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The future of non-wood forest production

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Increasing synchronization of local economies with national and international markets has opened up several opportunities and has introduced unforeseen threats, which can have significant impact on the non-wood forest product (NWFP) sector. This paper analyses the recent trends in production and trade related to NWFPs from selected sites in South Asia. It then attempts to extrapolate the same trends to predict the future of NWFP production and suggest some strategies for sustainable management of NWFPs in Asia and the Pacific. Experiences from across the region suggest that NWFP domestication is a viable option to address resource supply constraints. Open access forests are prone to unsustainable harvest from collectors for commercial purposes as they are often not concerned about continued supply of the product. The collection of high value NWFPs from open access forests results in overharvesting and severely affects regeneration due to unsustainable and faulty harvesting methods. Hence, increased commercialization is likely to lead to overharvesting, resource depletion, degradation of forests and depletion of biodiversity and needs stricter enforcement of regulations. On the other hand domestication can reduce the incentives to conserve the ecosystems in which the NWFP species grow naturally. NWFP certification, intensive management, marketing support, popularization of sustainable harvesting techniques and ensuring economic and social equity can assure sustainable production of NWFPs. The review of the NWFP sector across the region suggests that collection of subsistence NWFPs is generally sustainable and does not warrant much concern. Cultivation or enrichment of natural forests with NWFPs (e.g. forest gardens) is by and large sustainable. The cultivation of NWFPs on farmlands needs to be promoted so as to reduce the pressure on the forests and promote income to the people through this sector. However, cultivation of NWFPs on erstwhile forest land or by clearing natural forests is a cause of concern as it depletes biodiversity and affects availability of forest goods and services. In general, the trend of NWFP production is moving away from the forest except the clandestine and illegal trade of high value low volume products which continue to deplete the biodiversity and productivity of forests.

Keywords: non-wood forest products, commercialization, cultivation

Introduction

NWFPs include all goods of biological origin other than wood derived from forests, other wooded lands and trees outside forests. They are important in day-to-day life, as they are used for food, spices, edible oils and medicines, for fodder, forage, stall bedding and green manure, as construction material and household utensils, as fibre for cloth and rope, for basket and mat-making and for ornamentation and religious purposes. NWFPs can be put both in subsistence and commercialized contexts; therefore people associate them with enormous value. For the majority of tribal and indigenous people living in regions rich in forest resources, NWFPs constitute a critical component of their food and livelihood security. NWFPs provide supplementary income sources to forest and forest fringe dwellers. NWFP-based activities including collection, sale of raw materials, simple primary processing and

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local handicraft production fill seasonal food or income gaps. They also act as a "safety-net" in times of hardship or emergency and generally improve household income security (Ruiz Perez and Arnold 1996). During the early years of scientific forestry, NWFPs were considered as minor forest produce and hidden harvest. But about a decade or two ago several studies highlighted the importance of NWFPs for sustainable forest management in general and poverty reduction in particular (Wollenberg and Ingles 1998; Sunderland and Ndoye 2004). Commercialization and expansion of trade in forest products have further enhanced their role by making harvesting and sale of these products important to the rural poor.

In Asia and the Pacific, NWFPs form an important subsistence and livelihood means for the majority of people living near forests. NWFPs like rubber, rattan, bamboo, aromatic oils and medicinal plants are traded or bartered within the Asia and the Pacific region and in markets outside the region generating billions of US dollars per year as revenue. Countries like Malaysia, Indonesia, Viet Nam and China generate around US$50 million from rattan alone, thus occupying a lion's share of the average annual world trade of US$88 million (Iqbal 1993). Growing population, rapid economic growth, reduction in poverty and expanding trade in the region have over the years changed the outlook towards forests and forest products. There is increasing shift from subsistence towards commercialization of these products. Increasing synchronization of local economies with national and international markets has opened up several opportunities and has brought in unforeseen threats, which can have significant impact on the NWFP sector. This paper analyses the recent trends in production, trade and policies related to NWFPs, attempts to extrapolate the same trends with the objective of predicting the future of NWFP production and suggests the strategies for sustainable management of NWFPs in Asia and the Pacific.

Subsistence and commercial NTFPs

NWFPs can be broadly grouped into subsistence and commercial components. Subsistence NWFPs are collected in small quantities mainly for household use; for example, food (nuts, fruits, animals, insect, vegetables, and mushrooms), fodder and roofing material. Commercial NWFPs are those which are collected or produced on a large scale mainly for trade; for example, bamboo, rattan, medicinal plants and spices. Rattan and bamboos, for instance, form important commercial NWFPs of several Asian countries making them the major international traders of these products (FAO 1997). The commercialization of *tendu* leaves (*Diospyros melanoxylon* Roxb.) has yielded huge economic benefit to local communities in Central India (Boaz 2004). In many cases, the development of social and economic networks and infrastructure as well as markets has led to the conversion of subsistence NWFPs to commercial ones. Bamboo shoots, medicinal herbs, broom grass and mushrooms are some examples of such a shift. Evidence from many countries shows that extraction of NWFPs for subsistence use is generally sustainable, as it does not lead to depletion of the resource while extraction of NWFPs from natural ecosystems for trade and commerce is generally not sustainable. Although subsistence NWFPs play a major role in the livelihoods of the forest-dependent poor in the region there is a glaring lack of reliable quantitative data on the subject. One of our recent studies conducted in the forest-rich state of Meghalaya has revealed that as many as 380 NWFPs are collected by the people. Bamboo, cane, broom grass (*Thysanolaena maxima*), bay leaf (*Cinnamomom tamala*), bark of *Cinnamomum zeylanicum*, *Emblica officianalis*, wild pepper (*Piper longum*), lichen (*Usnea* sp.) and honey are major commercial NWFPs. Important subsistence NWFPs of the state include *Phoenix* spp., *Luffa* spp., cones and seeds of *Pinus kesiya*, mushrooms, Torch wood, nuts of *Castanopsis hysterix*, fruits of *Prunus nepalensis*, *Myrica nagi*, *Eleagnus khasianum*, *Flemengia vestita*, *Zanthozylum khasianum* and ornamentals like orchids and rhododendrons. It is noted that the spectrum of species tapers as we move from household consumption to international trade NWFPs (Table 1). However, there is significant lack of information on quantity and methods used for the collection of these products.

Table 1. Important subsistence and commercial NWFPs of northeastern India

Subsistence		Commercial		
Household consumption	**Local markets**	**National markets**	**Industrial raw material**	**International trade**
Bamboo, nuts, fruits, vegetables, medicinal plants, thatch grass, fodder, insects, snails, fish, crab, frogs, reptiles	Bamboo, rattan, bay leaf, wild pepper, medicinal plants	Bamboo, bay leaf, broom grass, wild pepper, lichen, resin, medicinal plants	Bamboo, broom grass, medicinal plants	Medicinal plants and aromatics

Distribution of NTWPs in forests across the management gradient

NWFPs are extracted from natural forests, forest gardens or home gardens as well as from tree plantations that are subjected to varying degrees of management. Mostly wild edibles like mushrooms, insects, worms, nuts and fruits, lianas, bamboo, rattan and medicinal plants are collected from natural forests. Some NWFPs sourced from natural forests have a complex life cycle and population dynamics and cannot be brought under cultivation. Such wild NWFPs are mainly extracted for subsistence use as their availability is limited to geographical distribution and seasonality. However, there are cases where such NWFPs find their way for commercial uses and fetch cash income for the collectors or gatherers. An example of a commercialized wild NWFP is wood lichen (*Usnea* sp.), which has a good national market but the harvest is not sustainable. In forest gardens efforts are made to promote and enrich the forests with NWFP species. Such NWFPs can be classed as semi-wild because they are also extracted from the wild. The wild collections are generally done by the landless and poorer sections of the society, while forest gardens are under the control of landowning communities. Examples of semi-wild NWFPs are *Thysanolaena maxima* (broom grass), *Cinnamomom tamala* (bay leaf) in Meghalaya, *Aleurites* spp. in Mizoram and *Livistona jenkinsiana* in Arunachal Pradesh (Tiwari 2001). In the high ranges and Nelliampathy Hills in Kerela (India), cardamom is grown in managed forests. Some 90 percent of the households in the area are involved in production or processing of cardamom in some way or other, deriving most of their cash income from it (Nair and Kutty 2004). In Nepal many medicinal and aromatic plants such as keshar (*Crocus sativa*), jatamansi (*Nardostachys grandiflora*), sugandhwal (*Valeriana jatamansii*), padamchal (*Rheum australe*), bojho (*Acorus calamus*), kutki (*Neopicrorhiza scrophulariiflora*), atis (*Delphnium himalayai*), chiraito (*Swertia chiraita*), hatkaudo (*Podophyllum hexandrum*) and nirbisi (*Pernacia nubicola*) are being cultivated in community forests (Bhandari *et al.* 2006). Most NWFPs are collected from natural forests and very few from the plantations (Table 2).

Table 2. Important NWFP species found in forests under varying degrees of management

Natural forests	Forest gardens	Home gardens	Plantations on forest lands
Bamboo, rattan, lichen, wild nuts, fruits, mushroom, vegetables, medicinal plants, insects, fish, snails, crab, frogs, reptiles	Bamboo, rattan, bay leaf, wild pepper, medicinal plants	Bamboo, bay leaf, wild pepper, medicinal plants	Bamboo, broom grass

Economic, ecological and social values of NTFPs

NWFPs make a substantial contribution to the livelihoods of hundreds of millions of people living in or near forests. Around 200 million people in the Asia–Pacific region are dependent on NWFPs for at least some part of their income. Aside from the millions of people that benefit directly from NWFP-based activities, millions of others consume NWFPs to meet their nutritional requirements. Although NWFPs provide important benefits year-round, it is during periods of scarcity when collection, processing and trade of NWFPs are most critical to family survival; hence they represent an important "safety net". The vast majority of upland farmers in the Asia–Pacific region (e.g. shifting cultivators) cannot produce sufficient food to satisfy their annual household nutritional requirements. Hence, they resort to NWFPs to supplement food and income deficiencies. Therefore, NWFPs can be considered to be one of the crucial alternatives available to supplement income and ensure minimal family subsistence needs.

There is a growing interest in NWFPs for their enormous economic value. A number of NWFPs contribute to the creation of economic benefits and cash income at the local and community level, e.g. forest foods and medicines sold in village markets. NWFPs generate local, national and international trade revenues that are worth billions of dollars annually.

NWFPs provide subsistence income and livelihood security to forest and forest fringe dwellers, encouraging the local communities to conserve the forests. Large tracts of community forests of northeastern India maintained for day-to-day NWFP requirements also conserve natural resources like soil, water and biodiversity and thus ensure ecological security. An example has been documented by Tiwari (2005) where it was found that medicinal aromatic plants contribute towards the conservation of biodiversity and save a fragile ecosystem from degradation. Hence, managing forests for their NWFP values helps in meeting the complex demands of both conservation and development.

One of the key characteristics of NWFP trade is that they provide employment to women who harvest, process and sell various NWFPs. This has helped to improve their economic and political status in many cases. For example, collection and processing of lichen in Meghalaya is mainly done by women. Similarly, the mat-making industry of Tangmang village of Meghalaya is entirely in the hands of women. In Manipur State of India about 250 000 women are involved in collecting forest products (FAO 1992).

For forest-dwelling ethnic groups in Asia and the Pacific, forests are integral to culture, and a source of physical, spiritual and psychological sustenance. One can see that cultural identity and traditional knowledge systems are intertwined with the forests mainly due to the use of NWFPs in various cultural activities and rituals. Thus, numerous NWFP species and forest habitats are valued as components of cultural identity and religious rituals for which they are mostly conserved. Many indigenous traditional knowledge (ITK) systems have evolved in relation to the dependence of remote traditional populations on forest resources to secure reliable and sustainable livelihoods.

Opportunities in the NWFP sector

Commercialization and domestication of any NWFP species is motivated by high market demand, adequate product availability and advantageous pricing which generally provide the strongest incentives for harvesters, buyers and processors. Increasing commercialization of a particular NWFP may be attributed to: (1) the preferences of the consumers and (2) easy and cheap access to harvest the product by the producers.

Many NWFPs which were harvested only for subsistence use some years ago have now been commercialized on a large scale (e.g. bamboo shoots in China). NWFP commercialization has been promoted by development programmes and driven by market forces or both have acted synergetically. Some scholars have argued that in tropical rain forest areas, NWFP commercialization is an effective way to simultaneously solve the problem of achieving species and ecosystem conservation and improving local livelihoods (Ruiz Perez and Arnold 1996; Wollenberg and Ingles 1998). But others challenge this view and have raised serious doubts about achieving the objective of conservation through commercialization of NWFPs (Belcher and Schreckenberg 2007).

The commercial success of any NWFP at a global scale has the potential to result in such high demand that this cannot be assured from supplies of natural NWFP stocks as the quantities available have already declined with continuous harvesting in many cases. However, this decline more often than not creates strong incentives for domestication and cultivation of NWFP species and can be an effective alternative for conserving biodiversity as well as generating income. Some examples of NWFP domestication are: the mulberry plant (*Broussonetia papyrifera*) in Sayaboury Province, Laos, Moso bamboo (*Phyllostachys heterocycla* var. *pubescens*) in Anji County, China, rattan (*Calamus tetradactylus*) in the buffer zone of Ke Go Natural Reserve Area, Cam Xuyen District, Viet Nam and broom grass (*Thysanoleama maxima*) in Meghalaya, India.

Factors affecting the NTFP sector

Availability: For successful and sustainable development of commercial NWFPs the most important factor is resource availability. Many forest species that yield commercial NWFPs are usually remotely located and found in small volume. In the long run, these species are unlikely to remain important suppliers of commercially large quantities, as they can be quickly overharvested. For example, high market demand of rattan has caused serious depletion of the product in the forests of Arunachal Pradesh (India), so much so that now rattan is available only in inaccessible areas. This is also the case for lichens in Meghalaya.

Market and demand: NWFP exploitation is usually the first and easiest step taken when supply constraints appear due to high market demands generate by commercialization. Domesticating NWFP species is ultimately the most viable option to address resource supply constraints when trade demands occur. A case study in Paklay District of Sayaboury Province, Laos, shows a steady increase in areas planted with paper mulberry as well as production between 1990 and 1999 under the influence of a strong Thai market demand (Aubertin 2004). The value of the products multiplies as they move away from the site of production. A good example of this is the marketing of broom grass in Meghalaya. There is a vast difference between the prices of raw broom grass in the local markets in the interior areas compared to the retail price in the regional markets. The main reason is there are a few traders who are organized in small groups and hence they monopolize the business (Tiwari *et al.* 1995).

Key stakeholders in the market chain, whether producers, traders, consumers or governments, have decisive roles to play. Traders can influence the output of raw materials by increasing prices paid to producers and they also control and decide the fate of a product. When NWFP profit margins decline, they often shift their investments to other products with better margins. Consumers influence markets by their preferences for products or processes (e.g. organic products or fair trade), while producers can expand or improve their gathering intensity or change their production systems in response to demand. For low value products e.g. leafy vegetables, tubers and wild fruits where demand is likely to decline with economic prosperity, domestication and cultivation is unlikely to occur. A common picture in the northeastern region of India is that the major portion of the NWFP market is dominated by traders and intermediaries who earn most of the benefits while the participation of the local

producer/collector is limited only to the collection and disposal to the intermediary forces (Tiwari 2000).

Pricing: A stable and/or growing demand with fair prices offered to producers gives strong incentives to private investors at all levels to increase commercialization and cultivation of NWFPs. The supply of traded NWFPs depends directly on the prices offered to gatherers or cultivators. For the NWFPs gathered from the forests, the price is often determined by the time spent in collection and not by the actual value of the NWFP. The women collectors of lichen in the Jaintia Hills of Meghalaya, India are paid Rs20–35 (<US$1) for a kilogram of lichen which after some processing is sold to the consumers at a price of more than Rs200 (US$5) a kilogram. The collector and the communities owning the NWFPs have very little or no say in this regard. The intermediaries, traders and larger processors benefit because they usually control the price of the product. A village survey in Pynursla community development block of Meghlaya revealed that in the absence of organized marketing, the price of broom grass had slumped from Rs1 700 (~US$41) for 100 kg in 1996 to Rs700 (~US$16) per 100 kg in 2000 causing significant loss to the growers and gatherers of this NWFP.

Certain policies can also negatively affect prices paid to producers; for instance in Indonesia, the restrictive trading policies on raw rattan depressed the domestic prices of rattan, which in turn contributed an adverse impact on the income of rattan farmers and collectors (FAO 1997). Prices also tend to be cyclical, as they depend more on economic, social or climatic factors outside the producers' region or on the price fluctuations of their competing substitute(s).

High value NWFPs are more likely to be cultivated rather than their low values counterparts as they result in more economic benefits. High value NWFPs, even though traded in small quantities, generate higher returns generally. When higher prices are offered, producers intensify or expand their gathering or cultivating efforts over larger areas as appropriate to their means. When prices are down, they even forsake gathering or cultivating, as it may not compensate their time investment *vis-à-vis* other income-earning options. For example in Meghalaya, NWFPs such as broom grass, wild pepper, lichen (the rate exceed Rs.10/kg) are preferred to low value products like thatch grass, bay leaf and bamboo.

Extraction: Extraction of NWFPs for both subsistence and commercial uses is often done by children, herders and women. Generally, children are involved in collecting nuts, fruits and birds while the women generally collect *inter alia* tubers, leafy vegetables and fuelwood. The herders mostly collect wild animals, insects, vegetables and fish that are usually meant for use as an evening meal. NWFPs that are collected for commercial use are mostly seasonal. Hence, they generate seasonal income and employment involving villagers from all ages and gender groups. The mode of collection varies from place to place and time to time. In the commercial exploitation of NWFPs, most methods employed for collection from open access forests are not sustainable and the collectors are not concerned about their continued supply either.

Medicinal plants are collected by both common villagers and traditional herbal practitioners. Globally, the trade in medicinal plants is increasing at a very fast rate; it is mainly characterized by supply of products from the poor countries to economically growing countries as well as developed countries. This has a positive income transfer effect. China and India are the two leading countries in the trade. Increasing global interest in medicinal plants has created a sustained demand but at the same time increased illegal trade in plant materials resulting in indiscriminate harvest of wild varieties and serious damage to biodiversity. The overexploitation of several of these plant species and resultant decline in availability has led to their cultivation under field conditions. In many cases, medicinal and aromatic crops have better economic opportunities as opposed to traditional field crops. The price of these crops as raw-material to pharmaceutical industries has increased substantially, fetching higher prices for the cultivators and collectors.

Ownership rights: For the domestication of NWFPs, individual ownership is more effective than community ownership. For instance, in 1983, the shift from commune-based management to individual management after the introduction of the Household Responsibility System (HRS) in Anji County in China generated more intensive cultivation of bamboo by the farmers. Since then most bamboo cultivation has been contracted to individual farmers who currently manage 96 percent of the total bamboo area. The introduction of the HRS brought dynamism to a stagnant sector, greatly increasing culm and shoot production (Maoyi and Xiaosheng 2004). Similarly, in Meghalaya, tenurial security has promoted cultivation of broom grass on forest lands previously subject to shifting cultivation.

Issues relating to NWFP commercialization

Economic benefits: Commercialization and domestication of NWFPs has improved the economic conditions of poor forest dweller by increasing their household incomes. For example, the rattan sector in the Philippines is generating significant amounts of foreign exchange and rural employment and constitutes up to 60 percent to a household's cash income among the Batak tribal groups (Palis 2004). While subsistence NWFPs benefit the poorest of the poor, commercial NWFPs generate employment and supplement income for many people involved at various levels in the NWFP value chain, for example collection, production, harvesting, processing, value addition and sale of such products. In India, about 50 percent of 68 million tribal populations are dependent on NWFPs for their livelihood requirements. Tendu leaf (*Diospyros melanoxylon*), for instance, forms an important NWFP with an annual production of 350 thousand tonnes (US$2 000 million) and employs about 30 to 40 million people in both collection and local cigarette making (Bhattacharya 2007). NWFPs also provide substantial income to households during seasons when other income is low. The people of Tangmang village, Meghalaya are involved in making bamboo items like mats and baskets during slack seasons when there is little or no agricultural work. They sell these goods in the market, earning some income to meet household needs.

Domestication of commercial NWFPs: Domestication of commercial NWFPs can result in better-quality products, more control over the timing and quantity of production and higher efficiencies in producers' time and resource inputs, while reducing production costs. Harvest can be facilitated by the proximity of planted stocks to settlements and product quality can be improved by using genetically superior planting material. The higher returns to labour from cultivated NWFPs tends to discourage forest collection, therefore possibly allowing natural stocks to regenerate. Cultivating an NWFP species can also significantly diversify areas of production compared to the limited occurrences of the same species in its natural habitat. If demand levels and prices remain stable over time, rewards for intensifying management will increase. For instance, broom grass has a high benefit–cost ratio and a very good market. As a result, broom grass cultivation is expanding rapidly and the farmers are obtaining good returns while the traders are assured of steady supply. In villages where farmers cultivated this crop, within ten to fifteen years it had almost completely occupied all the lands previously used for shifting cultivation (Tiwari *et al.* 1995).

Policy initiatives: Governments in Nepal, Indonesia and the Philippines, among others, are attempting to revise forestry policies to support national sustainable management and conservation goals. Recently enacted laws and newly revisited legal interpretations in these countries now support providing resource rights to local forest communities (Republic of Philippines 1992). Policies related to collection of NWFPs are becoming more pro-poor in India. Section 14 of the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (2 of 2007) of India has stated that the access, collection, use and disposal of all holders of forest rights shall be free of royalty. In about 100 000 Joint Forest Management villages of India, the forest dwellers have the right to collection of NWFPs from

government-controlled forests. Such policy initiatives are helping the rural poor who are dependent on the collection of NWFPs for their livelihood.

The popular trends of the past two decades have been greater decentralization and devolution, privatizatio, and the delegation of many social service/welfare functions from the state to civil society and NGOs. This has begun to influence forestry policy and practices also. Involvement of local communities in forest management and NWFP harvest and sale by scrapping restrictive policies can create strong incentives for local people to actively implement sustainable forest management (Ruiz Perez and Arnold 1996). This will directly benefit people by providing alternative livelihoods which in turn reduces pressures on the forest.

Weakening of traditional/customary management systems: In many countries, customary law and traditional management arrangements predominated long before forest resources came under the ownership, administration and/or regulation of governments. However, increased commercialization of NWFPs in response to growing market demand has weakened customary tenure and increased private property. As a result, many traditional arrangements and systems are under pressure and on the verge of breaking down. They either need to be strengthened or replaced with systems which can cope with the changes induced by markets and privatization of common resources.

Decline in traditional sustainable harvest practices: Decline in product availability due to commercialization has led to many traditional sustainable harvest practices being abandoned in favour of more destructive methods, even among some indigenous forest groups. Increase in demand and hence price of certain NWFPs has attracted outsiders to hitherto less valuable resources. This has often resulted in overharvesting or unsustainable and faulty harvesting methods. Many NWFP collectors, mostly outsiders, have generally caused negative impacts on forest resources, fuelled escalating social tensions and prompted local collectors to "get what they can, while they can". In India this has happened for *Embilica officinalis* (amla) fruit in Madhya Pradesh and *Litsea citrata* and *Cinnamomum zeylanicum* bark in Meghalaya. Commercial exploitation of NWFPs often leads to supply constraints because the resource is being harvested in uncontrolled and unlimited quantities and in an unsustainable manner. Such cases are usually in the context of free access systems where the resource is not subjected to any control. An example is the medicinal plant, *Taxus baccata*, in Meghalaya where commercialization drastically reduced the availability of the species until it was depleted to the extent that the government was forced to impose a ban on the trade of the plant.

Decline in importance of wild products: Commercialization of NWFPs will favour only some products and make them more important while other products will remain important only in economic or ecological niches and are likely to be abandoned as better opportunities arise. For example the rattan species, *Calamus tetradactylus* Hance (locally known as may) in Viet Nam. The farmers living in the buffer zone of Ke Go Natural Reserve Area in Cam Xuyen District previously harvested this rattan species from the wild. However, as availability of wild may has been decreasing owing to overharvesting, it is being replaced by a domesticated variety to meet commercial demands (Quang 2004). Similarly, domesticated NWFPs, like nuts and fruit species, will often be larger and of better quality As a result, they can be supplied with more regularity. In combination, these "domesticated" attributes of NWFPs can result in their forest cousins completely losing their marketability. A number of fruits (*Calamus, Myrica, Castonopsis, Prunus* sp.*)* collected from the forest have very high nutritive value yet they are not able to compete with the fruits available in the market. Also, in some cultures, fruits and vegetables collected from forests are considered to be inferior to the ones bought from the market (Tiwari and Rani 2004).

Socio-economic disparity: From the socio-economic point of view, an important long-term implication of promoting domestication is that it will benefit the farmers more than the gatherers and may even result in forest clearing to grow the NWFPs. The promoters of NWFP commercialization often tend to ignore that many forest products are important because they are available to poor people. Development and conservation projects that make forests inaccessible — economically or legally — to poor people can have severe economic and social consequences, especially in times of financial distress. Unabated, these trends will lead to the demise of natural NWFP supplies, to the loss of critical livelihoods for forest-dependent people and to the further degradation of forest resources and ecosystems. Several examples have shown that NWFP commercialization has resulted in extremely low returns for women in comparison to the amount of work they have done. This is seen in Sarawak, eastern Malaysia, where women are involved in labour-intensive production of fine woven rattan mats and baskets for very low returns (Brosius 1995). The women collectors of lichen and mat weavers in Meghalaya also receive very low remuneration for their labour as reported by Tiwari (2000).

Ecological effects: Increased commercialization will lead to overharvesting, resource depletion, degradation of forest and depletion of biodiversity while domestication of NWFPs can reduce incentives to conserve the ecosystems in which the NWFP species grow naturally. Increasing demand for *Thysanolaena maxima* inflorescence for the production of broom in Meghalaya has resulted in large-scale conversion of erstwhile forest lands into pure plantations of the species resulting in loss of ecological services provided by the forests in the mountainous regions (like water and soil conservation). Gathering NWFPs in forests is felt by some environmental conservation organizations to be more compatible with biodiversity conservation than timber extraction (Kuster *et al.* 2006). However, this very much depends on the type and way in which the product is harvested. Low density NWFP extraction from natural forests, as occurs for some fruits, leaves or nuts, can have minimal impact on local biodiversity at landscape and species levels. But as harvesting intensity increases, techniques become more destructive, such as uprooting or clear felling to harvest products. Hence, the exploitation of NWFPs can become as harmful to the long-term survival of a species and its related ecosystem as timber extraction. Intensively managed NWFP production systems can even completely displace natural vegetation, as in the case of bamboo shoot production in China.

Assuring sustainable production of NWFPs

Promote certification of NWFPs: Forest certification is evolving as a useful option to help protect the commercial viability of NWFP-based businesses against competition from similar products obtained through farming or synthetic substitutes. Proper forest management certification schemes offer promising frameworks for successful commercialization of certified NWFPs. Several certification schemes already exist, covering a range of products in agriculture, fishing and forestry, but NWFPs are only marginally involved in these schemes. Certification programmes relevant for NWFPs are forest management certification, organic certification, social certification and product quality certification (Walter 2006)**.** Such schemes can help guarantee better prices for gatherers, social equity within the processing and marketing chains and ensure that attention is given to the sustainability of the resources providing NWFPs.

8.2 Encourage cultivation: Domestication of NWFPs which are in high demand will to enable sustainable commercialization. For medicinal plants, increasing global interest in them has created a sustained demand but at the same time illegal trade in plant materials results in indiscriminate harvest of wild varieties causing serious damage to biodiversity. The overexploitation of these plant species has led to the cultivation of them under field conditions. Medicinal and aromatic crops have better economic opportunities as against

traditional field crops. The price of these crops as raw material to pharmaceutical industries has increased substantially and fetches higher prices for cultivators and collectors. This is also encouraged by the increasing demand of these crops in the international market. In Nepal medicinal plants such as atis, kesar and chiraito are cultivated in community and private land in Karnali zone along with agricultural crops. Cultivation will reduce pressure on natural stock and thus help to conserve NWFP biodiversity in the forests.

Inventorying and research: An inventory of NWFP resources is important because it gives us an idea about their availability; harvest levels can then be calculated and devised, different sustainable harvesting techniques developed and, if needed, intensified management can be targeted. Sustainable traditional harvesting techniques, low-cost technology solutions for inventorying resources are useful for assuring sustainable non-wood forest production. At present, there are many NWFPs which are still harvested from natural systems where domestication has not yet been able to fill the gap in the supplies. Therefore, substantial research is needed to devise better and inexpensive technologies for managing non wood forest production through improved silviculture and cultivation methods. Basic information about NWFPs, for example about their biology and population dynamics, or the socio-economic context of their use, including access and user rights is important because it helps to address the supply of NWFPs for trade; it gives an idea about regulating access to the resource, enhancing resource productivity through forest management and offering economic incentives. New tools and methods for forest management need to take into account the trade-offs of forest development — identifying the winners and losers.

Strengthen institutional support and policies for the NWFP sector: In many developing countries, institutional arrangements to monitor and regulate the flow of NWFPs from producers to consumers are not well-established. Even if formal institutional arrangements for management and conservation of NWFPs exist, they are based on coordinated multi-agency approaches, and this fragmentation of competencies can result in poor management owing to poor communication and poorly coordinated action. Thus, communication/exchange of information among institutions within countries and synergies among international partners, must be substantially improved. There should be more focus on programmes which will enable the promotion of fair NWFP trade.

Policies generated outside forestry sectors may be as important as much as NWFP policy within the forestry sectors. They must be included in the development of institutional arrangements governing NWFPs. Any development assistance or change in policy should be such that it will benefit the rural poor. This requires strengthening user groups that have limited power and influence and their land and resource property rights. In most countries of the region, forest management is still oriented towards timber species and NWFPs are not included in the management plan. For example, in India most working plans of government-managed forests do not include NWFP species.

8.5 Encourage traditional conservation and management practices: Traditional management practices are conservation oriented and should be encouraged. In Meghalaya, management for different NWFPs is practiced in forest gardens by the people from the traditionally called ‘War Areas’ of Meghalaya. The forest are managed in such a way and at least once or twice a year weeding and cutting off undesirable trees species to promote better growth of certain NWFPs like bay leaf is done. The harvesting of Bay leaf is done mainly by skilled men and in a sustainable manner. The older branches that have attained a particular diameter are cut, while younger branches are left. Harvesting is done after a gap of one to two years depending on the age of the tree and fertility of soil. In this way the production can also be maintained. Such traditional harvesting techniques need to be encouraged.

Better technology for processing NWFPs and develop more industries: Many NWFPs require some postharvest processing either to make them viable for storage or to make them marketable. Most of these processes are simple like grading, cleaning, purifying or preservation through physical or chemical processes. Thus it is evident that through the application of very basic and simple processes the value NWFPs can be enhanced both in utility and the potential price they can fetch for both the collector and the producer. But there is a significant need for more knowledge, experience and information on use of current technologies. Most of the collection, harvesting and processing of NWFPs and production of ancillary products are still done using inefficient equipment, obsolete technologies and low productive traditional methods. This sector also lacks proper infrastructure, finance, skilled personnel and most importantly cohesion or cooperation as most of the NWFP-related activities are carried out at microscales (families and individuals). Hence they are unable to exploit the market and in most cases do not even have access to proper markets. Thus, to realize the actual potential of the NWFP sector these gaps need to be addressed urgently.

Improve economic and social equity of NWFP-dependent communities: Effective management to secure property rights and ensure that management benefits are obtained by the local managers, mainly rural communities who are dependent on the non-wood resources, is desirable. In cases where governments are the largest forest owners, they can play a key role in ensuring equitable distribution of benefits among all forest-user groups. However, significant attention to assisting weaker groups of society, such as indigenous forest-dependent communities who usually gather NWFPs, needs to be given. This can occur through licenses or gathering permits with the objective of protecting both gatherers' income and conserving the resource. The roles and impact of non-tariff, trade-related instruments such as certification schemes and best practice codes are important. More focus should be given to high value products. In the case of domestication, most forest-dependent people or socially disadvantaged groups may not have access to farmland or be able to compete with large-scale production on well-established farms and therefore deserve some degree of protection.

Discussion and conclusion

Through commercialization and domestication, the future of non-wood forest production looks promising as it will benefit a wide spectrum of people involved in the production and trade of NWFPs. Subsistence non-wood forest production has generally been the main driving force for sustenance of rural households. However, commercialization, coupled with proper management for intensive cultivation (domestication), has brought brighter prospects for forest-dependent people. The contribution made by non-wood forest production towards alleviation of poverty is immense and can be seen through the improved income of rural households, employment and revenue generation. Although the adverse impact of overharvesting and resource depletion generated by commercialization cannot be discounted, to some extent domestication can fill this gap, with slight risk of lowering the value of wild NWFPs. Conservationists and development managers need to address the challenges of balance between livelihood improvement through NWFP trade and conservation concerns. Regulation of markets for NWFPs collected from open access forests at national as well as international level is desirable.

It has been observed that commercial NWFP production can decline and if no intervention is made it can either lead to total collapse of the resource in the case of products with high global demand or continue to decline in the case of "business as usual". However, if external interventions such as market, management, technology and policies are made, resource availability can be stabilized, improved or enhanced (Figure 1). The review of the NWFP sector across the region suggests that the collection of subsistence NWFPs and enrichment of

natural forests with NWFPs (e.g. forest gardens) are generally sustainable. Similarly cultivation of NWFPs on agricultural lands is also not a concern but needs to be promoted to reduce pressure on forests and promote income to people in this sector. However, commercial NWFPs collected from open access forests are a cause of concern and warrant regulation and control. The cultivation of NWFPs on erstwhile forest land or by clearing natural forests is also a cause of concern as it depletes biodiversity and affects the availability of other forest goods and services. In general, the trend of NWFP production is moving away from forest except for clandestine and illegal trade of high value low volume products, which continues to deplete the biodiversity and productivity of forests.

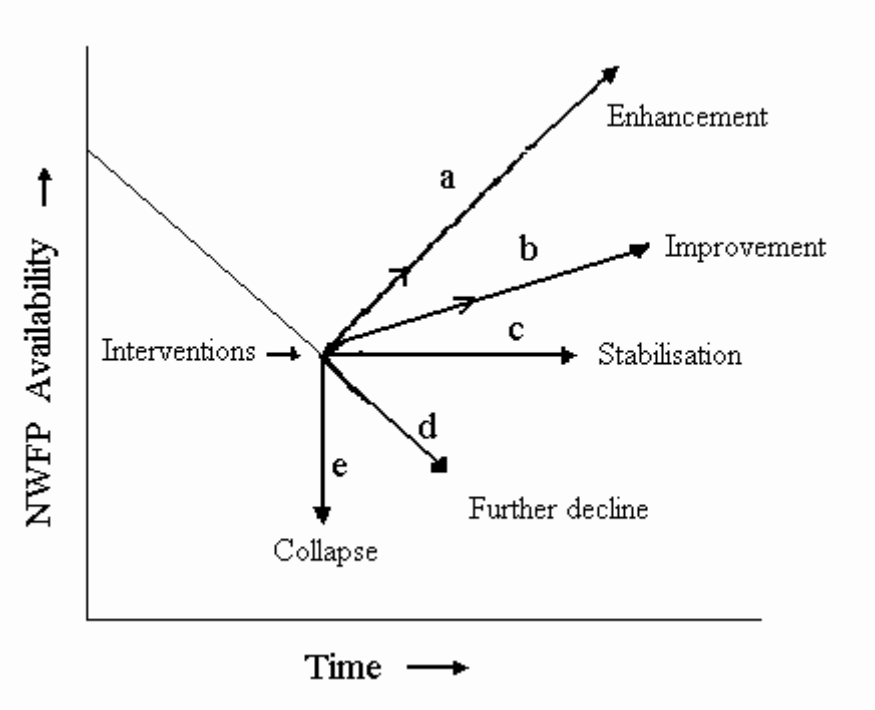

Figure 1. Ensuring NWFP availability through external interventions

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