
Chapter 9

Management and conservation of NWFP resources

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1. INTRODUCTION

In the late 1980s, NWFPs were presented as a possible alternative to deforestation and other activities that convert forest land, such as timber extraction, agriculture or plantations (Falconer, 1990; Plotkin and Famolare, 1992). Since some NWFPs have considerable market value, the premise was that the long-term gains derived from the sustainable harvesting of these products could exceed the short-term gains from the conversion of forests or individual trees to other uses (Peters *et al.*, 1989; [Godoy and Bawa, 1993](#)).

This concept is interesting from the point of view of biodiversity conservation and improvement in the living conditions of local inhabitants. The latter, who live in harmony with their environment and exploit forests to satisfy their essential needs, actively protect them and use “nature’s subsidies” sustainably ([Hecht *et al.*, 1988](#)). The concept of “rainforest harvest” (Prance, 1992) is firmly anchored in the extractive culture of Latin America. Such NWFPs as rubber and Brazil nuts are gathered in forest areas and sold in markets, providing a livelihood for local people. Formal recognition of reserves for extraction as legal entities is the direct result of lobbying by Brazil’s National Council of Rubber Tappers (CNS), established in 1985 following a serious social crisis connected with land use in Amazonia (Richards, 1993). The appeal of this system was recognized at the end of the 1980s, with several studies published almost simultaneously, lyrically stressing the possibility of saving the world’s tropical forests thanks to “sustainable exploitation”, an economic alternative to timber extraction or conversion to agriculture ([Hecht *et al.*, 1988](#); [Gradwohl and Greenberg, 1988](#); [de Beer and McDermott, 1989](#)). This optimism was supported by the marketing potential of forest products, including medicinal plants ([Farnsworth, 1988](#); [Nepstad and Schwartzman, 1992](#)), which would contribute to the well-being of local communities and guarantee the conservation of tropical forests by providing them with added value ([Godoy and Bawa, 1993](#)). Rainforests were then considered as having a self-financing capacity (Peters *et al.*, 1989), summed up in the popular expression “Use it or lose it” ([Freese, 1997](#); [Struhsaker, 1998](#); [Putz *et al.*, 2001](#)). If forests had no value in themselves, they could be converted in order to develop other more productive activities, such as agriculture. The sustainable harvesting of NWFPs was adopted as a direct way of protecting forests.

Twenty years later, the initial optimism over the prospects of a major contribution from NWFPs to conservation and development had faded considerably, mainly within the academic community ([Arnold and Ruiz Pérez, 2001](#); [Ros-Tonen and Wiersum, 2005](#); [Belcher and Schreckenberg, 2007](#)). It was said that the anticipated economic potential ([de Beer and McDermott, 1989](#); [Godoy *et al.*, 2000](#)) had been assessed too simplistically ([Southgate *et al.*, 1996](#); [Sheil and Wunder, 2002](#)). Additional complications were the limited understanding and appreciation of the complexity of

the political, economic, social and commercial issues connected with harvesting and marketing NWFPs (Dove, 1995). Doubts were also raised about the increased trade in forest products as a means of promoting conservation and development (Marshall *et al.*, 2003). In particular, it has been stressed that quite a few households barely recover the costs of gathering (Southgate *et al.*, 1996). Even for high-value forest products, the main share of the income goes to those who process the products, usually the richer members of society (Alcorn, 1993), local elites who control the market, and/or the state (Dove, 1993; Struhsaker, 1998; Ros-Tonen and Wiersum, 2005). Despite this, the development and promotion of NWFPs continue to undermine conservation efforts in the field, especially the implementation of integrated conservation and development projects (Kiss, 2004). The capacity of NWFPs to contribute to conservation and poverty alleviation is still being debated in contemporary writings.

This chapter examines the prospects NWFPs offer for sustainable forest management, the ecological and biological constraints, and the political and socio-economic factors that could compromise their contribution to conserving biodiversity in tropical rainforests.

2. NWFPs AND THE DEVELOPMENT OF RURAL COMMUNITIES

Before examining the potential contribution of the harvesting of NWFPs to biodiversity conservation, their contribution to the quality of life in rural and urban environments should be stressed. A number of authors note how important NWFPs are for the local economy (Ndoye *et al.*, 1997; Colfer, 1997; Belcher and Schreckenber, 2007; Paumgarten and Shackleton, 2009; Tieguhong *et al.*, 2012). In some rural localities, especially in zones lacking basic infrastructure and market access, NWFP gathering is a fundamental source of subsistence (food, medicine, shelter, tools, plants and animals of cultural value). Agricultural production is supplemented by the harvesting of wild products that contribute to long-term food security (Sunderland, 2011).

Marketing certain NWFPs represents a way – often the only one – of gaining access to the market economy (Ros-Tonen and Wiersum, 2005). The trade sometimes reaches such proportions that the chain of beneficiaries becomes complex (Belcher and Kusters, 2004). There are many examples: the marketing of Brazil nuts in Amazonia (Ortiz, 2002), the sale of *Prunus africana* from montane forests to the pharmaceutical industry (Ndam and Tonye, 2004), the trading of *Irvingia gabonensis* among Cameroon, Equatorial Guinea and Gabon (Ndoye *et al.*, 1999) and between Cameroon and Nigeria (Awono *et al.*, 2009), the export of *Gnetum* spp. from Cameroon to the Congo, Gabon and Nigeria (Shiembo, 1999) and the international trade in rattan from Southeast Asia and Africa (Sunderland and Dransfield, 2002), to name but a few. Tabuna (1999b) stresses the considerable trade in NWFPs from Central Africa intended for the African diaspora in Europe (see Chapter 8). Although NWFPs thus offer numerous economic advantages, it is important to examine the extent to which this economic or subsistence value contributes to the conservation of wild resources and biodiversity.

3. IS THE HARVESTING OF NWFPs SUSTAINABLE?

The debate on the development of NWFPs is based on the premise that their harvesting is naturally more sustainable and ecologically less invasive than alternative economic activities such as agricultural conversion (Arnold and Ruiz-Pérez, 2001; Putz *et al.*, 2001; Ruiz-Pérez,

2005). Sustainability is a complex concept for which there are a number of definitions (Tovey, 2009; Ostrom, 2009). In the case of NWFPs, the difference between ecological sustainability and economic sustainability must be stressed, inasmuch as they do not always go together (Hall and Bawa, 1993). Overexploitation of a resource can lead to a general decline in wild populations, while a constant demand is accompanied by a constant market value. On the other hand, increased scarcity can increase harvesting costs, raise market prices, lead to a fall in demand and possible replacement by some other product that is easier to obtain (Homma, 1992). In any case, in economic terms the effects of unsustainable extraction are more subtle and harder to detect (Hall and Bawa, 1993). This is particularly the case with very long-lived plant species such as Brazil nuts (*Bertholletia excelsa*), for which the low-impact harvesting of fruit can, even so, have effects on regeneration that have not yet been much studied (Ortiz, 2002). In ecological terms,¹⁵ harvesting cannot be considered sustainable for a plant or animal species unless it has no long-term adverse effect on its reproduction and regeneration. Moreover, harvesting must not have any perceptible detrimental effect on other species within the community or on the structure or functioning of the ecosystem (Hall and Bawa, 1993). Some authors hold that there can be no truly sustainable harvesting of NWFPs (Hall and Bawa, 1993; Redford and Stearman, 1993; Peters, 1994; Struhsaker, 1998) inasmuch as long-term effects can manifest themselves in a variety of ways that are not all fully understood at an acceptable degree of probability (Struhsaker, 1998). The gathering of leaves can also increase growth because of the redeployment of stored resources, at least in the short term (Ticktin and Shackleton, 2011). Although it may not be immediately damaging, the gathering of fruit and seeds can lead to a reduction in the availability of food for fruit-eating species, affecting their future regeneration (Hall and Bawa, 1993). The hunting of predators and seed-distributing animals can also lead to regeneration problems or, in the case of pollinating species, a reduction in reproductive capacity, which can in extreme cases “empty” the forest (Redford, 1992). The harvesting of bark and other woody parts can cause the aging and eventual death of the organism (Peters, 1994; Ros-Tonen and Wiersum, 2005). This situation is often exacerbated by the absence of sufficient monitoring and application of rules where these exist, hence the low adoption of “sustainable” practices (Ostrom, 2009).

The sustainability of forest products, including wood, can be determined only by comparing the extraction rate with the harvesting rate (Godoy and Bawa, 1993). Unfortunately, very few natural science studies have measured sustainability in a direct manner. There are therefore few practical examples of measurable sustainable harvesting of tropical forest products (Prance, 1992). Dynamic data on growth and mortality are needed, but they are still unfortunately incomplete, even for the most widely studied forest resources (Boot and Gullison, 1995; Sunderland *et al.*, 2004). Such data are assessed over a time-frame of years or even decades. The limited availability of most of the stakeholders on the ground, who suffer from financial uncertainty, prevents them from taking such a length of time into account. Attempts to measure sustainability also suffer from a lack of appropriate inventory techniques for NWFPs (Wong *et al.*, 2001). In the face of such a wide range of living organisms, harvesting techniques and impacts, these methods are complex and hence rarely applied. To redress this lack of sufficient knowledge, some advanced forestry study courses include training on the ecology and management of NWFPs (Guariguata *et al.*, 2008). A great deal of effort is thus needed to reach a better understanding of the economic and ecological sustainability of NWFP harvesting.

¹⁵ See Chapter 12 for examples of studies on the ecological aspect of certain NWFPs.

4. NWFPs, PROTECTED AREAS AND CONSERVATION

4.1 Expansion of protected areas and annexation of forest land

Although the concept of protecting nature in its virgin state is disputed today (Willis *et al.*, 2004), protected areas are still the most commonly used means of conserving biodiversity in almost all the countries in the world (Chape *et al.*, 2005; Coad *et al.*, 2009). In the face of the current crisis in biodiversity, the number of protected areas has increased exponentially in recent years (Chape *et al.*, 2005) and the global network of protected areas currently covers 11.5 percent of the planet's surface (Rodrigues *et al.*, 2004). In Central Africa, 50.6 percent of all protected areas fall into Categories I to IV of the International Union for Conservation of Nature and Natural Resources (IUCN) classification (de Wasseige *et al.*, 2012). In theory, the majority of protected areas are therefore regulated and have restricted access, thus depriving millions of forest inhabitants of rights of use over forest land on which they often depend for their livelihoods (Cernea, 2005). If low-impact NWFP harvesting is seen as the best way of managing land in tropical areas (Prance, 1992), then why is there such an increase in the number of protected areas and appropriations of land available for extractive activities?

Redford and Stearman (1993: 252) explain this contradiction as follows:

Although many discussions have taken place suggesting that low-level economic activity would be compatible with biodiversity conservation, it is clear that if all the genetic diversity of species and ecosystems must be maintained in its natural abundance on a given plot of land, then (almost) no human activity should be allowed.

This advocacy for the protection of “virgin nature” (Willis *et al.*, 2004: 402) in the absence of human activities encourages the expansion of protected areas despite the fact that the gathering of NWFPs could be compatible with implementation of conservation objectives. This contradiction is seldom accepted within the conservation community. Despite the major expansion of protected areas, they are still relatively incapable of ensuring the conservation of all biodiversity (Rodrigues *et al.*, 2004) and today the major part of the world's biodiversity is found outside protected areas, often in complex, multifunctional landscapes occupied by human beings (Putz *et al.*, 2001; Sayer and Maginnis, 2005). These are perhaps the most precious landscapes for NWFPs and those where the latter make their greatest contribution to rural people's subsistence. Hence the need for a form of management midway between natural forests and intensive forest systems that are in the final analysis less diversified, thus encouraging the conversion of natural forests rich in biodiversity.

4.2 From natural forests to agroforests

Although closed forests are highly diversified and remain major reservoirs of forest products, a large proportion of NWFPs are gathered in secondary forests, on fallow land and in plantations (Ambrose-Oji, 2003; Ros-Tonen and Wiersum, 2005; Awono *et al.*, 2009; Kengue *et al.*, 2011), referred to as “domestic forests” (Michon, 2005a: 21). The periurban agroforests that supply the flourishing NWFP economy of Belém in Brazil are a good example of this type of forest (Shanley *et al.*, 2002), as are the domesticated forests of Indonesia, which supply up to 95 percent of fruit for domestic markets and 80 percent of the resin from trees of the Dipterocarpaceae family (Michon, 2005a). Domesticated forests in Cameroon supply local, national, regional and

international markets with high-demand varieties of *Dacryodes edulis* (Eyog-Matig *et al.*, 2006). These forest zones made up of planted trees may include mosaics of natural forest, forest fields and fallow land. Such agroforests are planted with a mixture of trees grown for commercial purposes, generally for NWFPs rather than timber (Jamnadass *et al.*, 2011).

This transition “from nature to cultivation” (Dove, 1995: 194; Levang *et al.*, 2005) takes place partly because often only very small quantities of NWFPs are found in old closed-canopy forests (Peters, 1994). The very varied nature of tropical forests means that gatherers obtain extremely low yields. Fruit production in Peruvian Amazonia (Phillips, 1993) and resin and bark production in Indonesia (La Frankie, 1994), for example, show remarkably low productivity levels per hectare, compared with timber extraction and other land uses. Harvesting in such diversified environments requires a thorough knowledge of the forest and control and monitoring of each productive body (Browder, 1992a; Phillips, 1993).

The extraction of NWFPs does not necessarily depend on a base that is rich in biodiversity, inasmuch as only a few major resources are in great demand in relatively poor and often human-disturbed forests. How great a role could sustainable methods of NWFp harvesting play in the conservation of forests rich in biodiversity? The experience of the past 20 years, with the rise of alternative conservation methods such as protected areas (Hutton *et al.*, 2005), shows that it does not contribute effectively to biodiversity conservation.

5. SOCIO-ECONOMIC AND POLITICAL ISSUES

5.1 Commercialization: what is the outlook for conservation?

Calls for the promotion and development of NWFPs are based on the premise that an increase in the market value of NWFPs will contribute to a greater appreciation of forests and thus foster a reduction in poverty and increased forest conservation (Neumann and Hirsch, 2000; Ruiz-Pérez, 2005). Historically, private capital and public interventions have played a role in the commercialization of NWFPs (Dove, 1995). This process is not viable unless there is a well established regional or global market for the products. Colonial expansion was often motivated by the commercialization of various forest products (Hobhouse, 1999), which not only changed the face of the natural world, with the destruction of large swathes of forest in order to grow cocoa, coffee, tea, rubber etc., but also led to the establishment of an economic system based on commodities with short- and medium-term financial yields, which still predominates today (Brockway, 2002).

When trade becomes effective and markets expand, control by the elite increases. Within communities or regions, the wealthiest people are those in a position to invest in expanding trade, since they have access to land and can purchase the inputs needed for cultivation and/or processing (Dove, 1993; Marshall *et al.*, 2003). To start with, the growing demand for forest products leads to the increased harvesting of wild resources, which leads in turn to the loss of economic viability of these resources and the encouragement of cultivation and eventually domestication (Homma 1992). The establishment of cropping systems fosters the elimination of economically viable products from natural forests, reducing the value of the latter. These more lucrative activities, particularly alternative land uses, are often destructive (Homma, 1992). Evaluations of the commercialization of NWFPs have shown that even if it does have advantages for local communities (Marshall *et al.*, 2003), it is unlikely to guarantee better conservation of biodiversity (Belcher and Schreckenberg, 2007).

The NWFP trade is often part of the informal forest sector or the “hidden harvest” (Scoones *et al.*, 1992: 17). Regularization of harvesting and sales, which would allow the revenue to contribute to the formal forest sector, is a major topic ignored by NWFP research and official forest policies, making for a problematic situation (Laird *et al.*, 2010).

5.2 Land tenure system: policy and culture

The issue of the ownership of land and resources is a vital one with a view to assuring that the harvesting of NWFPs has a minimum of sustainability. Without the right of ownership, free harvesting is the almost certain guarantee of depletion of the resource (Angelsen and Wunder, 2003). Wherever the ownership of land and resources is uncertain, members of the local community choose production systems that maximize short-term yields at the expense of long-term sustainability, particularly with the production of annual crops. This is a real problem especially when landless migrants settle in a forest zone, as happens in Amazonia (Browder, 1992b) and Indonesia (Levan *et al.*, 2007), where short-term subsistence strategies prevail over more sustainable land-use practices. Sustainable production systems would be more attractive to rural communities if they had permanent rights over their lands. In the case of Africa, security of land tenure can encourage rural communities to plant NWFPs and improve their production systems (Laird *et al.*, 2010).

Unfortunately, most NWFP production systems operate within free or semi-free access systems, often leading to overexploitation of resources of economic value. Such overexploitation is exacerbated by the rapid expansion of markets for products from zones where security of tenure is limited or nonexistent (Alcorn, 1993). The case of rattan in Indonesia is a perfect example of how rapid market growth and free access combine to undermine long-term conservation objectives (Belcher *et al.*, 2004). However, even were the problems of free access leading to destructive harvesting to be resolved, the increase in the value of NWFPs might not work to the benefit of tropical forest conservation or improvement in the inhabitants’ living conditions (Southgate *et al.*, 1996). Thus, as an extracted product becomes scarcer, it is cultivated outside its natural ecosystem in order to forestall its depletion in the forest, and such crop intensification often excludes the initial users of the resource. Most of the benefits then go to local elites, commercial enterprises or the state (Dove, 1993; Marshall *et al.*, 2003).

Another problem connected with land tenure is the interaction between customary law and written law. In most African countries, governments exercise *de jure* control over land and can often impose contradictory tenure policies in the same zone (for example, granting mining concessions in protected areas in Gabon¹⁶ or in zones earmarked for agro-industrial development in Cameroon) (Sidle *et al.*, 2012). The overlapping of “rights” affects all forms of innovative management of NWFPs but also that of other natural resources.

Issues regarding the control of powers and resources often carry more weight than biological factors in forest management. The establishment of extractive reserves in Brazil, for example, was undoubtedly motivated more by sociopolitical than by ecological considerations (Richards, 1993). Dove (1995) describes how the development of rubber economies in Amazonia and Brazil has produced widely differing results in terms of conservation and living conditions, depending on regional historical and sociopolitical factors. In Central Africa, the instability of regimes has both positive and negative repercussions on the exploitation of forest products (Debroux *et al.*, 2007).

¹⁹ <http://www.mappingforrights.org/files/Forest%20Tenure%20in%20Gabon.pdf>

In indigenous systems of NWFP management, controls to avoid overexploitation do exist for certain products (Redford and Stearman, 1993). However, traditional crops are often left defenceless in the move from a subsistence economy to sedentary agriculture and in the face of the sudden arrival of modern knowledge (Ros-Tonen and Wiersum, 2005). The number of conflicts within communities has increased everywhere over the question of the effectiveness of ancestral harvesting models in meeting development needs (health, education, market access), setting young people against local institutions and sometimes leading to a break with customary control over resource management. Confining indigenous peoples to a symbolic role in the management of natural resources or depriving them of the social and economic development linked to exploitation of the resources would be highly unjust. The long-held idea that local people are by nature essentially in favour of conservation is being called into question (Redford and Stearman, 1993), since the absence of a secure tenure system does not encourage the sustainability of resources and often leads to their depletion. Studies carried out in Cameroon conclude, for example, that there is a lack of management in the framework of traditional harvesting practices, including those for economically viable NWFPs (Malleon, 1999).

6. DISCUSSION

Over the past 20 years, it has become increasingly clear that the initial enthusiasm over the sustainable harvesting of NWFPs, which was seen as a miracle solution to save tropical forests, was based on somewhat simplistic and generalized approaches. Even if NWFPs play a major role in the lives of rural inhabitants, this is very often because of the absence of economic alternatives and the existence of periods of agricultural difficulty or household vulnerability (Ros-Tonen and Wiersum, 2005). Today, we need to examine the “real” value of NWFPs for local inhabitants. Is this value reflected in the sustainable management of wild resources? Generally speaking, the poorest people depend essentially on forest products for their survival (Alcorn, 1993; Paumgarten and Shackleton, 2009), inasmuch as the NWFP sector has low or moderate profitability and requires little capital and very few skills. For rural communities with no access to skilled labour, markets, political power or credit, the harvesting and marketing of NWFPs are increasingly important. They provide a safety net, and the benefits drawn from forest resources help rural inhabitants to avoid sinking into poverty by providing them with income at critical moments of the year, especially periods of low agricultural production (Angelsen and Wunder, 2003; Ros-Tonen and Wiersum, 2005). When products become commodities and are highly profitable, very few material benefits filter down to the original producers (Dove, 1993; Dove, 1995; Marshall *et al.*, 2003). Talking about extractive reserves in Brazil, Fearnside (1989) writes: “When the value of trade goes to the intermediaries, the original extractors remain poor, however great the volume of wealth they generate.” The same picture can be seen in the tropics. NWFPs are thus seen as “poverty traps” (Angelsen and Wunder, 2003). In view of their low profitability, studies show that if alternatives to NWFP extraction are offered, many people will prefer to take up intensive farming or salaried employment (Levang *et al.*, 2007; Paumgarten and Shackleton, 2009). This compromises the potential of sustainable NWFP harvesting and the possible contribution of NWFPs to biodiversity conservation, given that agricultural expansion is one of the main drivers of deforestation.

It has been clearly demonstrated that long-term harvesting of any NWFP very often leads to depletion of the resource (Peters, 1994). Responses to depletion include exclusion by regulatory or regular controls, other legal forms of control (harvest tariffs and quotas), cultivation and *ex situ* conservation (Hamilton, 2008). Cultivation by domestication, using improved species

with higher yields than those of species found in natural forests (while preserving features that are important to consumers), could be a viable solution to scarcity. Participatory domestication,¹⁷ which combines traditional and scientific knowledge in the gathering of germplasm, selection and vegetative propagation (Jamnadass *et al.*, 2011), has an important role to play here. From the point of view of rural gatherers, the two most common local responses to scarcity are to step up the harvesting margin and to seek a replacement, for example, replacing rattan with synthetic substitutes (Cunningham, 2000). In both cases, it is important to note the weak link between biodiversity conservation and harvesting.

Recent initiatives seeking to combine NWFPS harvesting with social and environmental responsibility through such systems as fair trade and certification are still in their infancy (Shanley *et al.*, 2002) and suffer from the same problems as those analysed earlier in this chapter: insecurity of tenure, control by local elites, poor monitoring capacity, poor management capacity and poor organization of producers. Otherwise what is needed is a complete change of model, or at least major efforts and considerable expertise to put these systems in a position to contribute to biodiversity conservation and local communities' quality of life.

Favourable conditions for the sustainable harvesting of NWFPS – the right to land tenure, low population densities, the right of customary use and simple technologies – all seem to encourage the expansion of intensive exploitation systems outside high-biodiversity forest systems. Given that the ever-expanding global network of protected areas deprives many forest inhabitants who depend on NWFPS for their subsistence of their access to resources, sustainable use of resources could be promoted in multifunctional landscapes with a multistoreyed structure, rather than creating more of these areas (Putz *et al.*, 2001). However, the complexity of planning, managing and monitoring such a type of land use means that appropriate and often complex systems must be established and brought into line. There are few examples of landscape-level holistic management that produce optimal results in terms of conservation and development (Sayer and Maginnis, 2005).

Although the academic world has already recognized the limitations of the NWFPS sector and reassessed its potential more strictly, the promotion and development of forest resources are still at the heart of many initiatives. This discrepancy demonstrates the lack of communication between theoreticians and those actively involved in conservation, a state of affairs that was recently examined by Sunderland *et al.* (2009) and that produces highly questionable results for conservation or for the development of local communities' livelihoods.

7. CONCLUSION

Despite substantial commendable efforts to establish NWFPS harvesting systems that foster the conservation of high-biodiversity forest systems, the past 20 years have seen precious few concrete cases demonstrating the feasibility of this alternative type of land use. By laying the stress on the establishment of protected areas that are not accessible for the harvesting of forest products, the primary approach to biodiversity conservation shows that confidence in the possibilities of sustainable NWFPS extraction is relatively weak. Management of forest products as components of complex landscapes can certainly play a role by contributing to more diversified production systems. The possibility that NWFPS can provide a single solution to the current

¹⁷ Chapter 15 addresses participatory domestication of NWFPS in greater detail.

crisis in biodiversity needs to be examined with considerable caution. The tendency to apply simple solutions to complex problems and the effects of passing fads (whether focusing on NWFPs, debt-for-nature swaps, green marketing, payments for environmental services or reducing emissions from deforestation and forest degradation [REDD]) must give way to a more holistic long-term approach that is multidisciplinary and equitable, encompassing human needs and biodiversity conservation.