

Compensating forest-dwelling communities for drug discovery: the work of the Healing Forest Conservancy

K. Moran

This article affirms that much of the world's tropical biological diversity is in areas inhabited by indigenous, or native, cultures, making them the primary in situ caretakers of the planet's biological diversity; and that native cultures' knowledge of medicinal plant usage is of value to pharmaceutical companies in drug development and therefore merits compensation. The article then describes the work of the Healing Forest Conservancy, a non-governmental organization, in enabling forest-dwelling communities to benefit from their contribution to drug development efforts, and presents a conceptual framework to provide compensation for drug discovery to native communities.

Biological diversity refers to the number and variety of the genes, species and ecosystems comprising life on earth. The plants, animals and natural environments that constitute biological diversity fulfil aesthetic and spiritual needs for much of humanity as well as benefiting human welfare directly. For example, plant species provide the basis for many of today's medicines and hold the promise of supplying useful chemicals for tomorrow's therapeutics. Tropical species are particularly valuable because, over time, especially in the moist tropical ecosystems with low seasonal climatic variation, many plants have evolved chemical defences from predation and infection. The chemical defences that increase plant resistance against bacteria and other infectious organisms could also be therapeutically useful for humans.

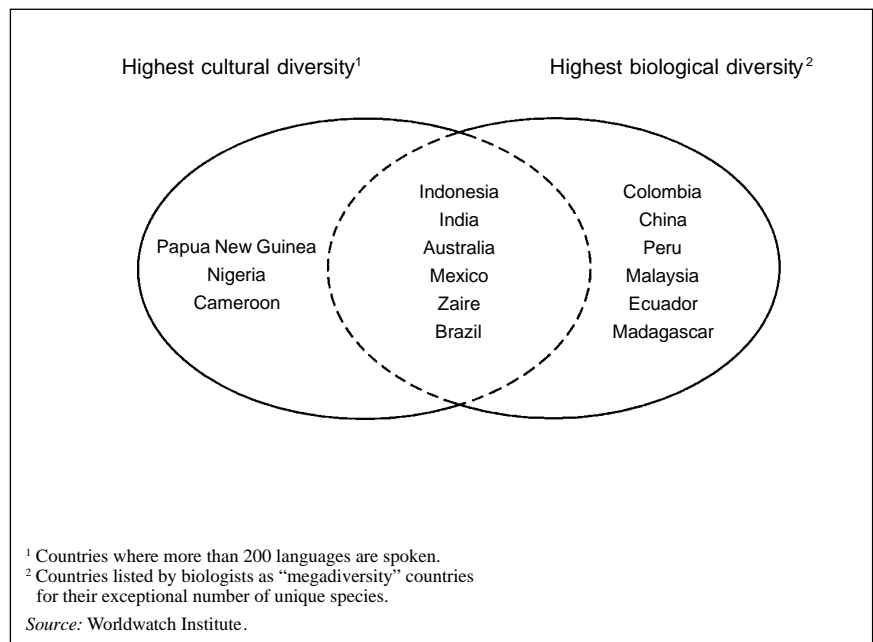
However, if present trends in the loss of plant habitats in the tropics continue, large numbers of plant species could be extinct by the middle of the next century. We have little knowledge of the promising

cures we are losing. Of the estimated 250 000 to 500 000 existing species of flowering plants, for example, less than 1 percent have been investigated clinically for their chemical composition and medicinal value (Farnsworth, 1988) although many have recognized traditional medicinal use.

Cultural diversity and human health

According to the United Nations, there are 300 million indigenous people in about 5 000 groups in more than 70 countries. Anthropologists tend to feel that the best single indicator of distinct cultures is spoken language. In the Figure below, the Venn diagram (Durning, 1992) shows in the left circle the nine countries with the highest level of cultural diversity (based on number of languages spoken). The right circle contains countries with the highest numbers of unique species, the so-called "megadiversity countries". It is interesting to note that six of the 12 centres of biological diversity also rank highest in cultural diversity (Indonesia, India, Australia, Mexico, Zaire and Brazil).

FIGURE
Cultural and
biological diversity,
circa 1900



Katy Moran is Executive Director of the Healing Forest Conservancy, Washington, DC.



Participants at a Medicine Woman training course at the National Herbarium in Lucknow, India

Accumulated over millennia and passed down through generations within communities, traditional knowledge of medicinal plants is as rich and diverse as biotic resources, and as threatened (Moran, 1992). Loss of traditional knowledge on medicinal uses of plants in the developing world is a loss to all humanity, for future as well as present generations. Indigenous knowledge of the local medicinal use of tropical species can help guide and render more efficient the selection and screening of medicinal plants for use in drug discovery.

Use of cultural diversity for drug discovery

Richard Schultes (1988), the Harvard ethnobotanist widely renowned as the "father of ethnobotany" and co-author of *The healing forest* (Schultes and Raffauf, 1990), from which the Conservancy draws its name, stated in 1988:

"The accomplishments of aboriginal people in learning plant properties must be a result of a long and intimate association with, and utter dependence on, their ambient vegetation. This native knowledge warrants careful and critical

attention on the part of modern scientific methods. If phytochemists must randomly investigate the constituents of biological effects of 80 000 species of Amazon plants, the task may never be finished. Concentrating first on those species that people have lived and experimented with for millennia offers a short cut to the discovery of new medically or industrially useful compounds."

There are rich traditions of the use of medicinal plants in every continent. According to the World Health Organization, 80 percent of the total population of developing countries, about 4 000 million people, depend on plant-based traditional medicine for their primary health care.

Economic analysis by Artuso (1994) documents that, rather than random screening, it is more efficient to use traditional knowledge of the medicinal use of plants as a lead to pinpointing promising plants. Most plant-based prescription drugs on the market today have the same or related use in Western medicine as was originally practised by native healers (Farnsworth, 1988). But virtually no post-product royalty or

compensation has been returned to native communities for their intellectual contribution to the drug discovery process. Moreover, today there is no international legal instrument that specifically protects this intellectual property (Greaves, 1994).

The Convention on Biological Diversity, which formalized the sovereignty of nations over their biological resources, merely "encourages" equitable sharing of benefits arising from traditional knowledge, innovations and practices. The basic framework of the Convention does not establish mechanisms to accomplish this equitably within nations. It has not resolved, nor does it yet adequately acknowledge, the difference between ownership of biotic material by national governments and the ownership of the vital contribution of traditional medicinal use of the biotic material by indigenous cultures. Although equity is a critical issue in the spirit of the Convention, indigenous peoples' contribution to the drug discovery process has not yet been adequately addressed.

COMMUNAL COMPENSATION

In 1990, the Healing Forest Conservancy (hereinafter referred to as the Conservancy) was founded as a non-profit-making organization by Shaman Pharmaceuticals Inc. Its purpose is the conservation of tropical forests, particularly medicinal plants and their sustainable use for human health, and the

welfare of tropical forest peoples, with particular emphasis on their traditional knowledge of the use of medicinal plants. The focus of the Conservancy is to work with indigenous federations to devise and implement a strategy to compensate local cultures for the value of their knowledge of medicinal plant usage in the drug discovery process (Moran, 1994).

Funding for the Conservancy was originally contributed by Shaman Pharmaceuticals Inc., a natural products

company based in California, United States (see Box). The Conservancy is a public foundation with an independent board of directors and has offices in Washington, DC and San Francisco, California. Operational funding is provided by Shaman Pharmaceuticals, with programme support from the Aveda Corporation, the Rex Foundation, the Asia Foundation, the Leland Pikes Foundation, the Nelson Talbott Foundation and the Jocarno Fund.

The Conservancy consults with indigenous federations, tropical country governments, professional associations of scientists, foundations and other organizations involved in the conservation of biological and cultural diversity. Basically, all acknowledge that indigenous plant knowledge is not owned by an individual (for example, a healer) but by the community or the culture group. Compensation, then, should benefit the whole culture.

The focus of the Conservancy is to develop communal compensation options in the form of programmes with the following objectives:

- promote sustainable local harvesting of natural products in forests, thereby providing economic justification for their maintenance as forest rather than conversion to other forms of land use;
- generate local employment (where appropriate, to focus on women) by providing training in technical skills (integrating traditional and non-traditional scientific methods and processes) for species collection, identification and inventory of local genetic resources;
- provide resources to survey, demarcate and deed historic territories to indigenous groups;
- develop local markets for non-timber forest products such as medicinal plants;
- build and strengthen indigenous federations and institutions; and
- link national and international practitioners and policy-makers in initiatives that foster the health and welfare of indigenous cultures and tropical forests.

Shaman Pharmaceuticals Inc.

Shaman Pharmaceuticals Inc. is a natural products company based in California, United States. Shaman focuses on the discovery and development of novel pharmaceutical products from plants and uses the science of ethnobotany, as well as isolation and natural products chemistry, medicine and pharmacology, in its drug discovery process. The rationale behind this method is to speed up the process of drug development which, at present, typically takes 12 to 15 years at a cost of nearly US\$300 million.

To date, Shaman has identified potential therapeutic activity in more than one-half of the 800 plants it has screened. Eight compounds are currently prioritized for clinical studies (King, 1996). The company argues that plant-derived drugs with a history of medical use can be developed for pharmaceutical use more quickly and cost-effectively than traditional pharmaceutical products.

Although Shaman has yet to commercialize a product, the use of ethnobotanic leads has brought two potential products to clinical trials in record time. Virend™ is a topical formulation derived from a plant that is a pioneer species used by cultures in South America to treat herpes lesions. More than 30 million people worldwide have genital

herpes and each year almost 500 000 new cases are diagnosed. Currently, only one drug has been approved to treat herpes; this drug, called oral acyclovir, in 1994 totalled sales of US\$1 400 million. Stages I and II of clinical trials undertaken in 1993 and 1995 determined the safety of Virend and provided preliminary indications of its efficacy in a controlled setting. In 1996, stage III trials were initiated. Another Shaman product undergoing clinical trials is Provir™, an oral product for the treatment of secretory diarrhoea which, worldwide, affects more than 16 million people.

Shaman provides up-front compensation that responds to the immediate needs of the country and indigenous collaborators when contact is established with local communities and during research expeditions, and is committed to the development of a long-term compensation programme which will be available through the Healing Forest Conservancy once a product is commercialized (King, 1996).

PILOT PROJECTS

The Conservancy has undertaken a number of pilot projects to improve the ability of local people to reap the benefits of medicinal plants and to consider



*Medicinal plants
on sale in a market
in Kunming, China*

options for compensation of local communities for drug discovery. Results are shared with communities and countries which can then relate experiences from pilot projects to their specific circumstances and make an informed choice among compensation options. Pilot programmes were developed with input from three sources:

- indigenous federations and their declarations;
- international conventions signed by the governments of species-rich countries; and
- professional associations, such as the International Society for Ethnobiology, whose members collaborate with governments and federations.

Terra Nova

The Government of Belize has designated about 24 000 ha for the establishment of an ethnobiomedical plant reserve. This area, named Terra Nova, which is located in the Cayo district of Belize, has ideal conditions for the growth of many types of medicinal plants. It also has a nursery for the maintenance of threatened species of medicinal plants which are important in traditional medicine in Central America. To curtail illegal hunting and logging near Terra Nova, the Conservancy and the Rex Foundation have supported the surveying, demarcation and deeding of the land following a request from the Belize Association of Traditional Healers (BATH). The management of Terra Nova has been assigned to BATH.

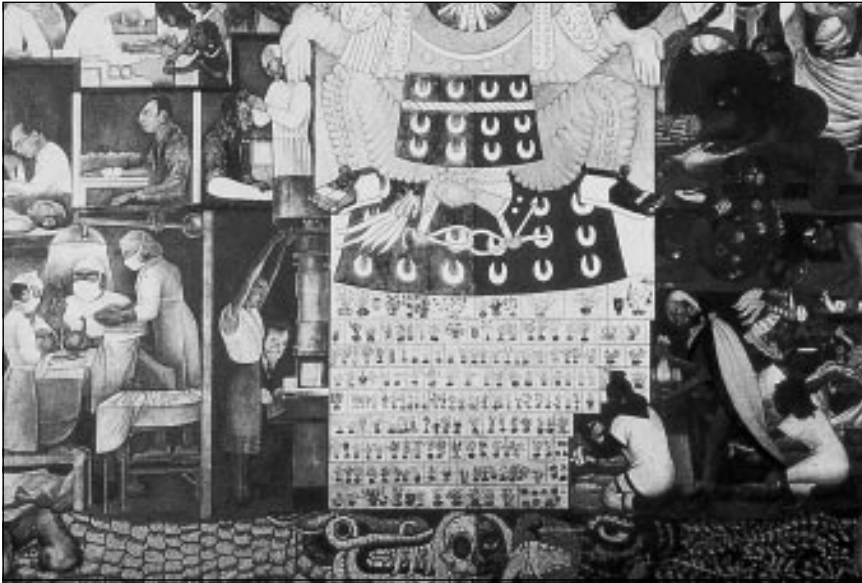
The association has held monthly public education meetings for local villagers where traditional healers discuss medicinal plants and traditional remedies for a variety of common ailments. The demarcation of such reserves offers a place for traditional healers to train and pass on the healing forest legacy to future generations of practitioners in a reserve that unites traditional people's use of plants with their sustainable extraction.

Medicine woman

Together with external support through grants, the Healing Forest Conservancy also provides education and training programmes for women, particularly indigenous women, in tropical countries to increase local information on the value of biotic resources.

In 1994, the Asia Foundation sponsored a grant to the Healing Forest Conservancy to participate in the Environmental Fellowship Program, a component of the United States-Asia Environmental Partnership of USAID. As part of the fellowship, the Conservancy funded a Medicine Woman pilot project in Lucknow, Uttar Pradesh, India, for students from different regions of the country. The pilot project was located in India because it was the site of the Fourth International Congress of Ethnobiology, which the students also attended. The purpose of the course was to increase and diffuse the knowledge of basic technical skills in ethnobiology; to promote discussions on related ethical issues; to promote the establishment of a network and professional dialogue among indigenous people or those associated with ethnobiology worldwide.

The Conservancy, in cooperation with the Asia Foundation, the Rex Foundation and the National Botanical Research Institute of India, supported the participation of 28 trainees, half of whom were tribal women. Mornings were spent



A mural on past and present use of medicinal plants at La Raza Hospital, Mexico City

in classes discussing methods in ethnobiology with various international specialists in the natural and social sciences from India, or who arrived in India before the congress so that they could help teach the course. Afternoons were spent in the field for technical training in collection methods, such as how to make and use a plant press and plant drying methods. Evening discussions focused on ethical issues in applied ethnobiology such as intellectual property rights. Students in the course, as well as gene-rich countries and indigenous federations, all petitioned for opportunities to add value to their biotic resources in their own countries and communities (Akere, Heywood and Syngé, 1991; Soejarto and Gyllenhaal, 1992). They now recognize that information on plant and animal species is valuable in itself and they want the skills to increase this information locally.

National governments can also benefit from the Conservancy's training programmes by gaining a technological infrastructure for science and commerce which will yield jobs and taxes. Fees can be charged to outsiders with commercial or research interests in the sustainable

development of biotic resources. For example, new technologies to screen plant supply information that can lead to the design of new drugs. These technologies enhance the capacity of countries and communities to increase the value of their biotic resources. The pharmaceutical industry in biological diversity-poor countries currently prices plant collecting at US\$50 to \$100 per raw plant sample, but doubles that price for a chemical extract. Countries can choose whether to supply natural products in the form of extracts, rather than raw, unprocessed material, to foreign investors or to establish their own medicinal plant, phytochemical or pharmaceutical industry. In either case, adding value locally lowers the total cost of drug discovery from natural products in a high risk, high gain industry valued at US\$100 000 million annually.

Evaluations by participants at the end of the MedicineWoman course in India were positive; they suggested future training courses of greater length to broaden training opportunities. Another Medicine Woman programme was held at the Limbe Botanic Garden in Cameroon in October 1995. The programme, which formed part

A traditional healer from Belize collecting medicinal plants



10154-13x24

of an Ethnobiology and Field Taxonomy Training Course for pan-African participants, was organized by the Bioresources Conservation and Development Programme (BCDP), a West African non-profit-making, non-governmental organization that links the development needs of tropical peoples with the conservation of the environment.

COMMUNAL COMPENSATION TRUST FUNDS

A key issue is how pharmaceutical companies, in this case Shaman, could provide compensation to indigenous communities for their contribution, through traditional knowledge, to the development of commercial drug products. Once Shaman has commercialized a product, a percentage of the profits will be devolved to compensation trust funds. Monies will continue to be devolved to compensation trust funds through the Conservancy. Monies will continue to devolve as long as Shaman continues to show a profit. The trust funds will be administered by the Healing Forest Conservancy to deliver biannual funding to indigenous communities for



Pressing medicinal plant samples in Belize

projects or programmes that will benefit the community as a whole, thereby maintaining consistency with the concept of communal ownership of the intellectual property represented by traditional knowledge of medicinal uses of plants. It is worth noting that the funds will be used to provide benefits to all communities collaborating with Shaman, rather than just the community from which plant

material or knowledge has been drawn for development of the specific drug product (King and Carlson, 1995). Through this process, the risk of receiving no compensation for a commercialized product in individual countries or communities that did not contribute to the product discovery will be lessened. In a financially unpredictable industry, spreading the benefits and risks among all collaborators will increase the opportunities for compensation and hasten compensation returns.

For this process to be successful, the Conservancy will need to:

- create a structure that can deliver long-term funding with which to finance programmes in a consistent manner; and
- maintain enough flexibility so that programmes can be managed locally in order to remain responsive to local needs.

Richard Evans Schultes Award

In order to increase the visibility of the contributions of ethnobotany and to foster and give due recognition to those who further the work in this field, the Healing Forest Conservancy presents an annual award to a scientist or practitioner (or organization) who has made an outstanding contribution to ethnobotany or to indigenous people's issues that are related to ethnobotany. The award bears the name of Richard Evans Schultes, widely recognized as one of the most distinguished figures in the field. The award is associated with a US\$5 000 cash prize.

The Richard Evans Schultes Award seeks a balance in geographical location, gender and field of study for recipients. Nominations of indigenous people active in this area are especially welcome. Nominations for the award, together with a statement of the candidate's qualifications, should be sent to the Healing Forest Conservancy, 3521 S. Street, NW, Washington, DC 20007, USA.

Governments will be compensated for the use of their biotic material in a separate process since they typically have legislated mandates to use compensation funds for national priorities such as biological inventories.

A precedent for the establishment of the communal compensation trust funds envisioned by Shaman and the Healing Forest Conservancy can be found in the environmental funds that were established in relation to debt-for-nature swaps (Moran, 1991; IUCN, 1994). In considering compensation, it is noteworthy that indigenous cultural groups often have an identity distinct from the dominant society and are often geographically and linguistically isolated. This makes them particularly vulnerable. The envisioned trust funds can make a direct link to indigenous communities, empowering them to determine how to use their compensation without outside interference. In addition, the communal compensation trust funds offer the potential added value of attracting and managing additional sources of finance.

CONCLUSIONS

The efforts of the Forest Healing Conservancy suggest a number of criteria for the sustainable use of biological diversity:

- The potential for maintaining the integrity of the forest ecosystem and forest cultures over time must be considered as natural products are harvested.
- Local capacity must be sufficiently well organized to monitor and manage the process.
- Programmes, in addition to generating direct employment and income, should offer adequate and secure compensation to indigenous communities in order to provide benefits for future as well as present generations.

It is useful to apply economic and environmental criteria when deciding how to conserve biological and cultural diversity. The question of equity stands out as a critical component of the discussion. Equity not only means compensation but, more important, equal standing among participants in making decisions about what form this compensation should take. The participation of indigenous groups can help to ensure that the value of biological diversity is recognized and compensated at the local level, and in ways that unify and strengthen cultures through the use of traditional or compatible institutions. If we are serious about the sustainable development of biological diversity for the discovery of new therapeutics, participation and equal standing among all concerned must be a guiding principle. ♦



Bibliography

- Akere, O., Heywood, V. & Synge, H.**, eds. 1991. *The conservation of medicinal plants*. Cambridge, UK, Cambridge University Press.
- Artuso, A.** 1994. Economic analysis of biological diversity as a source of pharmaceuticals. Paper presented at the PAHO/IICA Conference on Biological Diversity, Biotechnology and Sustainable Development, 12-14 April, San José, Costa Rica.
- Durning, A.** 1992. *Guardians of the forest*. Washington, DC, Worldwatch.
- Farnsworth, N.R.** 1988. Screening plants for new medicines. In E.O. Wilson, ed. *Biological diversity*. Washington, DC, National Academy Press.
- Ford, R.I.** 1978. *The nature and status of ethnobotany*. Anthropological Paper No. 67. Ann Arbor, USA, Museum of Anthropology, University of Michigan.
- Greaves, T.**, ed. 1994. *Intellectual property rights for indigenous peoples*. Oklahoma, USA, Society for Applied Anthropology.
- IUCN.** 1994. *Report of the first global forum on environmental funds*. Washington, DC.
- King, S.R.** 1996. Conservation and tropical medicinal plant research. In M.J. Balick, E. Elizabetsky & S. Laird, eds. *Medicinal resources of the tropical forest*. New York, Columbia University Press.
- King, S.R. & Carlson, T.J.** 1995. Cultural diversity, biomedicine and ethnobotany: the experience of Shaman Pharmaceuticals. *Interciencia*, 20(3): 134-139.
- Moran, K.** 1991. Debt-for-nature swaps. United States policy issues and options. *Renewable Resources J.*, (Spring): 19-24.
- Moran, K.** 1992. Ethnobiology and United States policy. In M. Plotkin & L. Famolare, eds. *Sustainable harvest and marketing of non-timber forest products*. Washington, DC, Island Press.
- Moran, K.** 1994. Cultural diversity conservation through the Healing Forest Conservancy. In T. Greaves, ed. *Intellectual property rights for indigenous peoples*. Oklahoma, USA, Society for Applied Anthropology.
- Schultes, R.E.** 1988. Primitive plant lore and modern conservation. *Orion Nature Quarterly*, 7(3): 8-15.
- Schultes, R.E. & Raffauf, F.** 1990. *The healing forest*. Portland, Oregon, USA, Dioscorides Press.
- Soejarto, D. & Gyllenhaal, C.**, eds. 1992. The declaration of Belem and the Kunming action plan. *International Traditional Medicine Newsletter*, 4(1).
- United Nations.** 1992. Report on the Intellectual Property Rights of Indigenous Peoples. United Nations Working Group on Indigenous Peoples, 6 July 1992. New York. ♦