Forest products and traditional peoples: Economic, biological, and cultural considerations

Bradley C. Bennett

Abstract

Conservationists and environmental economists have promoted the extraction of non-timber forest products (NTFP) as an alternative to forest conversion and as a means to benefit forest peoples. This article discusses the development of NTFP economic analyses and some economic, biological and socio-cultural constraints on the use of forest resources and methodological limitations of NTFP investigations. Several case studies document the importance of the forest in both North and South America. While studies differ in their conclusions regarding the sustainability of NTFP extraction, most researchers agree that sustainable harvesting is rare. The article argues for additional considerations that transcend the biological and economic concerns. While forests provide the basis of material culture for peoples that inhabit them, they are also linked intrinsically to the religion, mythology, and psyche of native peoples. Conservationists have an ethical obligation to consider the needs and desires of these people in conjunction with conservation and management plans.

Keywords: Non-timber forest products (NTFP); Amazonian Ecuador; Chachi; Quichua; Seminole; Afro-Americans; Economic evaluation; Sustainability.

1. Introduction

During the past decade, extraction of non-timber forest products (NTFP) has been promoted as an alternative to agricultural and timber harvest in tropical forests. The term NTFP “encompasses all biological materials other than timber which are extracted from forests for human use” (NTFP, 2002). Tropical forest resources have been traditionally divided into two categories: timber and minor forest products. The latter category, now called NTFP, was named for its perceived low value. It is axiomatic that NTFP are important, at least on some scale. Plants are the basis of the material culture in all societies. For traditional people, the forest serves as convenience market, grocery, pharmacy, hardware outlet, lumberyard, and department store. As can be seen from Table 1, the Shuar of Amazonian Ecuador, for example, utilize nearly 600 species of plants from their fields and forests (Bennett et al., 2002, Table 1). Such a large number is not unusual, at least when compared to other Amazonian groups (see e.g., Balée, 1994).

The harvest of NTFP is economically significant throughout the world. An estimated 80% of the population of the developing world use NTFP for their daily needs, and the value of global trade in NTFP has been estimated at $US1.1 billion per year. The economic significance of NTFP, however, is not the only consideration. Conservationists have an ethical obligation to consider the needs and desires of these people in conjunction with conservation and management plans.

Table 1. Number and percentage of useful Shuar plants by use category

<table>
<thead>
<tr>
<th>Use category</th>
<th>Number of used species</th>
<th>Percentage of used species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>68</td>
<td>11.7%</td>
</tr>
<tr>
<td>Construction</td>
<td>91</td>
<td>15.7%</td>
</tr>
<tr>
<td>Craft</td>
<td>35</td>
<td>6.0%</td>
</tr>
<tr>
<td>Dye/Paint</td>
<td>9</td>
<td>1.5%</td>
</tr>
<tr>
<td>Fibre</td>
<td>30</td>
<td>5.2%</td>
</tr>
<tr>
<td>Fishing</td>
<td>10</td>
<td>1.7%</td>
</tr>
<tr>
<td>Food</td>
<td>177</td>
<td>30.6%</td>
</tr>
<tr>
<td>Food preparation</td>
<td>26</td>
<td>4.5%</td>
</tr>
<tr>
<td>Forage</td>
<td>142</td>
<td>24.5%</td>
</tr>
<tr>
<td>Fuel</td>
<td>89</td>
<td>15.4%</td>
</tr>
<tr>
<td>Hunting</td>
<td>26</td>
<td>4.3%</td>
</tr>
<tr>
<td>Medicine</td>
<td>211</td>
<td>30.4%</td>
</tr>
<tr>
<td>Ornamental</td>
<td>24</td>
<td>4.1%</td>
</tr>
<tr>
<td>Personal</td>
<td>25</td>
<td>4.3%</td>
</tr>
<tr>
<td>Poison</td>
<td>16</td>
<td>2.8%</td>
</tr>
<tr>
<td>Ritual/mythical</td>
<td>32</td>
<td>5.5%</td>
</tr>
<tr>
<td>Tools</td>
<td>10</td>
<td>1.7%</td>
</tr>
<tr>
<td>Veterinary</td>
<td>18</td>
<td>3.1%</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>13</td>
<td>2.2%</td>
</tr>
<tr>
<td>Total</td>
<td>578</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Bennett et al., 2002.
billion (FAO, 1997). About 300 families in South Carolina, USA make baskets from sweetgrass collected in the wild (DeVault et al., 1993). Padoch (1988) found that 500 people in Iquitos, Peru marketed fruits or fruit products from a single forest species, *Mauritia flexuosa.* Small-scale NTFP-based ventures employed 237,000 people in Zimbabwe: almost 15 times more people than were engaged in forestry and related industries (FAO, 1995). Forest products in Honduras provided 37–40% of mean annual household consumption of the Tawakah people (Godoy et al., 2002).

Much of the interest in NTFP has emerged from economic analyses of these products. While the natural biota yields material provisions for market economies, it has even greater significance for traditional cultures, who collect and directly use biological resources. In this article, the status of economic evaluation of NTFP is reviewed and several case studies from North and South America are examined. In addition to the common practice of considering the role of NTFP in the material culture, the importance of the non-material value of forest goods is also considered.

2. History of interest in NTFP

In 1989, Peters, Gentry and Mendelsohn published a seminal paper on the economic value of NTFP. They estimated the value of minor products from a one-ha, lowland forest plot located 30 km from Iquitos, Peru. They identified 72 species (26.6% of total) and 350 individual (41.6% of total) tree species (>10 cm diameter-at-breast-height or dbh) that had market value in Iquitos. Net present value (NPV) of fruit and latex was $US 6,330 (discount rate had market value in Iquitos). Net present value (NPV) of tree species (>26.6% of total) and 350 individual (>41.6% of total) tree species (>10 cm dbh). While most species were used (Bennett, 1992a), 13 most species-rich plot contained 249 tree species (>26.6% of total) and calculation of standard errors for all estimates. The net present value derived from extraction exceeded that of cattle ranching and timber extraction and compared favourably to the NPV of shifting cultivation.

3. NTFP case studies

3.1. Quichua pottery

An estimated 60,000 indigenous Quichua, or Runa as they call themselves, live in Amazonian Ecuador. The Quichua represent the amalgamation of several lowland cultures and perhaps migrants from the highlands. The Quichua language, called Quechua in Peru, was the lingua franca of the Inca Empire. Nowadays, several dialects are spoken. The Quijos Quichua are swidden agriculturists and hunters. In 1990, an Ecuadorian colleague, Rocío Alarcón, and I began an ethnoanatomical survey of the one-hectare plots used in the Grimes et al. (1994) study, to determine Quichua names and uses of all trees found in the plots. During the initial research, Quichua collaborators made no mention of the marketing of shilquillo, the resin from several species of *Protium.* We were aware of the resin’s utility, but the Quichua cited only the timber and medicinal value of these trees. Within one year, shilquillo resin had became one of the most important products of the area, representing 50–65% of the net revenue generated from the terra firme plots and 31% of the net revenue from the alluvial plot. This development was the result of increased ecotourism. As security conditions deteriorated in Peru and Colombia, more ecotourists chose Ecuador as a destination, in view of its safe and convenient access to the Amazon. Increased visitation sparked a revival of the traditional pottery making, in which shilquillo is used as a glaze. When plastic and aluminum goods became prevalent, the Quichua abandoned earthenware, except for ceremonial *chicha* bowls. Tourists created a new demand for indigenous crafts. One concern for NTFP extraction is that the tourist trade is capricious and could evaporate instantly as a result of political or economic instability.

---

1 Author citations and families of all plant binomials cited in the text are given in the Appendix.

2 A beverage made from fermented cassava (*Manihot esculenta*) roots.
3.2. Chachi baskets

The Chachi, formerly known as the Cayapas, are a small indigenous group (ca. 4,000) who inhabit the Esmeraldas Province in northern Ecuador. They live primarily along the Rio Cayapas, subsisting on swidden agriculture, hunting and fishing (Bennett, 1994a, 1994b). In 1994, a former Peace Corps volunteer (Patricia Terrack), who has lived with the Chachi for several years, and I initiated a project to construct a traditional Chachi house at the Fairchild Tropical Garden in Miami, Florida, USA. The goal of the project was to present Chachi culture to the outside world and raise awareness about destruction of their forests and culture. An additional objective was to launch a pilot project to sell baskets made by the Chachi, who fabricate a variety of products from the petiole of Carladuvica palmata (Bennett, 1994c). In Ecuador, these baskets sold for a nominal price of US$ 0.25–0.50. Our objective was to make a US$ 5.00 profit per basket. We imported several hundred baskets and other crafts to the Fairchild Tropical Garden, all of which were sold promptly in the Garden’s shop. In addition to the publicity generated by building the Chachi house, visitors to the Garden were captivated by the crafts made by indigenous rainforest dwellers. We initially purchased the baskets at above average Ecuadorian prices, and the Chachi artisans were delighted to sell such a large quantity. They were even more delighted when we returned several months later and gave them the proceeds from the sales in the United States. During the pilot project, there had been no cost for transportation since the baskets had been shipped in a maritime container along with material for the house and several dugout canoes for the display at the Fairchild Tropical Garden. Nonetheless, our calculations showed that we could easily net US$5.00 per basket even allowing for transport costs; larger baskets sold for US$15.00–25.00. These baskets were sold promptly in the Garden shop. In addition to the baskets, we also sold two Seminole baskets made by Seminole women, for example the Kuna of Panama and Otavaleños of Ecuador, have been particularly successful in promoting their crafts in international markets, while at the same time protecting their cultures.

3.3. Seminole baskets

One need not look to the tropics to find NTFP. The Seminoles are the indigenous people most closely associated with the state of Florida (Bennett, 1997a and b and 2001) — yet they are relative newcomers. The state’s first inhabitants arrived about 12,000 years ago. When Ponce de León stumbled upon the state in 1513, the indigenous population numbered as many as 350,000. Two and a half centuries later, all of the state’s original inhabitants were extinct (Milanich, 1995). Creek people from Alabama and Georgia soon filled the void left by the extirpation of Florida’s first people. By 1812 the Creek, who had become known as Seminoles, had established six villages in Florida. Seminole is derived from the Spanish word cimarron, which means wild or untamed. Conflicts with settlers led to a series of three wars. The Seminole population, which had risen to 5,000 before the wars, was reduced to a few hundred by the end of the last conflict in 1858. The descendents of the survivors of the Third Seminole War now number more than 2,000. They are represented by three groups — the Seminole Tribe, the Miccosukee Tribe, and the non-affiliated independents (Bennett, 1997a). Seminole women fashion dolls from the petiolar fibres of saw palmetto Serenoa repens, which they call sheopen.
shigra, a cloth bag of open weave known by the Quichua term piñe (Muhlenbergia capillaris var. filipes) that can sell for several hundred dollars. They seem to have adopted this practice from escaped African slaves in the 1800s. Coils of sweetgrass are tied with fibres from sabal palm (Sabal palmetto) leaves. Long-leaf pine (Pinus palustris) or slash pine (Pinus elliottii) needles and black rush (Juncus roemerianus) stems are added for strength and color (Dufault et al., 1993; Rosengarten, 1987).

3.4. Shuar crafts

The Shuar live in Ecuador’s Morona–Santiago Province in the region drained by the rivers Pastaza, Morona, Upano, and Zamora. The related Achuar people live north of the Ecuadorian-Pervian border. Previously called Jivaros, a pejorative Spanish term, the Shuar were notorious for their war-like nature and for making tsantsas — shrunken heads. A Spanish expedition led by Hernando de Benavente encountered the Shuar in 1549. During the next 50 years, the Spanish searched for gold and began trade relations in the region. The Spanish demand for a gold tribute from the Shuar prompted their successful uprising in 1599, freeing the Shuar from Spanish control. Until 1870, Macas remained the only permanent, white settlement near the Shuar (Harner, 1972). Since 1870, there has been increasing westernization through Catholic and Protestant missions, and through exploration for quinine, rubber, gold, and oil. In 1964, the Salesian Mission helped establish the Federación Provincial de Centros Shuara. Located in Sucia, the federation is considered the most effectively organized indigenous organization in South America (Whitten, 1981). With improved access to markets, the Shuar are shifting their livelihood to one based on cattle, timber, and cash crops.

The Shuar make necklaces from shuke (Erythrina spp.) and yusuri (Cosc lacyms-jobi L.) seeds. Catholic missionaries may have introduced the latter species for rosary beads. Shuar women weave wambíchi (a small bag) from kumúi (Astrocaryum chambira) fibres. They also make a cloth bag of open weave known by the Quichua term shigra. The Shuar construct baskets from the roots of kasp (Heteropappus oblongifolius) and from the petiole of pumpuna (Caraludovica palmate). Tsápa (Crescentia cujete) fruits are especially prized for making containers. The split fruits are cleaned and often elaborated with engraved designs. The Shuar fashion flutes from nankuchip (Lasiacis ligulata and L. sorghoides) and carve drums from large temashnum (Apehia aspera) trunks (see Bennett et al., 2002 for more details). As ecotourism develops and markets increase, the Shuar and related Achuar have begun to sell these products more widely. Ramiro Vargas, a native Achuar from the Ecuadorian village of Kapawi, visited the United States recently to develop a market for Achuar indigenous crafts and their ecotourist lodge. With external support, the Achuar have developed ecotourism facilities. They receive a monthly rent that increases by 7% annually, and will obtain full control and ownership of the project in 2011.

4. Limitations to NTFP

Conservationists have expressed interest in NTFP for at least three reasons (Arnold and Ruiz Pérez, 2001):

1. NTFP contribute to the welfare of nearby human populations.
2. NTFP harvest is less destructive than other land uses.
3. NTFP harvest bolsters the perceived value of tropical forest.

While few would argue about the merits of the first reason, the economic contribution is debatable. As such, the ability of NTFP to promote rainforest conservation also is equivocal. Moreover, many argue about the effects of harvesting on the rainforest. While it may be less harmful than other uses, extraction is by no means benign. Various researchers have identified economic, biological, and socio-cultural problems of NTFP. Even more fundamental is the controversy over methodology.

4.1. Methodology

Economic analyses of NTFP are riddled with methodological problems. The first problem concerns sample size. In part, this is due to the difficulty of establishing a one-hectare plot in lowland tropical forests. The study by Peters et al. (1989) was based on a single plot; Grims et al. (1994) included only three plots. A single plot may include 500–2,000 stems (> 10 cm dbh) distributed among 250 or more species. Botanical identification of trees requires the collection of fertile voucher specimens. Trees may not flower every year and canopy access is difficult. Therefore, most published economic studies, indicate more about a particular plot than they do about a region. Another sampling problem is plot location. Plots should be located randomly, not placed according to accessibility, floral diversity, or abundance of useful plants.

The standard forest inventory and economic valuation suffers from yet another problem: it indicates an economic potential, not a quantity actually realized by local harvesters.
An alternative method is based on interviews with collectors to ascertain actual harvest quantities. Harvest estimates based on interviews, may be unreliable, however (Gram, 2001), or unverifiable. In a recent survey, Wong et al. (2001) found that only 20% of the ethnobotanically based and 38% of all examined studies met sound statistical and sampling criteria. Gram (2001) criticizes some studies, such as Grimes et al. (1994), for ignoring timber.

Ignoring timber can be a legitimate objection but, in that paper, the co-authors (including myself) ignored wood harvest for the following reasons:

- The study took place in a biological reserve where timber harvest is not permitted.
- Timber is undervalued in the region.
- At the time of the study, transportation and market access were unreliable.

Timber, nonetheless, is an important resource in the region. While Rocío Añez and I were conducting the ethnobotanical surveys, one of the local collaborators joked that the forest was muy huapa (very attractive). The pun referred both to female researchers in the reserve and to the overall beauty of the forest. But, it was also a further play on words. Huapa is the Quichua term for several timber-producing Virola species (Bennett and Añez, 1994), and our local collaborators were eyeing the forest for its timber potential.

Most inventories focus on trees or select life forms of economic value. This is done solely for practical and not economic reasons. Small trees and saplings can be difficult to identify. Moreover, collection and identification of some life forms, such as epiphytes and lianas, can be difficult and time consuming, even though these are often used (Bennett, 1992b, 1995, 2000).

4.2. Economic uncertainty

Winston Churchill reportedly quipped, “If you put two economists in a room, you get two opinions, unless one of them is Lord Keynes, in which case you get three opinions.” Had Keynes been an environmental economist, three might be Lord Keynes, in which case you get three opinions. Another bone of contention is the problem of discounting. Lomley (1997) evaluates the ethics of environmental discounting and concludes that what is ‘good’ depends on who is making the assessment. “It is recognized that activities which have little variation in annual returns year after year will produce higher net present value than activities in which annual returns increase gradually over time. . . . The higher the discount rate, the greater the difference in the NPVs of such activities.”

Another problem with NTFP is that markets change. Fluctuations in the price of the two best-known non-timber products from Brazil, rubber (Hevea brasiliensis) and Brazil nuts (Bertholletia excelsa), are well documented. Extraction based on a few products is susceptible to the boom-to-bust cycles that have plagued the tropics. If tourism declines in Ecuador, then the NPV value of the sites studied by Grimes et al. (1994) could drop dramatically as well. Another disadvantage is the lack of opportunity to process botanical resources or manufacture value-added products from them, as exemplified by the following. In 1994, I interviewed an Afro-Ecuadorian on the Cayapas River who was paddling a canoe laden with nearly 200 kg of tagua (Phytelpea aquatorialis) nuts. He planned to sell the tagua in Baborín for a net profit of about US$ 20. If sold directly to carvers in the US, the same tagua consignment would fetch $1.00 each, which would translate to a total retail value of several thousand dollars.

Recent economic analyses have examined a more diverse array of options. Ricker et al. (1999) encourage enrichment planting of mamey (Pouteria sapota) in Mexico for its edible fruits. Echeverria et al. (1995) promote ecotourism, based on economic comparisons with alternative land uses in Monteverde, Costa Rica. Browder et al. (1996) advocate planting mahogany (Swietenia macrophylla), noting the trade-off between the higher economic return in pure stands and the greater ecological function in agroforest systems. In an even broader approach, Adger et al. (1995) argue for analyses that include the total economic value of Mexican forests by considering direct use, indirect use, option, and existence values.

4.3. Biological problems

One of the most basic of all research questions in the study of NTFP is “What species is it?” Linking a known product to its plant of origin (i.e., establishing the botanical identity of a resource) is a fundamental goal of ethnobotany (Bennett, in press). All subsequent research depends on the accurate determination of species. Using common plant names is not sufficient. In Amazonian Ecuador, for instance, Carludovica
little ways downriver. In 1992, Jim Burch commonly gave one of two replies: it occurs or it is not found in the region. Exploring along the Cayapas River was unfruitful. When asked about the plant, locals said that it was no longer found in the region. Exploring along the Cayapas River was unfruitful. When asked about the plant, locals commonly gave one of two replies: it occurs un poco mas arriba or a little ways upriver or a little ways downstream. In 1992, Jim Burch—a former Florida International University doctoral student—and I interviewed an Embera immigrant from Colombia. She wove baskets from the plant, but purchased the raw material from a fisherman. Jim and I eventually found the fisherman, who said that he obtained chocolatillo from another fisherman. Several days later, we located the chocolatillo supplier who showed us a small stand of the plant on a small tributary of the Santiago River: In the National Herbarium in Quito, I confirmed that the voucher we collected was Ischnosiphon aromann, a species used similarly in the Caribbean. Later, we learned that the plant’s mahogany sheen is developed during exposure to sunlight while it is being dried. The exercise cited above illustrates the time-consuming efforts that are required to identify a plant resource. In this case, the extensive harvest of the chocolatillo plant for many decades had driven most populations of the species to extinction.

Identification is only the first step. Knowledge of the basic biology of NTFP species is also needed. Where does the plant grow? How fast does it grow? How abundant is it? How does it reproduce? What pollinates and disperses it? What is its phenology (times of fruiting and flowering)? How many leaves and fruits, or how much latex does it produce each year? Knowledge of the latter is especially important for estimating the economic value of a plant product. Fruit traps, visual estimates, random branch sampling, and other techniques have been used to estimate fruit production, but all suffer from limitations. Moreover, biologists must consider both seasonal and year-to-year variation in life history traits. ‘Rapid assessment’ in relation to NTFP is an oxymoron.

Besides understanding biology at the species level, researchers must understand community and ecosystem dynamics. Godoy et al. (2002) note that the Tsimane appreciate Bactris gasipaes fruits and the Tawahka harvest mahogany (Swietenia macrophylla), tropical laurel (Corinda alliodora), and tropical cedar (Cedrela spp.) found in old growth forests. Bactris gasipaes, however, is known only from cultivation or abandoned fields. Likewise, the presence of laurel and mahogany suggest anthropogenic enrichment. Were these really natural forests or were they anthropogenic stands? Many tropical ecologists would argue that the distinction is meaningless since the human influence on tropical ecosystems is ubiquitous (e.g. Clark, 1996; Janzen, 1998).

Understanding the biology of forest products and their role within the ecosystem is a prerequisite for understanding ecological sustainability. The lack of sustainability is a major concern for NTFP extraction. What does sustainability mean? Elleringham (1984) defines a sustainable yield as one that does not exceed the capacity of the existing population to replace it. For Boost and Gullison (1995), sustainable means that there is no loss in species and no irreversible changes in ecosystem processes. Soulé (2001) identifies the following requirements for sustainability and concludes that it is rarely achievable:

1. Humans exploiting the resources must practice restraint so that the commodities can be harvested by them indefinitely.
2. Sustainable use assumes that people will continue to live in harmony with their ecosystems.
3. Sustainable exploitation assumes that markets do not change and that there will continue to be commercial uses for the harvested resources.

Are these conditions ever met? How much of a product can be harvested? Early economic studies assumed that harvest rates of 75% of total yield were sustainable (Peters et al., 1989; Grimes et al., 1994). This figure is convenient, but it has no biological basis. Examples of overexploitation abound. Leaf harvesting reduces clone size and reproductive output of Geonoma deversa in Peru (Flores and Ashton, 2000). Bark collection of Prunus africana is sustainable only if the interval between harvests exceeds 10 years and if large trees are not harvested. Seldom is either condition met (Stewart, 2001). In South Carolina, USA, sweetgrass has become scarce due to urbanization and coastal zone development. Basket makers must travel to Georgia and Florida to find the once common resource (Dufault et al., 1993).

The situation is even bleaker for most animal populations. The carrying capacity of human populations that rely exclusively on wild game can rarely exceed one person per km² (Robinson and Bennett, 2000). West Africa’s Biko Island would have to produce more than 4 million kg of meat each year to satisfy the estimated local demand for bushmeat. Sustainable hunting could provide only 0.6% of that amount (Fa, 2000) and, even when hunting is sustainable, animal populations may be maintained at such low...
levels that the functions of the species in the ecosystem are not fulfilled (Schaller, 2000).

4.4. Socio-cultural concerns
An economist has been defined as someone who knows the price of everything and the value of nothing. Placing a price on a resource and evaluating its potential for perpetual harvest is important but, by itself, is an insufficient practice. In some cases, the extraction of NTFP may supplement the income of traditional peoples and, at the same time, protect forest resources. One rarely considered role of NTFP is its function in times of scarcity and emergency (cf. Arnold and Ruiz Pétiz, 2001). The Shuar consume nearly 200 species of plants, of which only a small fraction contribute to their daily caloric intake. But in times of famine or during treks, these plants substitute for yuca (Manihot esculenta Crantz) (cassava) and other staples (Bennett et al., 2002).

There is much more to consider. Stocks (1996) argues that it is an error to assume that the prime objective of indigenous organizations is the conservation of biodiversity in some abstract sense. Similarly, Hill (1996) states that, “[t]he dilemma is, that conservationists wish to protect natural resources and native people wish to exploit them.” He notes that the Achí of Bolivia see no discrepancy between resource utilization and protection. Do traditional peoples protect resources merely so that they will have future access to them? I believe that the picture is more complex. Traditional peoples have spent generations in intimate contact with nature and, for them, conservation is more than a conceptual ideal. Moreover, as Alcorn (1993) asserts, “[i]ndigenous people often find the Western idea of ‘conservation’ as something to be separated from the rest of their activities as strange.” While they are concerned with what nature can provide for their material needs, their non-material needs are of equal importance. People in the tropics hunt not only for food but also for cultural and recreational purposes (Bennett and Robinson, 2000). According to Madhusudan and Karanth (2000), the Kodava of India glorify hunting prowess and require feasts of wild meat at social events, such as weddings. Yet, in spite of the cultural significance of hunting, they advocate a preservationist model — i.e., a total ban on hunting. Vickers (1991) articulately summarizes the non-consumptive importance of wildlife: “... animals are inextricably woven into the native world view, mythology, religion, symbolism, [and] art...”

The following example is illustrative. The Shuar create headbands called tawasaps, from chambira (Astrocaryum chambira) fibres and toucan (Rhamphastos tucanus) feathers. They kill substantial numbers of the colorful birds to obtain sufficient feather supplies (Bennett et al., 2002). Tawasaps are used in the annual celebration of the uwe or peach palm (Bactris gasipaes) harvest, one of the most important resources for the Shuar and most other Amazonian peoples.

One could evaluate the sustainability of this practice as well as its economic value, since the tawasaps are sold in markets. To do so, however, would miss its true significance. The yearly uwe festival reaffirms Shuar cosmology and unites the culture. Wearing the tawasap is an essential component of the ceremony. Likewise, the tradition of making sweetgrass baskets is an fundamental element of the African cultural tradition in South Carolina, far more significant than what could ever be expressed in monetary terms (DuFaut et al., 1993).

5. Conclusions
Non-timber forest products have been and will continue to be vital resources for rural people. Improvements in methodology are beginning to provide a more accurate assessment of the economic value of NTFP. Yet, still little is known about the basic biology and ecology of useful tropical plants and animals. Published studies, which are often based on short-term data, indicate that both the biological and economic sustainability of non-wood product harvesting is questionable. More attention needs to be given to the realized value of the rainforest products rather than their theoretical potential that most economic studies measure. What percentage of calories do wild-collected fruits provide to the diet? How much protein is furnished by game animals? What percentage of a household’s income derives from NTFPs?

Moreover, a larger question remains: What is the role of nature in maintaining and nurturing traditional societies? Consideration of biology and economics alone is not enough. Cox and Elmqvist (1991) describe the successful formation of four indigenously controlled rainforest reserves in Samoa. It is encouraging that many other investigators acknowledge the essential role of forest dwellers in conservation (e.g. Alcorn, 1993; Bodmer and Puertas, 2000; Sooil, 2001). In discussing challenges to conservation of African rainforests, Webber and Vedder (2001) note that concerns over human origins dominated social science research in the region, and that extant cultures received little attention. Peterson (2001) received a very poignant, yet insightful response from an African farmer he tried to interview: “Don’t trouble me with all your questions. What good is this all going to do for me? You know life here is one endless crisis. What are you going to do to help? You wazunga (white people) come and study us Africans and say, they live this way, they plant this and that, they fish or hunt or sell their goods, but how does that ever bring any good back to us? Don’t trouble me.” Perhaps the prevailing practice of paternalistic preservationism will die a quick death. It is time to take a leap forward and give full consideration to the ethical rights of traditional forest dwellers to maintain their cultures. This requires the existence of healthy forest ecosystems and the full integration of local people into conservation planning and resource management.
References


Madhusudan, M.D., Kanath, K.U., 2000. Hunting for an answer: Is local hunting compatible with large mammal conservation in India? In:


### Appendix. Author citations and families for plant species cited in the text

<table>
<thead>
<tr>
<th>Species</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apera azarae</td>
<td>Tiliaceae</td>
</tr>
<tr>
<td>Astrocarum chambira</td>
<td>Burseraceae</td>
</tr>
<tr>
<td>Bactris gasipaes</td>
<td>Arecaceae</td>
</tr>
<tr>
<td>Bertholletia excelsa</td>
<td>Bignoniaceae</td>
</tr>
<tr>
<td>Carapa copa (Baiz &amp; Pavon)</td>
<td>Euphorbiaceae</td>
</tr>
<tr>
<td>Cedrela spp.</td>
<td>Fabaceae</td>
</tr>
<tr>
<td>Cordia lutea</td>
<td>Arecaceae</td>
</tr>
<tr>
<td>Cordia alliodora (Baiz &amp; Pavon)</td>
<td>Arecaceae</td>
</tr>
<tr>
<td>Crotalaria juncea</td>
<td>Fabaceae</td>
</tr>
<tr>
<td>Euterpe precatoria</td>
<td>Arecaceae</td>
</tr>
<tr>
<td>Guayusa reverses (Pot.)</td>
<td>Arecaceae</td>
</tr>
<tr>
<td>Heteropyxis chlorophylla</td>
<td>Arecaceae</td>
</tr>
<tr>
<td>Hevea brasiliensis</td>
<td>Moraceae</td>
</tr>
<tr>
<td>Ixora rosomana Schott</td>
<td>Rubiaceae</td>
</tr>
<tr>
<td>Lecythis polygama</td>
<td>Lecythidaceae</td>
</tr>
<tr>
<td>Lecythis polygama (Baiz &amp; Pavon)</td>
<td>Arecaceae</td>
</tr>
<tr>
<td>Miconia excelsa</td>
<td>Meliaceae</td>
</tr>
<tr>
<td>Mauritia flexuosa</td>
<td>Arecaceae</td>
</tr>
<tr>
<td>Myrciaria capitata var. filipes</td>
<td>Myrtaceae</td>
</tr>
<tr>
<td>Phyla inflata</td>
<td>Arecaceae</td>
</tr>
<tr>
<td>Physaleum songohoude (Boes) Hitchc. &amp; Chase</td>
<td>Sapotaceae</td>
</tr>
<tr>
<td>Protium macrophyllum</td>
<td>Sapotaceae</td>
</tr>
<tr>
<td>Schaal patulum (Walter) Lodd.</td>
<td>Arecaceae</td>
</tr>
<tr>
<td>Swietenia macrophylla</td>
<td>Malvaceae</td>
</tr>
<tr>
<td>Virola spp.</td>
<td>Myrtaceae</td>
</tr>
</tbody>
</table>

---

**References:**