
# Medicinal Plant Biodiversity & Local Healthcare: Sustainable Use & Livelihood Development

A paper by

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## Abstract

The linkage between biodiversity and human health is well established. The World Health Organization has recorded over 36 new emerging infectious diseases since 1976, many of which, particularly malaria and dengue, are the direct result of the influence of landscape on the ecology of disease. In the developing world, a large proportion of the rural population depend on biodiversity for their livelihood, nutrition and health. Human health, biodiversity, and poverty reduction represent a nexus of interrelated issues that lie at the centre of human development.

Conserving forest biodiversity by valuing & harnessing it as medicine is consistent with poverty reduction and local public health prevention efforts. Global demand for herbal medicines is accompanied by dwindling supply of medicinal plants due to over-harvesting, habitat loss and agricultural encroachment. As millions of rural households use plants for self-medication and local herbalists are widespread, community involvement in monitoring use and status can contribute to effective strategies for sustainable use.

Historic mistrust between communities and forestry departments, stemming from the exclusion of local communities from forests, represents a significant barrier to joint conservation efforts. Improved transportation near tropical forests has increased trade, creating national supply chains for what was previously a locally-based market system.

Cultivation is vital for the conservation of many medicinal plants, with gene banks and botanic gardens contributing to the conservation of species diversity. Plantations and corporate farming modes offer local farmers little control over what is grown, how it is grown and the price at which it is sold. Emerging cooperative models enable groups of farmers to sell direct to manufacturers and receive a fair price for produce and a dividend on profits of the cooperative. There is a need to improve basic knowledge about cultivation practices and dissemination of plant species; promote conservation of vulnerable species at the grass-roots level; adopt sustainable collection and management practices on public lands; and link the management and conservation of medicinal plants with their commercial development. It is timely to move beyond the demonstration projects of the 1990's towards comprehensive conservation strategies.

## 1. Background

### Biodiversity & Health Linkages

The environmental impact of landscape changes on health is now gaining attention in both public health and conservation arenas, where it is recognized

that environmental disturbance impacts the ecological balance of the hosts of diseases as well as of disease-causing pathogens and parasites. The World Health Organization has recorded over 36 new emerging infectious diseases since 1976, many of which, particularly malaria and dengue, are the direct result of the influence of landscape on the ecology of disease (Taylor et al 2001).

In the developing world, a large proportion of the rural population depend on biodiversity for their livelihood, nutrition and health. Changing forest land to agriculture may, in the short term, slightly enhance the nutritional status of some people, yet leads to a loss of important medicinal plants and can expose them to diseases resulting from ecosystem imbalance. As has been noted by the Harvard Project on Biodiversity and Health, human health, biodiversity, and poverty reduction represent a nexus of interrelated issues that lie at the centre of human development, with biodiversity in turn being dependent upon human health (Epstein, Chivian & Frith, 2003). It is a clear implication then that conserving forest biodiversity by valuing & harnessing it as medicine is consistent with poverty reduction and local public health prevention efforts.

**Demand for plant-based medicines**

The surge in global demand for herbal medicines has been followed by a belated growth in international awareness about the dwindling supply of the world's medicinal plants. Over-harvesting for commercial purposes, destructive harvesting practices, habitat loss resulting from forest degradation and agricultural encroachment have all been recognised as contributing factors. Recent policy interest (WHO, 2002) in the importance of traditional medicine in meeting the health needs of indigenous peoples, rural communities and the poor throughout the developing world has underscored the significance of this topic for the health of the poor and indigenous groups as well as in meeting the pluralistic health requirements of more affluent consumers internationally.

More than a decade ago, a WWF/UNESCO report noted that in Africa, which has the highest rate of urbanization in the world, the larger the urban settlement, the larger the traditional medicine markets tend to be, thus placing pressure on rural stocks through unsustainable harvesting practices to meet burgeoning demand. The report noted that "there is significant evidence to show that the supply of plants for traditional medicine is failing to satisfy demand" (Cunningham, 1993). In South Africa, between 400 to 550 species are currently sold for use in traditional medicine, of which an estimated 99% are originate from wild sources (Williams, 1996).

Despite recent awareness of the supply-side challenges of the herbal medicine boom, it is now almost two decades since these issues were first given a global profile in the Chiang Mai Declaration of 1988 (Akerele et al., 1991). The Chiang Mai Declaration stated its recognition that medicinal plants are essential in primary health care, both in self-medication and in national health services, and expressed alarm at the consequences of loss of plant diversity. Expressing grave concern that many medicinally important plants were under threat, the Chiang Mai Declaration highlighted "the urgent need for international cooperation and

coordination to establish programs for conservation of medicinal plants to ensure that adequate quantities are available for future generations". The Chiang Mai Declaration was followed in the subsequent decade and a half by several other declarations and sets of recommendations calling for the conservation, cultivation and sustainable use of medicinal plants[1].

Consistent themes have been: the need for coordinated conservation action based on both *in situ* and *ex situ* strategies; community and gender perspectives in the development of policies and programs; the lack of information on the medicinal plant trade; the need to establish systems for inventorying and monitoring the status of medicinal plants stocks, involving indigenous taxonomies and para-taxonomists where possible; sustainable harvesting practices; micro-enterprise development by indigenous and rural communities; and the protection of traditional resource/intellectual property rights.

## 2. Issues relevant to local, national, regional and international communities

**Local:** Throughout the non-industrialised world, hundreds of millions of rural households are estimated to use medicinal plants for self-medication. While reliable data are scarce, it has been estimated that in India approximately two million traditional health practitioners use over 7500 species of medicinal plants (FRLHT 2002). Community-based methodologies for gathering reliable data on patterns of use of medicinal plants along with baseline data on their local conservation status do exist and are pre-requisites for establishing effective strategies for sustainable use.

Unsustainable harvesting practices by herb gatherers, often for commercial purposes, has resulted in the depletion of many medicinal species in otherwise healthy forests. This shift from a subsistence to a commercial focus in harvesting is also accompanied by a lengthy marketing chain that offers very low rates of return to gatherers. Gatherers of the bark of *Prunus africana* in Madagascar, for example, are paid negligible rates compared to the rates received by middlemen in the trade chain from where it is bought by Spanish and French companies for use as a herbal medicine for benign prostatic hypertrophy (Walter & Rokotonirina, 1995). In Mexico, collectors are reported to receive a mere 6% of the consumer price for medicinal plants (Parrotta, 2002).

[1] These include the Arusha Declaration (Mshegeni et al., 1991), the WWF/UNESCO People and Plants Initiative statement on the causes of medicinal plant biodiversity loss and possible remedial strategies (Cunningham 1993), the 1995 recommendations of the Global Initiative For Traditional Systems (GIFTS) of Health (Bodeker, 1996), the Bangalore Declaration of 1998 (http://ece.iisc.ernet.in/ernet-members/frlht.html), the Neemrana Vision Statement of November 1999 (http://source.bellanet.org/medplant/infodoc.php?op=showdoc&infodoc_id=4 ), the Nairobi Declaration of 2000 (Burford et al, 2000), the Joint Declaration for the Health of People and Nature resulting from the WWF/ TRAFFIC symposium at the Hannover 2000 Expo, whose signatories include representatives of industry, practitioners' associations, the International Council for Medicinal and Aromatic Plants, WWF, IUCN and TRAFFIC (http://www.traffic.org/news/expo2000b.html), and the 2001 Global Plant Strategy of the CBD http://www.iucn.org/themes/ssc/news/globalplantstrategy.html

With such low rates of return, gatherers feel a financial pressure to harvest large volumes of plant material. Low prices also discourage cultivation as, with less effort, plants can be gathered for the wild and sold at the same rate. Traditional knowledge can be a fundamental starting point in conservation strategies. In characterising the medicinal properties of plants, indigenous taxonomies often ascribe identity and spiritual values to plants (Posey 2000). The apparently polar values of honoring and using, revering and understanding, harvesting and conserving are seen as compatible partners. Andean shamans, for example, characterize plants in their own gardens with a greater degree of discrimination and more diverse information than is found in Western botanical categories. Their gardens at the same time reflect a knowledge of ecosystem management and represent symbolically the interrelationships between plants, humanity and the cosmos (Pinzon and Garay, 1990). Such indigenous knowledge and value systems may have a central role in providing the value base necessary for the acceptability and viability of local medicinal plant conservation strategies. Equally, new models of trade are called for to ensure a fair return to gatherers and producers of medicinal plants.

**National:** While forestry policies have focused on trees and the forest canopy as priorities for conservation, they have largely overlooked the forest under-storey and ground level non-timber forest products (NTFPs). Some national forestry departments have devised mechanisms for regulating unsustainable removal of NTFPs, based on both their wider commercial value and their local economic value. Clearly there is a need for forestry and environment departments to assign priority to the promotion of medicinal plant diversity within programs such as tree planting and the rehabilitation of forest and boundary areas. Historic mistrust between communities and forestry departments, stemming from the exclusion of local communities from forests, represents a significant barrier to be overcome if partnerships for joint conservation efforts are to be established.

Improved transportation networks near and into areas of tropical forest biodiversity have increased trade, thus creating national supply chains and collection points for what was previously more of a locally-based market system. A report from Nepal notes that "Hundreds of varieties of herbs in all incarnations - leaves, roots, stems, extracts - continue their journey from remote crags to staging posts in the hills and then to the Tarai. Through a time-tested network of legal and illegal routes, the bundles and sacks are heaved onto trucks, they hop on international flights, board trains and find berths in cargo vessels" (Aryal, 1993).

If local gatherers are to secure a fair price for their work and participate willingly in sustainable harvesting and local cultivation, new models of trade are called for which will shorten marketing chains. Cooperatives of gatherers supplying direct to manufacturers or linked chains of local bio-enterprises combining cultivation with managed wild harvesting and value-added processing may offer new directions. These could offer enhanced levels of returns to local communities and hence a more sound basis for the sustainable management of medicinal plant resources. Such bio-enterprise development is promoted by the UN Conference on Trade and Development (UNCTAD) and is viewed as a novel way of converting the economic potential of biodiversity into conservation initiatives and sustainable development opportunities (UNCTAD 1998).

Other national factors of significance include inadequate regulatory infrastructure, absence of legal protection, including intellectual property rights (IPR) protection (Bodeker 2003), and inadequate access to appropriate technology for harvesting and plantation development. Steps to redress this could include identification and protection of threatened species through national legislation and implementation of international trade regulations via CITES as well as promotion of good-practice regimes within industry that are supportive of long term sustainability rather than simply short term sustainable production.

**Regional & International:** There is high medicinal plant use across regions, with Asia representing the greatest volume of medicinal plants use, both domestically and for export. India, which reportedly harvests 90% of its medicinal plants from uncultivated sources, has an estimated 9000 manufacturing units using almost 1,000 of 7,500 known medicinal species, with an annual domestic market valued at almost US$1 billion. Due to habitat loss and over-exploitation, approximately 1,000 medicinal species are under threat in India, where export of raw material and finished herbal products is valued at around US$100 million per year (FRLHT, 2002). China, which harvests an estimated 80% of its medicinal plant material from wild sources, exports an estimated 32,600 tons of medicinal raw material each year (Parrotta 2002). Extensive and historic trade routes exist, with the trade itself characterised by secrecy and generational control over territory, gatherers and access to purchasers. Increased global demand has brought traders into contact with international regulatory regimes, not least of which is the Convention on International Trade in Endangered Species (CITES). This has led to the recognition that endangered species cannot be exported and that conservation and cultivation strategies must be established as a matter of urgency in order to at least maintain export levels. In 1994, the Government of India banned export of more than 50 species believed to be threatened in the wild (Government of India, 1997). This was subsequently reduced by about a third following strong representation from the herbal industry which argued that such restrictions would damage a lucrative area of India's trade with the West.

In response to this situation, new approaches to medicinal plant production have emerged. In Asia, these are large-scale programs of commercial production, while in other regions, activity is more piecemeal and on a demonstration project basis. Critical factors influencing regional development are the presence or absence of policy awareness, the volume of international trade in medicinal plants, the political will to forge necessary partnerships between the public and private sectors and civil society, and a significant absence of dedicated funding to catalyse such action.

Regional and international issues have been identified and responded to by major institutional actors:

- The IUCN Medicinal Plant Study Group has focussed on the identification, management and protection of regionally and globally threatened species

- TRAFFIC and CITES focus on the monitoring and regulation of international trade;

- WWF and the Rainforest Alliance promote education and the regulation of international production-to-consumption chains, e.g. via certification schemes

- WWF, People and Plants, IDRC, and others concentrate on the development of capacity and best practices

The Global Environment Facility (GEF) appears to be the leading source of international support for broad-based programmatic development. Of at least eight GEF medicinal plant conservation projects, four are in Africa (Egypt, Ethiopia, Ghana, Zimbabwe), one is in the Eastern Mediterranean region (Jordan), two are in Asia (India and Sri Lanka) and one multi-country project is in the Caribbean. Other organisations and funders long active in supporting model medicinal plant conservation and sustainable use projects include TRAFFIC, IUCN, IDRC, the Rainforest Alliance, MPSG, DANIDA and WWF/UNESCO's People and Plants Program. The model projects of the 1990s are now waiting to be expanded into full regional strategies for comprehensive, ecosystem-based management of medicinal plant biodiversity in the 21st century. The path to this is as yet unmapped, but is undoubtedly a priority need.

## 3. Emerging and current trends

There is now broad consensus that cultivation offers the best prospect for conserving many medicinal plants currently found in the wild. In addition to maintaining or expanding supply, cultivation is seen as facilitating enhanced species identification and improved quality control, as well as species improvements. A World Bank commentary has observed that "while commercial cultivation of medicinal plants is taking place on a miniscule scale, this activity is poised for ‘dramatic growth’ in the coming decade" and favours organic and mixed cropping to ensure 'good agricultural practices' (http://wbln1018.worldbank.org/sar/sa.nsf/a22044d0c4877a3e852567de0052e0fa/fae63d87e2bd14038525687f0057e0d1?OpenDocument).

The Chinese Ministry of Agriculture has identified 1000 species of medicinal plants that are important and has begun cultivating species which are in high demand. Over 300,000 hectares are now under cultivation with seabuckthorn (*Hippophae rhamnoides*), employing 10,000 people. The berries alone generate revenues in the vicinity of $40 million annually. *Eucommia ulmoides* which is used for medicinal tea as well as for a natural rubber used for insulation, is grown in 260 counties of 16 provinces. Around 5,000 tons of bark and more than 5000 tons of leaves are produced annually (Lambert et al, 1997). In Namibia, Devil's Claw (*Harpagophytum procumbens*) has been harvested by poor and marginal communities for the international market for use in a range of conditions including arteriosclerosis, neuralgia, gastro-intestinal disorders, diabetes and

hepatitis. *H. procumbens* is now under threat on communal lands as gatherers secure low revenues for unsustainable harvesting of secondary storage tubers, which have the highest concentration of active pharmacological agents. Processing does not take place locally but in importing countries, thus no revenues are gained through value addition. While cultivation projects do exist in Namibia, South Africa and possibly Morocco, the quantities produced play a minor role in international trade (Hachfeld & Schipmann, 2001). To redress this situation, the Namibian NGO CRIAA SADC assists rural communities to ascertain the quantity of their resource and to establish quotas and sustainable harvesting techniques for the production of high quality products. Direct and economically feasible access to the market is aimed at in order to generate as much income as possible for the harvesters in the rural and almost exclusively marginalized and poverty stricken communities. Results indicate that despite conditions of extreme poverty, communities are willing to sustainably harvest their resource (Lombard C, 2001).

In South Africa, parts of Asia and the Caribbean, manufacturers of herbal medicines and of plant-derived pharmaceuticals have entered into contracts with local communities for large volume production of certain species. Such projects can reduce pressure on wild stocks and create new local enterprises. At the same time, many are based on vertically integrated corporate control of production. Plants are provided along with agricultural inputs and a guaranteed buy back. However, farmers have little control over what is grown, how it is grown and the price at which the crop can be sold. By contrast, an emerging trend towards cooperative development aims to enable gatherers and small farmers to sell through their cooperative direct to manufacturers and receive not only a fair price for their produce but a dividend on any profits of the cooperative.

In India, the Gram Mooligai Company Ltd. (GMCL) was established in 2000 to ensure more equitable participation of rural medicinal plant suppliers. The majority shareholding of the company is limited to suppliers of medicinal plants who, through collection and/or cultivation, supply direct to GMCL. Rural cultivators and collectors organize into groups which then become eligible to buy shares. The board of the company is drawn from these groups and a resource pool of professionals is available for technical advice. NGO partners organize the collectors and cultivators into small groups which undertake the collection or cultivation of medicinal plants according to the demand of the industry. Training is provided in group building, sustainable harvest methods, agro-techniques, cleaning, quality control, accounts and record keeping. The material collected at the village level is then transported to the respective buyers who are assured of a supply of quality raw drugs. During 2000-1 GMCL organised cultivation of 400 acres consisting of *Cassia augunstifolia, Cathrenthus Rosea, Bacopa monneri, Mucuna pruriens, Phyllanthus amarus* and *Aloe vera*. Collection from non-forest areas supplied about 40 tons of *Eclipta prostrata, Boerhavia diffusa, aloe vera suckers, Tribulus terristeris,* and *Ocimum sanctum.* GMCL mobilized around 1000 acres in 2002 (http://www.frlht-india.org).

Yet there are risks in reducing the number of players in the supply and marketing chain. Increased government controls at *in situ* or in-transit levels can impact negatively on local livelihoods, while controls at the storage, manufacturing and trade stages can hurt commercial stake holders. While each may be necessary transitional phases, they can also invite opposition and sabotage In a move away from the demonstration projects of the 1990s towards integrated national conservation, GEF funding in India is helping develop a network of an anticipated 300 *in situ* forest reserves of medicinal plants across different biodiversity zones, linked to decentralised nurseries and a state level seed centre. This will serve as the gene bank for a sustainable national cultivation program (FRLHT 2002). As a further step towards integrated national policy and practice, the Govt. of India has established an independent known as the “Medicinal Plants Board" to oversee, coordinate and manage all aspects of medicinal plant biodiversity and its use.

NGOs are playing the lead role in this work, with countless small projects underway constituting an as-yet-undocumented series of models for *ex situ* conservation. Clearly, a strategic international audit of this field is needed in order to establish a frame of reference within which decisions can be made as to the conditions and strategies needed for optimal conservation and production. In the early 1990’s, TRAFFIC found that "The point of view of UK traders appears to be that any conservation considerations (specifically, cultivation as opposed to wild harvesting) are largely an unaffordable luxury" (Lewington, 1993 p.29). Now, there are moves towards certification of sustainably sourced medicinal plant products and eco-labelling to bring consumers in as a market force in support of conservation. If supply is to be guaranteed, industry growth must be stimulated, with incentives being given to companies which can demonstrate that their raw materials are either sustainably harvested or are cultivated commercially in a manner that supports, rather than undermines, the sustainability of the wild resource. A great deal more effort needs to go into evaluation of existing experience, as well as examination of the many assumptions that are currently being made about the relationships between production, resource sustainability, and the consequent impacts on equity and benefits. Such a move will need to be incremental as supply of cultivated material needs to grow exponentially to meet demand, but this would represent a significant step towards accountability on the part of industry.

Important emerging trends and relevant experience include:

- international acknowledgement of the fundamental importance of plants to human well-being including health, and the threat to their conservation. The recent adoption of the global plant strategy for plant conservation under the CBD will alter policy environment for work on medicinal plants as there is now more emphasis on contribution of traditional management systems and on the need for basic conservation efforts

- community level resolution of conflicts between use and protection of resources, being promoted by the IUCN/WWF People and Plants Working Group

- adaptation of global threat assessment criteria-methods to support local-national-regional threat assessment and management at local, national and regional levels - (for example the FRLHT Community Assessment of Medicinal Plants (CAMP) programme, and the IUCN-SSC Red List Programme).

## 4. Research needs & gaps

Clearly, such a diverse field calls for a range of interdisciplinary perspectives to be represented in a coordinated international and national research agendas. Most of the following research needs are currently gaps in knowledge:

- Identification of viable incentives for sustainable harvesting to be established
- Assessment, monitoring, and regulatory systems are required for managing sustainable harvesting
- Evaluation of conservation measures that may be effective in ensuring the maintenance of genetic diversity, both *in situ* and *ex situ.*
- Inventories of national medicinal plant stocks. Ethnomedical sources, field surveys, community rapid assessment methods.
- Agro-technology trials for priority species
- Support for tissue culture protocols on medicinal plants
- Dedicated research centres for diverse bio-climatic regions: high altitude, arid zone, tropical, etc.
- Social research - e.g. the contribution to sustainable resource use of women-oriented medicinal plant enterprise programs
- Economic research: studies on enterprise development; trade studies, micro-economics of community level use and trade with respect to their impact on patterns of use and sustainability
- Ecological studies - extent of harvesting, red areas, red book species, volume of harvest, capacity of ecosystem, estimates on viability of the species under current and projected harvest rates.

## 5. Next steps

To boost the quality of plant resource management and increase supplies:

- Agricultural support agencies should strengthen extension efforts to farmers

- Research institutions need to improve basic knowledge about cultivation practices and dissemination of plant species

- Conservation agencies and NGOs should promote conservation of vulnerable species at the grass-roots level

- Community organizations need to adopt sustainable collection and management practices on public lands

- Profitable private enterprises for processing, transporting, and marketing must be developed

- Government institutions need to be strengthened to regulate these important resources and, at the same time, foster their sustainable development and conservation

- A certification system is needed to demonstrate sustainability of harvesting - this is now done with timber and can be done with medicinal plants. Consumers need to be educated on this issue so that they choose products with the sustainable harvesting label

- Future initiatives should also link the management and conservation of medicinal plants (and other non-timber forest products) with the commercial development of these resources

There is a need now to move beyond the demonstration projects of the 1990's towards comprehensive conservation of the world's medicinal plant biodiversity - to maintain the resource that has sustained human health for time immemorial, to meet the prospects for new enterprise with viable actions at the local level, and to support the economic hopes of nations for participating in a burgeoning new industry.

In this spirit of inter-sectoral development, new forestry projects should be designed to have a significant effect on the sustained use of non-timber forest products. Management and conservation must be integrated with programs in other sectors: in health, to foster better use of plant materials; in education, to build awareness of the need for protection and judicious development; and in agriculture, to strengthen farmer extension methods for plant cultivation. Such a strategy would give priority to ensuring affordability in local health care through sustainable medicinal plant production and for contributing to poverty alleviation through micro-enterprise development.

While small scale projects are the crucible for new direction and progress at the community level, the importance cannot be underestimated of developing networks of projects across biodiversity zones, reflecting integrated and well

managed local, national and regional integrated strategies. New funding mechanism and commitments will be needed to support such developments. Nothing less than this is called for if the promise of saving the plants that save lives so rather than the threat of their loss, so poignantly outlined almost two decades ago in the Chiang Mai Declaration, is to become a reality.

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