Non-Timber Forest Products Conservation and Management

A Brief Bibliographical Survey

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Economic Contribution

1. Amacher, G. S., W. F. Hyde and K. P. R., Kanel (1996): "Household Fuel wood demand and supply in Nepal's terai and mid-hills: choice between cash outlays and labor opportunity", *World development* Vol. 24, No.11, Pg. 1725 – 1736.

2. Appasamy, P. P. (1993): "Role of non-timber forest products in subsistence economy: the case of a joint forestry project in India", *Economic Botany* 47(3), Pg. 258-267.

3. Arnold, J. E. M and M. R Perez (2001): "Can non-timber forest products match tropical forest conservation and development objectives?", *Ecological Economics*, Vol. 39(3), Pg. 437-447, Dec 2001.

   Abstract: The contributions that non-timber forest products (NTFPs) can make to rural livelihoods, and the fact that their use is less ecologically destructive than timber harvesting, have encouraged the belief that more intensive management of forests for such products could contribute to both development and conservation objectives, and have led to initiatives to expand commercial use of NTFPs. This paper reviews evidence that indicates that this 'conservation through commercialization' thesis needs to be revised. In practice, the selective nature of market demand, and the uneven distribution of resources of use value within forests, mean that with NTFP harvesting the resource can become altered and degraded. The pressures that market forces can place on local control mechanisms, and the conflicting interests of those using forest resources for subsistence and income generation, can also result in poorer users becoming disadvantaged as NTFP commercialization is intensified. An approach that recognizes such areas of conflict, and attempts to arrive at a realistic balance between development and conservation, is proposed.

4. Ashton, M. S., R. Mendelsohn, B. M. P Singhakumara, C. V. S Gunatilake, I. U.A.N. Gunatilake and A. Evans (2001): "A financial analysis of rain forest silviculture in southwestern Sri Lanka", *Forest Ecology and Management*, Vol. 154 (3), Pg. 431-441, Dec 1, 2001.

   Abstract: We examine the financial aspects of three silvicultural systems to encourage the sustainability of valuable hardwood species in mixed-dipterocarp forests of southwest Sri Lanka. We compare the net present value (NPV) of the current forest management approach (diameter limit harvests) with shelter wood harvests that promote light hardwood timber species. In this analysis, we also consider the potential of enrichment planting various precious timber (*Diospyros quaesita* - calamander), and non-timber forest product (NTFP) species (*Caryota urens* - fishtail palm; *Elettaria cardamomum* variety major cardamom; *Calamus zeylanicus* - rattan) in conjunction with timber harvests. Two real (inflation adjusted) discount rates were used, 4% and 6%, respectively. Results show that when real discount rates are low (4%), and advance regeneration is present, NPV is highest for the one-cut shelter wood US ($9983 ha(-1)). At a high discount rate (6%), reflecting the current short-term concession system and unstable rights to harvest, and where no advance regeneration was present, the diameter limit system (US $7173 ha(-1)) was the optimum. On sites with advanced regeneration, the one-cut shelter wood system is clearly preferable. For all but rattan, shelter wood treatments provide higher NPVs for NTFPs than diameter limit cuttings primarily because of the higher light regimes and more growing space made available early in the rotation. The value for tea cultivation (US $26,000 ha(-1)) far exceeds the value of managing these lands for timber alone, explaining the dramatic expansion in tea plantations on private lands. However, our results suggest that managing these lands for a combination of timber and enrichment plantings of NTFPs (US $23,000 ha(-1)) can be comparable to tea plantations. By managing for NTFPs and timber, forest managers have new opportunities to solve the old problems of high-grading and land-use conversion.

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7. Boot, R. G. A. (1997): "Extraction of non-timber forest products from tropical rain forests. Does diversity come at a price?", *Netherlands Journal of Agricultural Science 45*, Pg.439-450.

8. Cavendish, W. (2000): "Empirical regularities in the poverty-environmental relationship of rural households: Evidence from Zimbabwe", *World Development*, Vol. 28 No. 11, Pg. 1979-2003.

9. Chettri, R. B., B. K. Pokharel (2000): "IGA Program and NTFP Management in Community Forest User Groups", Issue Paper No. 3, Joint Technical Review Committee on Community Forestry, Ministry of Forests and Soil Conservation, Kathmandu.

10. Chopra, K. (1993): "The value of non-timber forest products: An estimation for tropical deciduous forests in India", *Economic Botany*, 47 (3), Pg. 251-257.

11. Davidson-Hunt, I., Duchesne, L. C, Zasada and John C., eds. (2001): "Forest communities in the third millennium: linking research, business, and policy toward a sustainable non-timber forest product sector", Gen. Tech. Rep. NC-217. St. Paul, MN: U.S. Dept. of Agriculture, Forest Service, North Central Research Station. A wide variety of papers given at the first international conference on non-timber forest products (NTFP) in cold temperate and boreal forests. Focuses on many facets of NTFPs: economics, society, biology, resource management, business development, and others.

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13. Goday, R., N. Brokaw and D. Wilkie (1995): "The effect of income on the extraction of non-timber tropical forest products: Model, hypotheses, and preliminary findings from the Sumu Indians of Nicaragua", *Human Ecology*, Vol. 23, No. 1, Pg. 29-52.

    Abstract: Microeconomic theory was used to frame hypotheses about the effects of income on the use of non-timber products from rain forests. It was hypothesised that an increase in income: (a) encourages foraging specialization, resulting in the extraction of fewer goods; (b) increases the share of household income from occupations besides foraging; (c) produces a yearly value from the extraction of non-timber forest goods of about $50 per hectare; and (d) produces depletion of forest goods entering commercial channels and sustainable extraction of goods facing cheaper industrial substitutes. To examine these hypotheses, this paper presents worldwide ethnographic information and preliminary findings from fieldwork among the Sumu Indians of Nicaragua. The fieldwork suggests that higher income produces (a) no reduction in the extraction of non-timber forest goods, but foraging specialization with animals rather than with plants; (b) a decline in the economic importance of forest goods in household income; and (c) a rise in the value of non-timber products removed from the forest of about $35/ha per year. Hypothesis (d) was not tested.

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18. Marshall, E. and A. C. Newton (2003): "Non-timber Forest Products in the community of El Terrero, Sierra de Manatlan Biosphere Reserve, Mexico: Is their use sustainable?", in *Economic Botany*, Vol. 57(2), Pg. 262-278, Summer 2003.

    Abstract: The importance of non-timber forest products (NTFPs) to rural income was examined in a highland community in the Sierra de Manantlan Biosphere Reserve, Jalisco-Colima, Mexico. Rapid Rural Appraisal (RRA) techniques were used to interview 70% of households in the community of El Terrero. Of the nine plant species identified as NTFP sources, the two principal species traded by the community were tila (derived from the flowers and fruits of the tree *Ternstroemia lineata*), and blackberry (*Rubus* spp.). Collecting and selling of NTFPs was almost exclusively undertaken by women, with 80% of respondents participating. NTFP sale ranked as the most important source of cash income for 30% of women interviewed, and either second- or third-most important for the remainder. The research examined harvesting impact on populations of *T. lineata*, an understory tree species characteristic of cloud forest, which this was assessed in the four most-frequented collecting sites. Our results suggested that current harvesting approaches appear to be sustainable, although 95% of the women interviewed reported a decline in resource availability within the last 15 years, apparently resulting from illegal cutting. Suggestions are made with respect to the sustainable development of NTFP resources to help alleviate poverty within the Reserve.

19. McLain, J. R: "Non-Timber Forests Medicinal Herbs, Fungi, Edible Fruits and Nuts, and Other Natural Products from the Forest", Edited by Marla R. Emery, Ph.D Aiken Forestry Sciences Lab, Burlington, Vermont.

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21. Ojha, H. (2001): "Commercial use of non-timber forest products: can the poor really get benefits?", *Journal of forest and livelihoods*, No. 1, July 2001, Pg 19-21.

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26. Shmatkov, N. and T. Brigham T. (2003): “Non-timber forest products in community development: Lessons from the Russian Far East”, in *Forestry Chronicle*, Vol. 79(1), Pg. 113 - 118, Jan-Feb 2003.

Abstract: One of the components of the IUCN-The World Conservation Union project, "Building Partnerships for Forest Conservation and Management in Russia" funded by the Canadian International Development Agency (CIDA), is designed to assist remote communities of the Russian Far East to sustainably develop their NTFP resources. In our project, NTFPs are viewed as one part of a local sustainable livelihood strategy (including tourism, cultural activities, hunting, herding). We provide business and legal issues training, consultation on small business and community-based enterprise development, and support for sustainability and monitoring programs. One of the basic principles of the project has been a participatory approach to project development and implementation. It is the hope of project participants that the successful development of NTFP and other opportunities will decrease the pressure to move forward with potentially damaging resource exploitation activities. Although community economic development is the primary goal, the revival and sharing of indigenous knowledge about NTFPs has been identified by participants as a key issue, and is a focus of educational materials being developed through the project.

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30. “Non-Timber Forest Products of India”, edited by S. Nautiyal and A.K. Kaul. Dehradun, Jyoti Pub, 2003, viii, Pg. 538. ISBN 81-88617-00-8.

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Marketing and Trade

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34. Chamberlain, J. L., R. J. Bush, A. L. Hammett and P. A. Araman (2002), 'Eastern National Forests: Managing for Non-timber Products', Journal of Forestry, Jan-Feb.2002.

35. Duchense L C, Zasada JC and Davidson-Hunt (2000): "Non-timber forest product industry in Canada: Scope and research needs", *Forestry Chronicle*, Vol. 76 (5), Pg. 743-746 SEP-OCT 2000.

    Abstract: With a current yearly output of $241 million per year nontimber forest products (NTFP) contribute significantly to the welfare of rural and First Nations communities in Canada. Maple sap products, wild mushrooms and wild fruits are the most important NTFP for consumption both in Canada and abroad. However, because of increased access to international markets by entrepreneurs along with a growing international demand for NTFP it may be possible to double or triple Canada's harvest of NTFP. Further development of this industry should be associated with adequate training of harvesters in terms of NTFP biology in order to maximize profits while achieving biological sustainability. As well, research should emphasize the domestication of specific NTFP to meet growing demand, increase revenues and promote biodiversity conservation.

36. Duchesne, Luc. C and S. Wetzel (2002): "Managing timber and non-timber forest resources in Canada's forests: Needs for integration and research", in *Forestry Chronicle*, Vol. 78(6), Pg. 837-842, Nov-Dec 2002.

    Abstract: Non-timber forest products (NTFP) are emerging globally as a tool for the establishment of sustainable forest communities. They provide employment to various sectors of society, draw on local expertise and culture, and increase the outputs of forests. In recent years, NTFP have received accrued interest by the general public, governments and the private sectors of Canada. However, for the NTFP industry to enter mainstream Canadian industrial culture it is now critical to attempt the integration of the timber industry with the NTFP industry to benefit both sectors. NTFP can be harvested from four types of environment: wild stocks from timber-productive forests, wild stocks from non-timber-productive forests or lands, managed stocks from intensively managed forests, and domesticated stocks from agricultural systems. A large body of evidence suggests that NTFP management and harvest can serve the forest industry in many ways. There are four possible types of interaction between the NTFP and timber industries: independent resource use, competition for resources, complementary resource use and symbiotic resource use. Integration of both industries in a sustainable manner will need to be supported with research that address economic, social, policy and ecological questions.

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Abstract: Many products are harvested from the forests of the eastern United States that are not timber-based but originate from plant materials. Over the past decade, concern has grown about the sustainability of the forest resources from which these products originate, and an associated interest in managing for these products has materialized. A content analysis of the management plans of 32 eastern national forests revealed that seven of the plans addressed nontimber forest products (NTFP). We used interviews with USDA Forest Service district- and forest-level managers to convey their ideas about NTFP management and to identify critical issues that affect efforts to manage for these products.

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41. Kline, J.D., R. J. Alig and R. L. Johnson (2000), 'Fostering the Production of Non-Timber Services among forest owners with heterogeneous objectives', Forest Science, Vol.46, No.2. pg.302-311.

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43. Marshall, E., A. C. Newton and K. Schreckenberg (2003): "Commercialization of non-timber forests products: first steps in analyzing the factors influencing success," in *International Forestry Review*, Vol. 5(2), Pg. 128 – 137, June 2003.

Abstract: Although trade in non-timber forest products (NTFPs) has been widely promoted as an approach to rural development, recent research has indicated that NTFP commercialization is often not successful. Analysis of the factors influencing success of NTFP commercialization has been hindered by the lack of an appropriate analytical approach for comparison of case studies. We tested and further developed a methodology recently developed by CIFOR, by examining 16 NTFP case studies in two workshops held in Mexico and Bolivia involving a variety of stakeholders involved in NTFP commercialization. Workshop participants identified a wide range of measures by which the success of NTFP commercialization can be defined, which included improvements in social justice, community organization and local culture, as well as economic status. Participants then considered the factors influencing the processes involved in NTFP commercialization: production, collection, processing, storage, transport, marketing and sale. In total 45 factors were identified that significantly limit one of the commercialization processes. Generally product marketing and sale were found to be those processes most constraining overall success. These results illustrate how participatory methods can be of value in analyzing the success of NTFP commercialization, and how a process-based approach can provide an analytical framework for comparison of NTFP case studies.

44. Vance N. C. and J. Thomas, eds. (1997): "Special Forest Products: Biodiversity Meets the Marketplace", General Technical Report GTR-WO-63. U.S.D.A. Forest Service, Proceedings from a seminar series, "Special Forest Products—Biodiversity Meets the Marketplace" held at Oregon State University in 1995. The seminars were given by 11 experts who, with first-hand knowledge, offered new created approaches for developing, managing, and conserving nontimber forest resources.

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47. Pierce, A. R. (2003): "In search of comprehensive standards for non-timber forest products in the botanicals trade", in *International Forestry Review*, Vol. 5 (2), Pg.138-147, June 2003.

Abstract: Non-timber forest products (NTFPs) are receiving increased attention from standard-setting agencies including governments, trade associations, and private sector certification organizations. A sub-set of the NTFP category, botanicals, is witnessing a proliferation in standards-setting initiatives addressing topics as diverse as ecological sustainability, social justice, and product safety and efficacy. To examine this trend a survey of companies, industry associations, research institutions and NGOs worldwide was undertaken, and more than 100 sets of voluntary standards and regulations that apply to the trade or sourcing of botanicals were collected and analyzed. It was found that many sets of standards under development are single-issue oriented and fail to address the wide and overlapping range of questions that arise as a product moves from source to shelf. Although a range of problems arises from this fragmented approach, steps are available to streamline processes and make standards development and implementation more effective.

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Abstract: There is a rapidly growing interest in, and demand for non-timber forest products (NTFPs); they provide critical resources across the globe, fulfilling nutritional, medicinal, financial and cultural needs. However, they have been largely overlooked in mainstream conservation and forestry politics. Tapping the Green Market explains the use and importance of certification and eco-labeling for guaranteeing best management practices of non-timber forest products in the field. Using extensive case studies and global profiles of non-timber forest products, this volume not only furthers our comprehension of certification processes but also broadens our understanding of non-timber forest product management, harvesting and marketing. It will prove invaluable for forest managers, policy makers and conservation organizations as well as for academics in these areas.

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Abstract: Increased trade in non-timber forest products (NTFPs) has been promoted as one possible means to slow tropical deforestation by increasing the economic value of intact forest. A market survey of NTFPs occurring in the Capim River basin in eastern Amazonia, Brazil demonstrated that the reality for many smallholder communities in frontier and remote regions includes chronic transportation difficulties, high variability in fruit production, perishable products and lack of market expertise. In some communities, declining abundance of NTFPs due to logging and fire has resulted in a lack of forest products to even meet subsistence needs. In areas close to cities where transportation is assured and where forest clearing has eroded the natural occurrence of some valuable native NTFPs, smallholders who manage and successfully market native fruit and medicinal species are overcoming these obstacles. In frontier regions undergoing rapid transformation, however, decline in locally used and regionally marketed NTFPs currently pose detrimental consequences for communities. Findings suggest that an overemphasis on NTFP marketing has diverted attention from local livelihood, resource access and subsistence issues.

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    This bibliography encompasses literature on the historic current scope of nontimber forest product industries in the Pacific Northwest and includes references on international markets and trade that bear on these industries. Key themes in the bibliography are biological and socioeconomic aspects of resource management for sustainable production; procedures for identifying, monitoring, and inventory important resources; means for technical innovation and resource development; and public education about nontimber forest resources. Social policy issues address the role of nontimber forest products in rural development and the spectrum of ethical considerations required for socially acceptable policy formulation. Economic literature covers estimating the contribution of non-timber forest products to the whole ecosystem economy, analyzing and planning for joint production of agro forestry systems, and enhancing the performance of nontimber forest product sectors. http://www.fs.fed.us/pnw/fight.pdf

52. **Virginia Tech Non-Timber Forest Products** (Southeastern U.S.A)
    A national clearing house focused primarily on NTFP products and markets. http://www.sfp.forprod.vt.edu/

53. **Non Timber Forest Product United States**
    Conservation and development information on commercial, recreational, and subsistence extraction of non-timber forest products (NTFP) in the United States.
    http://www.ifcae.org/ntfp/index.shtml

Resource Valuation Methods

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55. Godoy, R., N. Brokaw and D. Wilkie (1995): "The effect of income on the extraction of non-timber tropical forest products: model, hypotheses, and preliminary findings from the Sumu Indians of Nicaragua", Human Ecology, Vol.23, No.1, pg.29-52.

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    Abstract: We evaluated the diversity, social, and economic aspects of nontimber forest product (NTFP) collection in the Nilgiri Biosphere Reserve (NBR), in southern India. The NBR is a region known for its floral and faunal diversity, as well as an area with increasing human pressure. Fifty to 75% of the households (HH) in rural areas gather a diversity of forest products. Dominant NTFPs contributed 25-60% of the average annual per capita household income from NFTPs. The mean annual per capita household income from NTFPs ranges between Rs. 134 and Rs. 4955. The mean annual income per hectare ranges from Rs. 93 in the montane zone to Rs. 3780 in the moist deciduous. NTFPs contribute 15-50% of the annual per capita income of rural households. Ethnicity plays an important role in the collection of NTFPs and ethnic tribes derive a large proportion of their annual per capita income front NTFPs.

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    Abstract: Due to increasing recognition of the importance of Non-Timber Forest Products (NTFPs) to local livelihoods and biodiversity conservation, the need for accurate assessment of NTFPs growing stock and yields as well as identification of sustainable harvesting options has become more critical than ever before. This paper seeks to explore how learning is taking place in Nepal in order to develop **NTFP** resource assessment and sustainable harvesting techniques based on an analysis of case studies from contrasting contexts. Using an adaptive management approach as a framework, the analysis focuses on developing an understanding

of the strong and weak aspects of the current methodologies, leading to recommendations for ways forward.

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Environmental Aspects

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65. Belcher, B. M. (2003): "What isn't an NTFP?", in *International Forestry Review*, Vol.5 (2), Pg. 161- 162, June 2003.

66. Broekhaoven, G. (1996): "Non-timber forest products: ecological and economic aspects of exploitation in Colombia, Ecuador and Bolivia", IUCN Forest Conservation Program. Published by IUCN, Gland Switzerland and Cambridge, UK in collaboration with development of plant ecology and evolutionary biology, University of Utrecht.

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    Abstract: We examined the response of forest tree species with different dispersal modes to anthropogenic pressure in dry deciduous forest of South India. The species and their populations were sampled in two forest stands, one in proximity to a Soliga settlement (greater disturbance) and the other distant to the settlement (lower disturbance). Our results suggest that the populations of animal dispersed species than those of wind or passively dispersed species are more vulnerable to human disturbance. In fact wind dispersed species seem to be facilitated by human disturbances. The proximal site has a higher representation of understory plants and seedling belonging to wind dispersed species than that of animal dispersed species. We discuss the results in the contest of the of dispersal mode in shaping species response, and vegetation composition of forest to anthropogenic pressures.

68. Gautam, K. H. and T. Watanabe (2002): "Silviculture for Non-Timber forest product management: Challenges and Opportunities for Sustainable Forest Management", in *Forestry Chronicle*, Vol. 78(6), Pg. 830-832, Nov-Dec 2002.

    Abstract: Recent concerns regarding non-timber forest product (NTFP) management are focused on raw material production, but NTFP ought to be viewed from the perspective of ecological processes, cultural heritage, livelihood of local people, economic values and incentives for forest management. This broader role for NTFP cannot be realized by simply domesticating a few species, Integration of NTFP in forest management is necessary in order to achieve sustainable forestry. Because forestry technologies are developed with timber values uppermost, it is vital to develop forest management technologies that take into account both timber and non-timber values. Global examples show that traditional knowledge could play a vital role while developing silvicultural regimes, and in situ experimentation will strengthen the regimes. Guidelines for ethno botanical studies are briefly presented.

69. Hertog, W. H. and K. F. Wierum (2000): "Timur (*Zanthoxylum armatum*) production in Nepal: Dynamics in Non-timber Forest Resource Management", *Mountain Research and Development*, Vol. 20. No 2. Pg. 136-145.

    Abstract: The use of nontimber forest products (NTF-Ps) in tropical forest management is currently receiving greater attention. Use of NTFPs starts with extraction from natural forests but may gradually be intensified to cultivation of domesticated trees. In order to enhance understanding of the evolutionary processes in NTFP production, this article analyzes the different management systems of timur (Zanthoxylum armatum) production in Nepalese forests. Products of this medicinal plant are regularly traded with India. Four different

management regimes on open-access state lands, two different types of community-controlled lands, and private lands are described, each being characterized by a specific set of access regimes, organizational rules for collecting and managing timur, and management practices. A gradual increase in management intensification takes place from public lands to private lands as a result of various socioeconomic and politico-legislative factors. In contrast to earlier Nepalese studies, increased market price rather than increased scarcity was found to be the most important factor inducing intensification. It is concluded that the effects of supply and demand factors on management intensity of NTFPs cannot be generalized; these effects depend on both the management and marketing characteristics of specific NTFPs.

70. Johnston, M. (1998): "Tree population studies in low-diversity forests, Guyana. II. Assessments on the distribution and abundance of non-timber forest products", in *Biodiversity and Conservation*, Vol. 7(1), Pg.73-86, Jan 1998.

    Abstract: Comparisons between two forest localities were undertaken to assess the potential availability of non-timber forest products (NTFPs) within the low-diversity forests of Guyana. Information on the abundance and distribution of tree species, and local and national ethno botanical surveys were used classifying species into five categories (timber, construction, technological, edible and medicinal). A total of 152 species were recorded from the two localities; covering 236 different uses, 33 known commercial timber species and 106 species with potential non-timber product utilization. The most important plant families with the highest number of uses at both localities were Leguminosae (subfamilies Caesalpinioideae and Mimosoideae), Arecaceae, Bombacaceae and Chrysobalanaceae, although these families were not the most abundant families at both localities. At both forest localities eight tree species represented over 50% of all the trees. At Kurupukari three species, each with more than three identified NTFPs, represented over 20% of the trees.

    Potential utilization of NTFPs are discussed in accordance with species richness, tree density, the number of different uses per species, and the percentage of trees represented by each utilizable species. Considering the constraints on the future potential commercialization of NTFPs, two scenarios for the extraction of NTFPs are discussed. Within relatively species-rich forest types the high diversity of products provides potentially viable multiple-species extractionism. In contrast, in low-diversity forest types, typical of the Guiana Shield, one or two NTFP species frequently represent over 50% of the canopy trees, and therefore substantially increase the potential sustainable extraction for single-species harvesting. It is suggested that these low-diversity types of forest are prioritized for conservation on the basis of ensuring future utilization, refuge, of non-timber forest products.

71. Lawrence, A. (2003): "No forest without timber?", in *International Forestry Review*, Vol. 5(2), Pg. 87, June 2003.

    Abstract: The spotlight on NTFPs has changed the face of forestry, but is also a product of its time, emerging in the context of increasingly pluralistic forest management. Early hopes that NTFPs would underpin rural livelihoods, and rescue rural populations from poverty while providing them with a reason to protect and manage forests, led to exaggerated claims of economic potential. They also tended to overlook the great diversity of products referred to, in terms of biological characteristics, and social and economic value, whilst simultaneously ascribing unreasonably lofty and altruistic goals to some of the world's poorest people. This overview of the contributions to this special issue of 1FR points to the more sophisticated understanding of NTFP potential that has been acquired since the early 1990s. Focus on differences among NTFPs has led to literature around more specific groupings, such as 'bushmeat', 'indigenous forest fruits' or 'medicinal plants', each providing a more useful lens for assessing ways in which such products lead to sustainable rural livelihoods and forest management. However, contemplation of NTFPs as a group reminds us that forestry is a

complex multi-stakeholder management system. Where in a focus on any one subset of components cannot ignore the ecological and social systems of which they form part. The methodological developments portrayed here advocate a more systemic approach, combining biological and economic approaches with NTFP users' own perceptions and knowledge within adaptive forest management, thereby side-stepping the hazards of the NTFP category.

72. Mahapatra, A. and C.P. Mitchell (1997): "Sustainable development of non-timber forest products: Implication for forest management in India", in *Forest Ecology and Management*, Vol. 94 (1-3), Pg. 15-29, June 30, 1997.

    Abstract: Sustainable exploitation of non-wood forest resources as a means for achieving the complimentary objectives of natural forest conservation and income generation for rural inhabitants has drawn international attention in recent years. Accomplishing these dual goals requires an understanding of how non-timber forest products (NTFP) extraction and marketing functions in the tropical regions. This is often hindered by an absence of basic research and analysis. The paper reviews the prevailing management systems and forest policy in India with a view to examining the problems and prospects for NTFP development. Factors influencing the production of economically important NTFP were determined through a case study and the deficiencies in the existing marketing strategy were analyzed. Measures to improve the extraction system for higher returns to both the state forestry sector and primary collectors were highlighted and the need for domestication of NTFP species was stressed.

73. Menton, M. C. (2003): "Effects of logging on non-timber forest product extraction in the Brazilian Amazon: Community perceptions of Change", in International Forestry Review, Vol. 5(2), Pg. 97 – 105, June 2003.

    Abstract: Community perceptions are used to assess the effects of logging on non-timber forest product (NTFP) extraction in a case study Community in the Tapajos-Arapiuns Extractive Reserve, Para, Brazil. Rapid Rural Appraisal (RRA) is used to explore changes in community harvests of, and access to, the most important NTFPs. Community estimates showed a decline in fruit and nut harvests after conventional logging (CL) (with a forest-gate value reduction of 86%). According to community estimates, hunting rates declined 62%, after CL. Changes in abundance and accessibility of NTFP resources were seen as the key factors affecting harvest rates. Overall, the community held a negative impression of the effects of commercial logging on both NTFP extraction and community life in general.

74. Misra, M. K. and S. S. Dash (2000): "Biomass and energetics of non-timber forest resources in a cluster of tribal villages on the Eastern Ghats of Orissa, India", in *Biomass & Bioenergy*, Vol. 18(3), Pg. 229 – 247.

75. Pandit, B. H. and G. B. Thapa (2003): "A tragedy of non-timber forest resources in the mountain commons of Nepal", in *Environmental Conservation*, Vol. 30(3), Pg. 283-292, Sept. 2003.

76. Peres, C. A. and I. R. Lake (2003): "Extent of Non-Timber resource extraction in tropical forests: Accessibility to game vertebrates by hunters in the Amazon basin", in *Conservation Biology*, Vol. 17(2), Pg. 521-535, April 2003.

77. Perez, M. R. and N. Byron (1999): "A methodology to analyze divergent case studies of non-timber forest products and their development potential", in *Forest Science*, Vol. 45(1), 1-14 Feb, 1999.

78. Prajapati, T. B., N. K. Rasaily and S. S. Neupane (2000): "Participatory NTFP resources assessment and management", in S. M. Amatya (ed.), Proceeding of the third regional workshop on community based NTFP Management. Institute of Forestry, Pokhara, Nepal.

79. Romero, C. (1999): "Reduced-impact logging effects on commercial non-vascular pendant epiphyte biomass in a tropical montane forest in Costa Rica", in *Forest Ecology and Management*, Vol. 118(1-3), Pg. 117-125, June 14, 1999.

    Abstract: Compatibility of different commercial uses of a montane tropical oak-bamboo forest in Costa Pica was assessed for selective logging and harvesting of non-vascular pendant epiphytes, a focally valuable non-timber forest product (**NTFP**). The nonvascular pendant epiphyte taxa examined were mosses (*Pilotrichella flexilis, Phyllogonium viscosum, Zelometeorium* sp., *Squamidium leucotrichum*); liverworts (*Frullania convoluta* and *Frullania* spp.); and lichens (*Usnea* spp.). All of these species have pendant life-forms, and apparently play key roles in water interception, thereby influencing the hydrological balance in tropical montane ecosystems. Since the growth of pendant non-vascular epiphytes conversely depends on fog and mist, these species could be used as indicators of health of the tropical montane forests where they abound. Nine years after careful selective logging, no negative impacts were detected on the biomass of these NTFPs at the heights at which they are commercially harvested (1-3 m). This result was established through comparisons of logged and non-logged plots on the basis of abundance (biomass) of the commercial bryophytes and related variables such as substrate length availability and substrate type (shade tolerant, pioneer species, or bamboo, and substrate diameter). Pendant epiphytes were most abundant on thin substrates (branches <1 cm in diameter); the highest biomass values per unit substrate length were found on branches of shade-tolerant species.

80. Ros-Tonen, M. A. F. (2000): "The role of non-timber forest products in sustainable tropical forest management", in *HOLZ ALS ROH-UND WERKSTOFF*, Vol. 58(3), Pg. 196 – 201, Oct. 2000.

    Abstract: The importance of non-timber forest products (NTFPs) for forest-dwelling people in the tropics and the relatively small ecological impact of their exploitation has raised high expectations as to their potential to contribute to tropical forest conservation. Three major issues in relation to NTFPs are addressed: their potential to contribute to the conservation of tropical rainforests; their potential to improve the livelihood of forest-dwelling peoples and their potential for participatory forest management. It is concluded that for the proper management of NTFP resources, it is necessary to be specific about the aim of NTFP development and to take account of ecological as well as social and economic factors. Policymaking and land-use planning must furthermore take into account that NTFP extraction is part of an overall livelihood strategy of the people involved, in which other economic activities also play a role.

81. Shankar, U., K. S. Murali, R. U. Shankar, K. N. Ganeshaiah and K. S. Bawa (1998): "Extraction of non-timber forest products in the forest of Bilgiri Rangan Hills, India. 4. Impact on floristic diversity and population structure in a thorn scrub forest", in *Economic Botany*, Vol. 52(3), Pg. 302-315, July-Sept. 1998.

    Abstract: Impact of extraction of non-timber forest products (NTFPs) was analyzed in a thorn scrub forest in Biligiri Rangaswamy Temple (BRT) wildlife sanctuary India. Six species are most commonly extracted from BRT scrub for subsistence and income generation by an aboriginal tribe, the Soliga. Although the forest has been provided protection from indiscriminate felling since 1978 under a wildlife sanctuary cover, changes in vegetation structure are still occurring as a consequence of anthropogenic pressure in the form of extraction of fuelwood and other NTFPs. The results indicate that large woody species are being replaced by small woody species. The population structure also is becoming increasingly skewed to the smaller size classes due to extraction-bound mortality of the individuals, particularly those >7 cm and above. The data suggest that the scrub community, itself may be a manifestation of long persisting anthropogenic pressure in the form of extraction of a variety of

forest products, and it currently represents a downward transition from a deciduous forest to a shrub thicket.

82. Shiva, M. P. (2001): " A brief scenario of utilization prospective of non-timber forest products (NTFP's) for socio-economic growth, environment and biodiversity conservation", MFP News Vol. 11(3): 4-5

83. Tewari, D. D. and J. Y. Cambell (1996): "Increased development of non-timber forest products in India: some issues and concerns", *Unasylva* 187, Vol. 47, pp 26-31.

84. Zakharenkov, A. (2003): "The priority tasks of optimization of NTFP management and usage in the Russian Far East", in *International Forestry Review,* Vol. 5(2), Pg.89-90, June 2003.

General and Websites

85. Guidelines, Standards, and Regulations for Trade in Non-Timber Forest Products (NTFPs) and Botanicals. This contains an annotated collection of guidelines, standards and regulations for trade in non-timber forest products (NTFPs) and botanicals. This report resulted from a study undertaken by the Rainforest Alliance to look at how to make the production, harvesting and marketing of botanicals more sustainable for the land these products grow on, more valuable for the communities where they grow, and in helping businesses contribute to strategies that will work to do these things.

86. "Nontimber Forest Products in the United States", Jones, Eric T; McLain, Rebecca J; and James Weigand. "Nontimber Forest Products in the United States." University Press of Kansans May 2002.

    This book provides the first comprehensive examination of nontimber forest products (NTFPs) in the United States, illustrating their diverse importance, describing the people who harvest them, and outlining the steps that are being taken to ensure access to them. As the first extensive national overview of NTFP policy and management specific to the United States, it brings together research from numerous disciplines and analytical perspectives--such as economics, mycology, history, ecology, law, entomology, forestry, geography, and anthropology--in order to provide a cohesive picture of the current and potential role of NTFPs.
    http://www.kansaspress.ku.edu/jonnon.html

87. **Agrifor**
    AgriFor is a gateway to evaluated, quality Internet resources in agriculture, food and forestry, aimed at students, researchers, academics and practitioners in agriculture, food or forestry.
    http://agrifor.ac.uk/browse/cabi/detail/bd7f73aa6986d9aca18bf4c6e2cda777.html

88. **NTFP.org**
    This site contains definition of NTFPs, current activities that include a mission to Bhutan to complete the formulation process of the Second Eastern Zone Agricultural Project, and an exporter's database.
    http://www.ntfp.org/

89. **Soil association**
    The Soil Association is the UK's leading campaigning and certification organization for organic food and farming.
    http://www.soilassociation.org/web/sa/saweb.nsf/Farming/nontimber.html

90. **Center of Minor Forest Products** (India & Global)
    This website is geared toward promoting sustainable NTFP development with an emphasis on India. The website list many publications regarding NTFP's and contains useful databases.
    http://www.angelfire.com/ma/MinorForestProducts/

91. **FAO Non-wood Forest Products Website** (Global)
    This website is a major source of international NTFP information and includes an online version of their regular newsletter as well as searchable database of NTFP researchers, organizations, businesses, and more.
    http://www.fao.org/forestry/foris/webview/fop/index.jsp?siteId=2301&langId=1

92. **Pacific Network for Non-Timber Forest Products (**Pacific Rim)

The Pacific Network for NTFPs (PNN) develops interdisciplinary research and analysis on NTFP issues, including the recognition and protection of cultural, spiritual, recreational and subsistence values.
http://www.island.net/~ntfp/

93. **Non Timber Forest Product**
http://www.dcnr.state.pa.us/forestry/sfrmp/nontimber.htm

94. **The North Island NTFP Demonstration Project**
A project of Royal Roads University, Victoria, B.C. to learn "how best to manage non-timber forest resources in a way that is environmentally sustainable, economically viable and socially equitable." The project's final report is available on the website

95. **Falls Brook Centre (FBC)**

A New Brunswick environmental organization promoting, among other things, non-timber forest products (NTFP). FBC has organized an international NTFP Focus Group with participants from over 20 countries. "The mandate of the Focus Group is to promote field trials of NTFP certification, offer guidance to certifiers on the management of NTFPs, promote the inclusion of NTFPs in national initiatives and recommend refinements to FSC policy. The Focus Group has also served as a loose information network regarding the sustainable management and marketing of NTFPs." Focus Group documents are available on the site.