

The following is the established format for referencing this article:

Ruiz-Pérez, M., B. Belcher, R. Achdiawan, M. Alexiades, C. Aubertin, J. Caballero, B. Campbell, C. Clement, T. Cunningham, A. Fantini, H. de Foresta, C. García Fernández, K. H. Gautam, P. Hersch Martínez, W. de Jong, K. Kusters, M. G. Kutty, C. López, M. Fu, M. A. Martínez Alfaro, T. R. Nair, O. Ndoye, R. Ocampo, N. Rai, M. Ricker, K. Schreckenber, S. Shackleton, P. Shanley, T. Sunderland, and Y. Youn. 2004. Markets drive the specialization strategies of forest peoples. *Ecology and Society* 9(2): 4. [online] URL: <http://www.ecologyandsociety.org/vol9/iss2/art4>

---

## *Report*

# Markets Drive the Specialization Strategies of Forest Peoples

[Manuel Ruiz-Pérez](#)<sup>1</sup>, [Brian Belcher](#)<sup>2</sup>, [Ramadhani Achdiawan](#)<sup>2</sup>, [Miguel Alexiades](#)<sup>3</sup>, [Catherine Aubertin](#)<sup>4</sup>, [Javier Caballero](#)<sup>5</sup>, [Bruce Campbell](#)<sup>2</sup>, [Charles Clement](#)<sup>6</sup>, [Tony Cunningham](#)<sup>7</sup>, [Alfredo Fantini](#)<sup>8</sup>, [Hubert de Foresta](#)<sup>9</sup>, [Carmen García Fernández](#)<sup>2</sup>, [Krishna H Gautam](#)<sup>10</sup>, [Paul Hersch Martínez](#)<sup>11</sup>, [Wil de Jong](#)<sup>2</sup>, [Koen Kusters](#)<sup>2</sup>, [M. Govindan Kutty](#)<sup>12</sup>, [Citlalli López](#)<sup>2</sup>, [Maoyi Fu](#)<sup>13</sup>, [Miguel Angel Martínez Alfaro](#)<sup>5</sup>, [T.K. Raghavan Nair](#)<sup>12</sup>, [Ousseynou Ndoye](#)<sup>14</sup>, [Rafael Ocampo](#), [Nitin Rai](#), [Martin Ricker](#)<sup>5</sup>, [Kate Schreckenber](#)<sup>15</sup>, [Sheona Shackleton](#)<sup>16</sup>, [Patricia Shanley](#)<sup>2</sup>, [Terry Sunderland](#)<sup>17</sup>, and [Yeo-Chang Youn](#)<sup>18</sup>

---

<sup>1</sup>*Universidad Autónoma de Madrid*; <sup>2</sup>*Center for International Forestry Research (CIFOR)*; <sup>3</sup>*University of Kent at Canterbury*; <sup>4</sup>*IRD-Orléans*; <sup>5</sup>*Universidad Nacional Autónoma de México*; <sup>6</sup>*Instituto Nacional de Pesquisas da Amazônia*; <sup>7</sup>*World Wildlife Fund/UNESCO/Kew People and Plants Initiative*; <sup>8</sup>*Universidade Federal de Santa Catarina*; <sup>9</sup>*Institut de recherche pour le développement*; <sup>10</sup>*Hokkaido University*; <sup>11</sup>*Instituto Nacional de Antropología e Historia*; <sup>12</sup>*Sylva conS*; <sup>13</sup>*Chinese Academy of Forestry*; <sup>14</sup>*CIFOR-Cameroon*; <sup>15</sup>*Overseas Development Institute*; <sup>16</sup>*Rhodes University*; <sup>17</sup>*African Rattan Research Programme*; <sup>18</sup>*Seoul National University*

---

- [Abstract](#)
- [Introduction](#)
- [Data](#)
- [Results](#)
  - [Nontimber forest products in household economic strategies](#)
  - [Production options](#)
  - [Regional characterization](#)
- [Conclusions](#)
- [Responses to this Article](#)
- [Acknowledgments](#)
- [Literature Cited](#)

---

## ABSTRACT

Engagement in the market changes the opportunities and strategies of forest-related peoples. Efforts to support rural development need to better understand the potential importance of markets and the way people respond to them. To this end, we compared 61 case studies of the commercial production and trade of nontimber forest products from Asia, Africa, and Latin America. The results show that product use is shaped by local markets and institutions, resource abundance, and the relative level of development. Larger regional patterns are also important. High-value products tend to be managed intensively by specialized producers and yield substantially higher incomes than those generated by the less specialized producers of less managed, low-value products. We conclude that commercial trade drives a process of intensified production and household specialization among forest peoples.

**KEY WORDS:** Commercialization, forest use, market development, nontimber forest products, poverty, resource management, specialization.

*Published: September 1, 2004*

---

## INTRODUCTION

Beginning in the early 1980s, efforts to link conservation and development focused attention on the alarming rates of deforestation. This attention coincided with new commitments to address rural poverty and the recognition that forests can provide multiple products and services. Forest products, especially nontimber forest products (NTFP), were given a high profile at this time because of the perception that forest exploitation for products rather than timber is more benign (Myers 1988). Forest products were also considered more accessible to rural populations, especially to the rural poor (Kumar and Saxena 2002). Recently, more realistic assessments (Peters et al. 1989, Godoy and Bawa 1993, Simpson et al. 1996, Godoy et al. 2000, Sheil and Wunder 2002) have lowered these high expectations of the economic and conservation benefits of forest products. Nevertheless, interest in forest products remains strong. This interest was evident in several recent international meetings that looked at the issue of forests and forest-related livelihoods, including *The Role of Forestry on Poverty Alleviation*, 4–7 September 2001, Semproniano, Italy; *The International Workshop on Forests in Poverty Reduction Strategies: Capturing the Potential*, 1–2 October 2002, Tuusula, Finland; and *The International Conference on Rural Livelihoods, Forests, and Biodiversity*, 19–23 May 2003, Bonn, Germany.

Analyses of the processes and trends that affect the use and management of forest products are essential to guide further conservation and development interventions. So far, however, these analyses have offered contrasting perspectives. Some authors consider the wild harvesting of forest products to be the first step along a domestication-intensification path that leads to replacing wild-harvest forests with plantations or to substituting synthetics for forest products (Homma 1992). Other

approaches view forest products as part of a diversified household economy (Michon and de Foresta 1997). This approach emphasizes the domestication of landscapes rather than the domestication of species, creating agroforestry systems that occupy an intermediate position between wild-harvest forests and plantations. Finally, some authors stress idiosyncratic, cultural, and opportunity values to advocate the long-term maintenance of livelihoods based on the harvest of wild-harvest forest products (Grenand and Grenand 1996). Many agree that the relationship between people and forests must be considered within the larger context of macroeconomic processes (Angelsen and Wunder 2003). We consider commoditization, i.e., the transition from a subsistence to a market economy, as important to understanding the role, potential, and trends associated with the use and management of forest products. In this paper, we report on a comparative study that analyzes the links between the livelihoods of forest-related peoples and global commoditization processes.

---

## DATA

We looked at 61 cases of the use of commercial forest products and applied a multivariate analysis based on a method pioneered by Ruiz-Pérez and Byron (1999). Each case was defined as the commercial production of one forest product by people who live in a given area and who share common socioeconomic, environmental, and political conditions. Each case was thus treated as an internally homogeneous entity.

Regionally based research coordinators recruited collaborators and selected cases through established networks, referrals from experts, and direct contact with potential collaborators. Regional coordinators attempted to select 20 cases from each region. The selection of cases was based on three main criteria: (1) the forest product had to demonstrate commercial value locally, regionally, or internationally; (2) the production-to-consumption system (Belcher 1998) had to have been researched and documented with significant amounts of information already available; and (3) the overall set of cases had to balance regional coverage and represent a broad range of products, production systems, and uses. In practice, all the cases that met the first two criteria were included. The availability of cases with sufficient pre-existing data was the main limit on the number of cases included in this study.

The final selection of cases included many important case studies of commercially traded nontimber forest products (NTFPs) representing different product types, methods of management that ranged from wild gathering to plantations, and markets of various sizes. Cases were from Asia ( $n = 21$ ), Africa ( $n = 17$ ), and Latin America ( $n = 23$ ). Although the data set is extensive and diverse, it is not a truly random sample. Some conclusions should therefore be interpreted with care. However, the comparable size of samples from each of the three main tropical regions and the fact that the eight main categories of product use do not show statistical differences between regions ( $\chi^2 = 14.068$ ,  $df = 14$ ,  $P = 0.445$ ) lends support to the robustness of the sample. The table in Appendix 1 lists the case studies by species and location and gives the name of the author of this paper who provided the case.

A stepwise approach was followed for the selection of variables. First, the major categories of factors that characterize a case were identified based on those described by Ruiz-Pérez and Byron (1999). These categories were expanded by incorporating a production-to-consumption perspective (Belcher 1998). Each category was then characterized according to an extended list of attributes. This resulted in 114 variables that describe the geographic setting, the product, the production system, the ecological implications of production, the socioeconomic characteristics of the area in which the raw material is produced, the processing industry and trade, the institutional characteristics of producers, the relevant policies, and the external interventions. Many of these variables were measured or coded in more than one way, resulting in a total of 246 data points. Emphasis was placed on producer households. Where possible, quantitative variables were used. The variables included both current status and trends over the past 10 yr. Cash values were converted to U.S. dollars using official exchange rates and standardized using a purchasing-power parity index. The original list of variables and their definitions is included as Appendix 2. A full description of the approach is provided in Belcher and Ruiz-Pérez (2001).

To harmonize definitions, criteria, and measurements, two workshops were held in each of the three regions for a total of six. The first workshop was devoted to methodological issues, and collaborators discussed the definitions of variables and the practicalities of data requirements. The second workshop, which took place approximately 12 months after the first, focused on reviewing and completing data for individual cases and on preliminary analyses. Finally, a meeting was held with a subgroup of case authors from the three regions who indicated a strong interest in the analysis; they are among the authors of this paper.

Two main documents were prepared by each case author. The first was a standardized spreadsheet of all variables and a narrative report describing the case. The narrative reports were published in three edited volumes of Asian (Kusters and Belcher 2004), African (Sunderland and Ndoye 2004), and Latin American (Alexiades and Shanley 2004) cases, respectively.

---

## RESULTS

### **Nontimber forest products in household economic strategies**

Economic theory predicts that a shift from a subsistence to a cash economy will stimulate specialization to maximize economic opportunities. The degree of integration into the cash economy should influence production strategies. To analyze these relationships, we used a regression of the total contribution of forest products, i.e., subsistence plus cash, to household income ( $y$ ) as a function of the percentage of local household income earned in cash ( $x$ ). An exponential curve proved a good fit ( $\ln y = 0.044x$ ;  $R^2 = 0.86$ ,  $F(1,60) = 368.4$ ,  $P = 0.000$ ), indicating an increasing contribution of individual nontimber forest products (NTFPs) to the household economy of producers as they move from low to high levels of commoditization.

Cases were then grouped by quadrants (Fig. 1), yielding three case sets. A very similar grouping was produced using cluster analysis. The first set ( $n = 16$ ) represents cases of a typical subsistence strategy in which a forest product is the main and frequently sole source of cash income for predominantly subsistence livelihoods. We use the term "subsistence" to mean that cash income is used to support current consumption. The second set ( $n = 31$ ) includes cases of a typical diversified economic strategy in which the household economy is well integrated into the cash economy and the forest product provides only a small proportion of total household income. The third set ( $n = 14$ ) includes cases involving a typical specialized strategy in which cash-oriented households rely on a forest product as their main source of income. No cases occurred in the fourth quadrant.

We analyzed the relationships between the three categories of cases and all the other variables using bivariate analyses. A Kruskal-Wallis test (a nonparametric test robust to outliers) was used for the quantitative variables (Table 1), and multicorrespondence analysis was used for nominal and ordinal categorical variables (Fig. 2).

In 85% ( $n = 52$ ) of the cases in our study, average household incomes were lower than the national average. This reflects the lack of economic opportunities available in the case study sites, which are typical of rural areas in developing regions. Within these regions, however, the difference in the average income of households that produce forest products and the local average income is significant (Kruskal-Wallis = 6.717;  $df = 2$ ;  $P = 0.035$ ). The ratio of income from households that produce forest products to average local income showed median values of 0.86, 1.00, and 1.11 for the subsistence, diversified, and specialized sets of cases, respectively. This ratio measure can be considered a proxy for the potential income differentiation and development between NTFP producers and nonproducers in the same locality. The data indicate a statistically significant difference in the development potential of the economic strategies of the subsistence (below average income), diversified (same as average income), and specialized (above average income) households.

The results (Table 1) characterize each of the household economic strategies in the following terms:

1. The subsistence strategy households harvest NTFPs from wild resources in unmanaged or lightly managed forests. Analysis of the data from the 10-yr reference period shows that increasing numbers of households are involved, increasing amounts of household income are derived from NTFPs, and the resource base is declining. Subsistence-strategy households tend to use a larger number of other NTFPs, mainly for subsistence purposes, than those in the other two case sets.
2. The diversified-strategy households fall between the subsistence and specialized sets of cases in terms of household income, market size, and NTFP production value per hectare. In the diversified-strategy cases, NTFPs provide additional income to households that earn the bulk of their income from agriculture or from off-farm sources.
3. The specialized-strategy households tend to have higher household incomes, command higher prices for their NTFPs, enjoy a higher trade value for the NTFPs in their area, and get better NTFP production per hectare. In these cases, there is also stability in the NTFP markets, the producers' incomes, and

the numbers of households involved in production. They tend to have less product adulteration, a lower incidence of customary rules, and relatively stable populations of the target species.

## **Production options**

There are two distinct NTFP production approaches: (1) extraction based on natural regeneration and (2) cultivation in monodominant or mixed forest stands, i.e., plantations or managed forests, in which > 50% of production comes from planted material. We compared groups of cases that engage in these two approaches using Mann-Whitney  $U$  and chi-square tests for significance. We found that cases that engage in cultivation have higher values for labor, use more intense technology in production, and produce more per hectare. We also found that the cases that engage in cultivation tend to be strongly associated with private tenure, higher NTFP trade values both locally and nationally, and higher household incomes in absolute and relative terms (Fig. 3). Cases that use cultivation generally enjoy a stable resource base, whereas cases that engage in extraction are frequently associated with declining resources.

Cultivation becomes the more frequent NTFP production approach as the cases move from being less to more cash-oriented. Cultivation is used in only 6% of the cases in the subsistence-strategy households. However, cultivation is dominant in 29% of diversified-strategy cases and in 43% of cases of specialized-strategy households. An analysis within these latter two groups, in which cultivation is a relatively common practice, provides additional insight into household strategies.

In one subgroup ( $n = 9$ ) from within the set of cases using the diversified strategy, NTFPs are cultivated as an integral part of overall farming activity. These cases tend to be located in poorer areas in which average local incomes are low. NTFP producer households tend to be wealthier than their neighbors. For the subgroup of cases that do not use cultivation ( $n = 22$ ), households rely more on off-farm income. Their incomes are equivalent to the local average, and they use wild-harvested NTFPs to help bridge the gap.

In the set of cases that use the specialized economic strategy, a small subgroup uses cultivation ( $n = 6$ ). In these cases, raw material prices, productivity, household incomes at purchasing power parity, and the ratio of producer to local income all tend to be higher. Household incomes are also higher, approaching the national average. These cases account for a much larger total NTFP trade in the case study area than do specialized cases that do not use cultivation ( $n = 8$ ), indicating larger and more developed markets. Wild-harvested products tend to give better but nonsignificant (Mann-Whitney  $U = 17$ ;  $P = 0.366$ ) returns per unit of labor, but with less total production.

These findings are consistent with Homma's (1992) economic model showing an evolution toward intensive management and cultivation to meet the demand for NTFPs. However, specialization does not require monoculture plantations. Several of our cases within the specialized strategy set rely on managed-forest systems.

## **Regional characterization**

We also analyzed regional groupings by means of bivariate analyses. Kruskal-Wallis tests for significance were used for quantitative variables (Table 2), and multirespondence analysis was used for nominal and ordinal categorical variables (Fig. 4). The observed regional differences are the result of contrasting environmental and socioeconomic conditions.

Even though all the cases except Korean mushrooms are in tropical or subtropical environments, there is a marked climatic differentiation. The African cases, for example, occur in settings that are significantly drier than those of the other cases. Moreover, the African cases have a larger climatic variability than the other two regions ( $CV = 0.80$ , compared with  $CV = 0.47$  for Asia and  $CV = 0.42$  for Latin America). This suggests a higher internal climatic heterogeneity in the African sample.

Levels of economic development in the case study sites can be inferred from three variables: road density, local labor rate, and the per capita income of NTFP producers. The African cases have significantly lower values for these three variables than do the cases from the other regions (Table 2). This significant difference is even more marked if we conduct pairwise comparisons of this region with each of the others. The African cases had larger family sizes, more rapid population growth, and lower levels of development than did the cases from the other regions ( $X^2 = 10.636$ ,  $df = 4$ ,  $P = 0.031$ ). This means that the African cases are putting increasing pressure on resources and suffer more climatic restrictions than do the cases from the other tropical regions. Moreover, with stagnant or declining economies in many African countries, there may be greater demand for low-cost NTFPs and lower opportunity costs for commercial harvesters and traders.

We expect that different environmental and development conditions will affect the way forests and NTFPs are used. The analysis of our sample shows that African cases tend to have lower household incomes and smaller trade volumes compared to other regions. They also have growing human populations and an expanding NTFP market demand that increases pressure on the resources. Resources are predominantly unmanaged. Producers' organizations tend to be informal, and there is little government intervention or private investment in the sector.

Asian cases tend to have lower rates of local population growth. In Asia, the forest products are also generally managed more intensively than in Africa, and so there are more cases with a stable resource base. Formal producers' organizations are more common in Asia than in Africa, and producers have a better understanding of their legal rights. Both government interventions and private investment tend to be more common in the Asian cases than in the cases in Africa.

The Latin American cases tend to have intermediate economic conditions and population trends, with more variability within the case set than in the other regions. The NTFP market trends in Latin America are also variable, with a higher frequency of unstable boom and bust situations. There is no clear pattern of management regime nor any stability of resource bases. Producers have a medium level of organization, and they are knowledgeable about their rights. There is some support from government and nongovernment organizations, but little private sector investment.

We compared the regional case sets and their household economic strategies using bivariate analyses to provide a regional perspective of global processes and their effects on household NTFP use and trade (Fig. 5). Rather than a geographically determined analysis, the results present a general outlook that indicates regional features. Thus, although it is possible to find all kinds of strategies in each region, the features of the African cases tend to be associated with those of subsistence strategies, Latin American cases with diversified strategies, and Asian cases with specialized strategies.

This result may help to explain the divergence in the literature regarding the potential of NTFPs as tools to improve conservation and local livelihoods. Authors with different regional experiences could be more likely to stress different aspects of NTFP development. For instance, in Africa, researchers often emphasize the safety net and subsistence functions of NTFPs (Falconer 1990, Cavendish 2000). In Asia, which has better developed and more stable markets, research has focused more on market functioning and appropriation by elites (Dove 1993). In contrast, in Latin America, where markets tend to be more innovative and dynamic, researchers tend to stress the importance of the "green" market, e.g., "rain forest crunch," for NTFP conservation and development (Clay 1992, Evans 1993).

---

## CONCLUSIONS

Classifying forest products according to their role in household economic strategies suggests a continuum from lower to higher levels of development with highly differentiated roles and management approaches. Moving from subsistence to a cash economy drives a process of specialization that leads to higher incomes for producers in absolute terms as well as in relation to average local incomes. Increasing market demand for wild-harvested forest products tends to result in overexploitation, a process that is exacerbated by deforestation. Cultivation and intensified forest management are ways to maintain or increase the supply of valuable products to stable or expanding markets. Secure land/resource tenure stands out as a key factor in the cultivation of trees for nontimber forest products (NTFPs).

Although commercial NTFP production provides important income to producers in each of the three sets of cases, its income potential is also linked to the existence of infrastructure, access to skills and services, and other conditions that have been identified in the nonfarm rural economy literature (Lanjouw and Feder 2001). These features are found less often in Africa than in Asia and most of Latin America. Without them, the commercialization of NTFPs may not deliver great improvements and may lead instead to forest-based economies in permanent poverty. The safety net and subsistence value of NTFPs must be recognized. Nevertheless, interventions need to focus on products and systems with growth potential if poverty is to be reduced and people allowed to do more than meet their basic needs. Intervention plans need to consider opportunities and constraints at the household and local levels. They need to understand the nested relationship between local and regional conditions that link NTFP-based economies with general regional development. NTFP activities can



neither be researched nor promoted in isolation from the context of the livelihoods affected by them.

The ways that forests are valued and managed and their role in alleviating rural poverty are being revisited (Byron and Arnold 1999, Wunder 2001, Scherr et al. 2002). Our analysis of 61 cases demonstrates the importance of NTFPs as supplementary sources of income. It shows that NTFP activities follow the same economic principles as other income-generating activities. It also shows that some of the best income-earning opportunities lie in intensified systems that mark a transition from gathering to cultivating and that work to overcome the problem of resource depletion.

---

## RESPONSES TO THIS ARTICLE

Responses to this article are invited. If accepted for publication, your response will be hyperlinked to the article. To submit a comment, follow [this link](#). To read comments already accepted, follow [this link](#).

---

## Acknowledgments:

*The first two authors shared the lead in the analysis and writing of this manuscript. All the other authors, who are listed alphabetically, made significant intellectual contributions to the paper. We thank the Department for International Development for financial support for the research. The work was made possible by the careful documentation of the 61 individual cases by the case authors listed in Appendix 1. Sven Wunder, J. E. M. Arnold, Doug Sheil, Arild Angelsen, and two anonymous reviewers provided valued help with detailed comments and suggestions on earlier versions.*

---

## LITERATURE CITED

**Alexiades, M., and P. Shanley, editors.** 2004. *Productos forestales, medios de subsistencia y conservación: estudios de caso sobre sistemas de manejo de productos forestales no maderables. Volumen 3: América Latina.* CIFOR, Bogor, Indonesia.

**Angelsen, A., and S. Wunder.** 2003. *Exploring the forest-poverty link: key concepts, issues and research implications.* Occasional Paper 40. CIFOR, Bogor, Indonesia.

**Belcher, B.** 1998. A production-to-consumption systems approach: lessons from the bamboo and rattan sectors in Asia. Pages 57-84 in E. Wollenberg and A. Ingles, editors. *Incomes from the forests: methods for the development and conservation of forest products for local communities.* CIFOR, Bogor, Indonesia.

- Belcher, B., and M. Ruiz Pérez.** 2001. *An international comparison of cases of forest product development: overview, description and data requirements*. CIFOR Working Paper Number 23. CIFOR, Bogor, Indonesia.
- Byron, N., and J. E. M. Arnold.** 1999. What futures for the people of the tropical forests? *World Development* **27**(5):789-805.
- Clay, J.** 1992. Why rainforest crunch? *Cultural Survival Quarterly* **16**(2):31-37.
- Cavendish, W.** 2000. Empirical regularities in the poverty-environment relationship of rural households: evidence from Zimbabwe. *World Development* **28**(11):1979-2003.
- Dove, M. R.** 1993. A revisionist view of tropical deforestation and development. *Environmental Conservation* **20**:17-24.
- Evans, M. I.** 1993. Conservation by commercialization. Pages 815-822 in C. M. Hladik, A. Hladik, O. F. Linares, H. Pagezy, A. Semple, and M. Hadley, editors. *Tropical forests, people and food: biocultural interactions and applications to development*. MAB Series, Volume 13. UNESCO, Paris, France, and Parthenon Publishing Group, Carnforth, UK.
- Falconer, J.** 1990. *The major significance of minor forest products*. FAO, Rome, Italy.
- Godoy, R., D. Wilkie, H. Overman, A. Cubas, G. Cubas, J. Denmer, K. McSweeney, and N. Brokaw.** 2000. Valuation of consumption and sale of forest goods from a Central American rain forest. *Nature* **406**:62-63.
- Godoy, R., and K. S. Bawa.** 1993. The economic value and sustainable harvest of plants and animals from the tropical forests: assumptions, hypotheses and methods. *Economic Botany* **47**:215-219.
- Grenand, P., and F. Grenand.** 1996. Living in abundance: the forest of the Wayampi (Amerindians from French Guiana). Pages 177-196 in M. Ruiz Pérez and J. E. M. Arnold, editors. *Current issues in non-timber forest products research*. CIFOR-ODA, Bogor, Indonesia.
- Homma, A. K. O.** 1992. The dynamics of extraction in Amazonia: a historical perspective. Pages 23-32 in D. C. Nepstad and S. Schwartzman, editors. *Non-timber products from tropical forests: evaluation of a conservation and development strategy*. New York Botanical Garden, New York, New York, USA.
- Kumar, N., and N. C. Saxena.** 2002. India's forests: potential for poverty alleviation. Pages 99-136 in U. J. Lele, editor. *Managing a global resource: challenges of forest conservation and development*. Transaction Publishers, New Brunswick, New Jersey, USA.

- Kusters, K., and B. Belcher, editors.** 2004. *Forest products, livelihoods and conservation: case studies of non-timber forest product systems. Volume 1: Asia.* CIFOR, Bogor, Indonesia.
- Lanjouw, P., and G. Feder.** 2001. *Rural non-farm activities and rural development: from experience towards strategy.* Rural Development Strategy Background Paper Number 4. World Bank, Washington, D.C., USA.
- Michon, G., and H. de Foresta.** 1997. Agroforests: pre-domestication of forest trees or true domestication of forest ecosystems? *Netherlands Journal of Agricultural Science* **45**:451-462.
- Myers, N.** 1988. Tropical forests: much more than stocks of wood. *Journal of Tropical Ecology* **4**:209-221.
- Peters, C. M., A. H. Gentry, and R. O. Mendelsohn.** 1989. Valuation of an Amazonian rainforest. *Nature* **339**:655-656.
- Ruiz Pérez, M., and N. Byron.** 1999. A methodology to analyze divergent case studies of non-timber forest products and their development potential. *Forest Science* **45**(1):1-14.
- Scherr, S., A. White, and D. Kaimowitz.** 2002. *Making markets work for forest communities.* Forest Trends, Washington, D.C., USA.
- Sheil, D., and S. Wunder.** 2002. The value of tropical forest to local communities: complications, caveats and cautions. *Conservation Ecology* **6**(2):9. [online] URL: <http://www.consecol.org/vol6/iss2/art9>.
- Simpson, R. D., R. A. Sedjo, and J. W. Reid.** 1996. Valuing biodiversity for use in pharmaceutical research. *Journal of Political Economy* **104**:163-185.
- Sunderland, T. C. H., and O. Ndoye, editors.** 2004. *Forest products, livelihoods and conservation: case studies of non-timber forest product systems. Volume 2: Africa.* CIFOR, Bogor, Indonesia.
- Wunder, S.** 2001. Poverty alleviation and tropical forests—what scope for synergies? *World Development* **29**(11):1817-1833.

---

**Address of Correspondent:**

Brian Belcher  
Center for International Forestry Research Jl. Situ Gede  
Sindang Barang  
Bogor 16680, Indonesia  
Phone: +62-251-622 622  
Fax: +62-251-622 100  
[b.belcher@cgiar.org](mailto:b.belcher@cgiar.org)

---