy research*****. Washington, D.C.: International Food Policy Research Institute.**

Hatch, C.R., and G. G. Naughton. 1994. Using industrial wood markets to sustain farm forestry: the Pakistan experience. In ***Marketing of multipurpose tree***

***products in Asia*, ed. J. B. Raintree and H. A. Francisco, 169-178. Proceedings of an international workshop, Baguio City, Philippines, December 6-9 1993. Bangkok: Winrock International.**

Hartmann, B., and J. K. Boyce. 1983. *A quiet violence: View from a Bangladesh village*. London: Zed Press.

Hecht, S.B. 1992. Valuing land uses in Amazonia: Colonist agriculture, cattle, and petty extraction in comparative perspective. In *Conservation of neotropical forests*, ed. K. H. REDFORD and C. PADOCH, 379-399. New York: Columbia University Press.

Hecht, S.B., A. B. Anderson, and P.H. May. 1988. The subsidy from nature: Shifting cultivation, successional palm forests, and rural development. *Human Organization* 47(1):25-35.

Homma, A. K. O. 1992. The dynamics of extraction in Amazonia: A historical perspective. *Advances in Economic Botany* 9:23-32.

Hyman, E. L. 1982. *Loan financing of smallholder treefarming for fuelwood production in the province of Ilocos Norte, Philippines*. Honolulu: East-West Center.

_____. 1983a. Pulpwood treefarming in the Philippines from the viewpoint of the smallholder: An ex-post evaluation of the PICOP project. *Agricultural Administration* 14:23-49.

_____. 1983b. Analysis of the woodfuels market: A survey of fuelwood sellers and charcoal makers in the province of Ilocos Norte. *Biomass* 3:167-197.

Issar, R. 1994. Development of market intelligence and infrastructure for agroforestry in India. In *Marketing of multipurpose tree products in Asia*, ed. J. B. Raintree and H.A. Francisco, 279-288. Proceedings of an international workshop, Baguio City, Philippines, December 6-9 1993. Bangkok: Winrock International.

Iqbal, M. 1993. *International trade in non-wood forest products: An overview*. Working Paper. Rome: Food and Agriculture Organization (FAO). November.

Kent, J. 1994. Market-related constraints to NTTP development in Costa. Paper presented at the Non-Timber Tree Product Market Research in Annapolis, Maryland, December 12-14. International Food Policy Research Institute, Washington, D.C.

Kevane, M. 1993. Is the *sheil* a shill? Informal credit in rural Sudan. *Journal of Developing Areas* 27: 515-534. July.

King, K. F. S. 1987. The history of agroforestry. In *Agroforestry: A decade of development,* ed. H. A. Steppler and P. K. R. Nair, 3-12. Nairobi, International Council for Research in Agroforestry.

Kinyanjui, M. 1987. Fueling Nairobi: The importance of small-scale charcoal enterprise. *Unasylva* 39(157/158): 17-28.

Larson, B.A., and D. W. Bromley. 1991. Natural resource prices, export policies, and deforestation: The case of Sudan. *World Development* 19(10):1289-1297.

Leach, G. 1993. *Farm trees and wood markets: A review and economic appraisal.* Pakistan Household Energy Study Strategy (HESS). Prepared for the Government of Pakistan through the World Bank/UNDP Energy Sector Management Assistance Program. Stockholm: Stockholm Environment Institute.

Leakey, L. S. B. 1977. *The Southern Kikuyu before 1902*. London: Academic Press.

Leakey, R. B., and A. C. Newton eds. 1994. *Domestication of tropical trees for timber and non-timber products*. MAP Digest 17. Paris: United Nations Educational, Scientific, and Cultural Organization (UNESCO).

Liedholm, C., and D.C. Mead. 1993. *The structure and growth of microenterprises in Southern and Eastern Africa*. GEMINI Working Paper No. 36. Growth and Equity through Microenterprise Investments and Institutions (GEMINI) Project. Bethesda, Maryland.

Malawi, Government of. 1987. *Statement of development policies, 1987-1996.* Zomba: Government Printer.

Malindi, E. S. 1977. Agroforestry in Ngabu agricultural development division. Unpublished paper. Presented at the Agroforestry Seminar, Club Makokola, Mangochi, Malawi.

Martin, G. 1992. Searching for plants in peasant marketplaces. In *Sustainable harvest and marketing of rain forest products,* ed. M. Plotkin and L. Famolare, 212-223. Washington, D.C.: Island Press.

Matakala, P. W. 1986. Problems of forest extension work in the Zambia teak forests. In *The Zambezi teak forests*, ed. G. D. Piearce, 416-26. Proceedings of the First International Conference on the Teak Forests of Southern Africa, held in Livingstone, Zambia, March 1984. Ndola: Forest Department of Zambia.

May, P.H. 1992. Babassu palm product markets. In *Sustainable harvest and marketing of rain forest products*, ed. M. Plotkin and L. Famolare, 143-150. Washington, D.C.: Island Press.

McGregor, J. 1991. Woodland resources: Ecology, policy and ideology. Unpublished Ph.D. thesis. Loughborough: Loughborough University of Technology.

Mori, S.A. 1992. The Brazil nut industry -- past, present, and future. In *Sustainable harvest and marketing of rain forest products*, ed. M. Plotkin and L. Famolare, 241-251. Washington, D.C.: Island Press.

Mussak, M.F., and J. G. Laarman. 1989. Farmers' production of timber trees in the cacao-coffee region of coastal Ecuador. *Agroforestry Systems* 9:155-170.

Nations, J. 1992. Xateros, chicleros, and pimenteros: Harvesting renewable tropical forest resources in the Guatemalan Petén. In *Conservation of neotropical forests*, ed. K. H. REDFORD and C. PADOCH, 208-219. New York: Columbia University Press.

Newton, A., R. Moss, and R. Leakey. 1994. The hidden harvest of tropical forests: Domestication on non-timber products. *Ecodecision*. July.

Ng'ong'ola, D.H. 1992. *Malawi urban household energy survey*. Lilongwe: Bunda College of Agriculture, University of Malawi. October.

Nyirongo, G., and L. Mhango. 1993. *Rural households tree planting and fuelwood consumption survey*. Lilongwe: Monitoring and Evaluation Unit and the Energy Studies Unit.

Parkin, D.J. 1972. *Palms, wine, and witnesses: Public spirit and private gain in an African farming community*. London: Intertext Books.

Peluso, N.L. 1992. The political ecology of extraction and extractive reserves in East Kalimantan, Indonesia. *Development and Change* 23(4): 49-74.

Pendelton, L.H. 1992. Trouble in paradise: practical obstacles to nontimber forestry in Latin America. In *Sustainable harvest and marketing of rain forest products*, ed. M. Plotkin and L. Famolare, 252-262. Washington, D.C.: Island Press.

Peters, C.M., A. Gentry, and R. O. Mendelsohn. 1989. Valuation of an Amazonia rainforest. *Nature* 339:656-657.

Plotkin, M., and L. Famolare, ed. 1992. *Sustainable harvest and marketing of rain forest products*. Washington, D.C.: Island Press.

Poffenberger, M. 1994. NTTPs and tenure in India: Considerations for future research. Paper presented at the Non-Timber Tree Product Market Research in Annapolis, Maryland, December 12-14. International Food Policy Research Institute, Washington, D.C.

Poulson, G. 1981. *Malawi: The function of trees in small farmer production systems*. Report prepared for the FAO/SIDA Forestry for Local Community Development program, GCP/INT/347/SWE. Rome: FAO.

Raintree, J.B., and H. A. Francisco. 1994. *Marketing of multipurpose tree products in Asia*. Proceedings of an international workshop, Baguio City, Philippines, December 6-9 1993. Bangkok: Winrock International.

Redford, K.H., and C. Padoch, ed. 1992. *Conservation of neotropical forests: Working from traditional resource use*. New York: Columbia University Press.

Renkow, M., and S. Vosti. 1994. Joint production, output supply, and product markets: Research and policy implications for NTTPs. Paper presented at the Non-Timber Tree Product Market Research in Annapolis, Maryland, December 12-14. International Food Policy Research Institute, Washington, D.C.

Ribbans, E. 1992. Marketing the Amazon: Forest products in the First World. Unpublished MPhil thesis. Cambridge: Center of Latin American Studies, University of Cambridge.

Richards, E.M. 1993. The potential for non-timber forest products in sustainable natural forest management in Amazonia. *Commonwealth Forestry Review* 72(1):21-27.

Rocheleau, D.E. 1989. Gender division of work, resources, and rewards in agroforestry systems. In *Agroforestry development in Kenya*, ed. A. M. Kilewe,

K. M. Kealey, and K. K. Kebaara, 228-245. Nairobi: International Council for Research in Agroforestry (ICRAF).

Salafsky, N., B. L. Dugelby, and J. W. Terborgh. 1993. Can extractive reserves save the rain forest? An ecological and socioeconomic comparison of nontimber forest product extraction systems in Peten, Guatemala, and West Kalimantan, Indonesia. *Conservation Biology* 7(1):39-52.

Sangkul, S. 1994. Processing and marketing of Eucalyptus camaldulensis by the Forestry Industry Organization, Thailand. In *Marketing of multipurpose tree products in Asia*, ed. J. B. Raintree and H. A. Francisco, 201-206. Proceedings of an international workshop, Baguio City, Philippines, December 6-9 1993. Bangkok: Winrock International.

Saxena, N.C. 1992. Adoption and rejection of eucalypts on farms in north-west India. Unpublished D. PHIL. thesis. University of Oxford, Oxford.

_____. 1994. *India's eucalyptus craze*. New Delhi: Sage Publications.

_____. 1994. Implications of the multi-product nature of tree systems for NTTP market research: The case of eucalyptus in India. **Paper presented at the Non-Timber Tree Product Market Research in Annapolis, Maryland, December 12-14. International Food Policy Research Institute, Washington, D.C.**

Scherr, S. J. 1992. Not out of the woods yet: Challenges for economics research on agroforestry. *American Journal of Agricultural Economics* 74 (3) August.

Scherr, S. J., and P. Dewees. 1994. Policy interventions in NTTP markets: Issues and approaches. Paper presented at the Non-Timber Tree Product Market Research in Annapolis, Maryland, December 12-14. International Food Policy Research Institute, Washington, D.C.

Scoones, I., and F. Matose, F. 1993. Local woodland management: Constraints and opportunities for sustainable resource use. In *Living with trees: Policies for forestry management in Zimbabwe*. Technical Paper No.210, ed. P. N. Bradley and K. McNamara, 157-198. Washington, D.C.: World Bank.

Stanley, D.L. 1991. Communal forest management: The Honduras resin tappers. *Development and Change* 22:757-779.

Swaminathan, M.S. 1987. The promise of agroforestry for ecological and nutritional security. In *Agroforestry: A decade of development*, ed. H. A. Steppler and P. K. R. Nair, 25-42. Nairobi, International Council for Research in Agroforestry.

Spears, J. P. Oram, M. Byron, S. Scherr, and A. M. Izac. 1994. ***A review of tropical forestry and agroforestry problem areas and policy research needs and the planned response of the CGIAR system*****. Center for International Forestry Research (CIFOR), International Food Policy Research Institute (IFPRI), and International Centre for Research in Agroforestry (ICRAF). CIFOR Working Paper No. 5. Bogor, Indonesia: CIFOR. October.**

Tewari, D. N. 1982. Minor forest products of India. Paper presented at the USAID conference on Forestry and Development in Asia, Bangalore, India.

Timmer, C.P., W. P. Falcon, and S. R. Pearson. 1983. ***Food policy analysis.*** **Baltimore: Johns Hopkins University Press.**

Townson, I. 1994. ***Forest products and household incomes: A review and annotated bibliography.*** **Oxford: Oxford Forestry Institute.**

von Amsberg, J. 1994. ***Economic parameters of deforestation*****. Policy Research Working Paper 1350. Washington, D.C.: World Bank. August.**

Vosti, S.A., and J. Witcover. 1995. Non-timber tree product (NTTP) market research workshop: An overview. Washington, D.C., International Food Policy Research Institute. January.

Wiersum, F., and C. P. Veer. 1983. Loan financing of smallholder treefarming in Ilocos, a comment. ***Agroforestry Systems*** **1(4):361-365.**

Wilmington, M. W. 1980. Aspects of moneylending in northern Sudan. ***Development Digest*** **July, 71-78.**

List of EPTD Discussion Papers

01 ***Sustainable Agricultural Development Strategies in Fragile Lands,*** **by Sara J. Scherr and Peter B. R. Hazell, June 1994.**

02 ***Confronting the Environmental Consequences of the Green Revolution in Asia,*** **by Prabhu L. Pingali and Mark W. Rosegrant, August 1994.**

03 ***Infrastructure and Technology Constraints to Agricultural Development in the Humid and Subhumid Tropics of Africa,*** **by Dunstan S. C. Spencer, August 1994.**

04 ***Water Markets in Pakistan: Participation and Productivity,*** **by Ruth Meinzen-Dick and Martha Sullins, September 1994.**

05 ***The Impact of Technical Change in Agriculture on Human Fertility: District-level Evidence from India,*** **by Stephen A. Vosti, Julie Witcover, and Michael Lipton, October 1994.**

06 ***Reforming Water Allocation Policy Through Markets in Tradable Water Rights: Lessons from Chile, Mexico, and California,*** **by Mark W. Rosegrant and Renato Gazmuri S., October 1994.**

07 ***Total Factor Productivity and Sources of Long-Term Growth in Indian Agriculture,*** **by Mark W. Rosegrant and Robert E. Evenson, April 1995.**

08 ***Farm-Nonfarm Growth Linkages in Zambia,*** **by Peter B. R. Hazell and Behjat Hojjati, April 1995.**

09 ***Livestock and Deforestation in Central America in the 1980s and 1990s: A Policy Perspective,*** **by David Kaimowitz (Interamerican Institute for Cooperation on Agriculture), June 1995.**

10 ***Effects of the Structural Adjustment Program on Agricultural Production and Resource Use in Egypt,*** **by Peter B. R. Hazell, Nicostrato Perez, Gamal Siam and Ibrahim Soliman, August 1995.**

11 ***Local Organizations for Natural Resource Management: Lessons from Theoretical and Empirical Literature,*** **by Lise Nordvig Rasmussen and Ruth Meinzen-Dick, August 1995.**

12 ***Quality-Equivalent and Cost-Adjusted Measurement of International Competitiveness in Japanese Rice Markets*****, by Shoichi Ito, Mark W. Rosegrant, and Mercedita C. Agcaoili-Sombilla, August, 1995.**

13 ***Role of Inputs, Institutions, and Technical Innovations in Stimulating Growth in Chinese Agriculture*****, by Shenggen Fan and Philip G. Pardey, September 1995.**

14 ***Investments in African Agricultural Research*****, by Philip G. Pardey, Johannes Roseboom, and Nienke Beintema, October 1995.**

15 ***Role of Terms of Trade in Indian Agricultural Growth: A National and State Level Analysis*****, by Peter B. R. Hazell, V. N. Misra and Behjat Hojjati, December 1995.**