



A healer from western Cameroon. *Prunus africana* has been used by many different ethnolinguistic groups in the treatment of benign prostatic hyperplasia for centuries. Photo © 1999 Thomas Carlson.

## Issues in the Commercialization of Medicinal Plants

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During the last decade the potential of the plant world as a source of new, useful molecules has been the subject of numerous conferences and books. Discussions on these flora have highlighted ethical and legal frameworks for accessing indigenous knowledge and biological resources (Boom, 1990; Cunningham, 1992; Elizabetsky, 1991; Moran, 1992; Reid *et al.*, 1993; Posey and Dutfield, 1996; Baker *et al.*, 1995; King and Carlson, 1995; Churcher, 1996; Iwu, 1996 a, b; Richter and Carlson, 1998). To ensure that more equal benefits accrue from the use of biological resources, the United Nations Convention on Biological Diversity (CBD) was created during the Earth Summit in Rio de Janeiro in 1992 (Glowka *et al.*, 1994). By the end of 1998, 171 nations had ratified the CBD, with its stated goals of fostering the conservation of biodiversity, the sustainable use of biodiversity, and the equitable sharing of benefits arising from its commercial use.

Shaman Botanicals.com (SB) discovers and develops novel products for human diseases by isolating active compounds from tropical plants with a long history of medicinal use. By screening plants, used for centuries as medicines, for select diseases, SB produces a wide variety of products that are diverse in both chemical class and mechanism of action.

SB's discovery efforts began in 1990. At that time, SB also established guidelines for reciprocity to indigenous cultures and countries that contributed knowledge and resources to SB's medicinal plant discovery efforts. These guidelines created the foundation for SB's reciprocity program, which provides short, medium, and long-term support to indigenous cultures and the appropriate national governments' conservation agencies that manage the countries' biological resources.

The company contributes up to 15 percent of its drug discovery expedition costs

to fund projects or programs based on the expressed needs of the community. Examples of its short-term reciprocity programs: providing legal assistance for demarcating traditional lands; building, refurbishing, and expanding centers of traditional medicine in communities; installing clean water systems; and supporting community-based public health projects.

SB also provides medium-term reciprocity programs that include instituting technology transfer programs that bring tropical scientists to SB's California laboratories for three to 12 months; enabling them to learn technical skills in chemistry, pharmacology, and biology; providing laboratory equipment, solvents, and financial support for research conducted in host countries; funding numerous studies within tropical countries to evaluate the sustainable harvesting of indigenous medicinal plants; and providing financial resources to host-

The Buganda culture of Uganda and many others have used *Prunus africana* for centuries, but the culture groups do not share in any of the benefits.



Healer (left): Nakayiza Mauricia, midwife, with her mother in Namalinga Village, Bombo District, Uganda. Funds were supplied by Shaman Botanicals.com to help strengthen the clinic where Mauricia practices. Photo © 1998 Susan Nelson.



Healer Nakayiza Mauricia. Photo © 1998 Susan Nelson.



country research organizations and local communities.

To address long-term reciprocity issues, SB formed the Healing Forest Conservancy, a nonprofit organization dedicated to the conservation and preservation of cultural and biological diversity. Programs and the charter of the Conservancy are to promote the long-term survival of the biological diversity of tropical forests, particularly medicinal plants, and the cultural diversity of tropical forest peoples, particularly their traditional knowledge of medicinal plant usage.

Increasingly, conservationists are pointing out the diminishing diversity and supply of medicinal plants sold not as processed pharmaceutical products, but as phytomedicines, herbal medicines, or dietary supplements (Sheldon *et al.*, 1997; IUCN, 1997; Lambert, 1997; Leaman *et al.*, 1997; Pearce, 1997; ENS, 1998). The German Federal Agency for Nature Conservation published a trade survey of medicinal plants used in Germany in 1997 (Lange and Shippman, 1997). This survey is one of a number of international initiatives to quantify and maintain accurate data on the collection, use, and trade of medicinal plants in countries that use large volumes of medicinal plants. The Medicinal Plant Specialist Group of the International Union for the Conservation of Nature (IUCN) consists of over 60 scientists and specialists in medicinal plant trade throughout the world. Its mission is to monitor plant species that are endangered due to the medicinal plant trade, publish a directory and bibliography for medicinal plant conservation organizations and publications, and create action plans to reduce pressure on endan-

gered or threatened species. In April 1998, an international meeting, "Medicinal Plants for Survival," was convened in Bangalore, India, with 400 delegates from about 35 countries focusing on preserving biocultural diversity of medicinal plants. Representatives from communities, companies, non-governmental organizations (NGOs), and governments discussed the over-exploitation of medicinal plants.

TRAFFIC, wildlife trade monitoring program of World Wide Fund for Nature (WWF), and another NGO, The Nature Conservancy (TNC), track the trade of North American medicinal plants such as goldenseal (*Hydrastis canadensis*) and American ginseng (*Panax quinquefolius*). There are also botanical gardens such as the New York Botanical Garden and Missouri Botanical Garden, and conservation organizations concerned with the loss of medicinal plant species. More recently, concerned representatives from the herb and phytomedicine industry in the U.S. formed an organization, the United Plant Savers (UpS). They focus on the conservation and management of wild endangered medicinal plant species. UpS is a coalition of herbalists and phytomedicine companies, researchers, and organizations, such as the American Botanical Council and the Herb Research Foundation (UpS, 1997).

However, few discussions regarding phytomedicines take into account the second and third goals of the CBD: the sustainable use of biological diversity and benefit sharing from revenues generated from plants originally used by indigenous and local people in traditional medicine. In this context, few actions have been initiated that ad-

dress the goals of the CBD.

Medicinal plants are the source of primary health care to about 80 percent of the developing world's population (Farnsworth, *et al.*, 1985). The herb trade and phytomedicine industry takes traditional botanical medicines from countries throughout the world. These plant-based industries are rarely part of the discussion on the impact of industrialized industries using tropical plants for herbal medicine, even though they have a

**The fact that these plants and their chemical components have been patented has not, unfortunately, provided for investments in benefit sharing with the countries or cultures that first discovered their healing properties.**



Sylvia Lubwama, Buganda Traditional Healers Association, Luwero District. A nurse from the Nabayego Research Centre where traditional healers and western-trained practitioners work together in the treatment of diabetic patients. Shaman Botanicals.com has provided building funds for this clinic. Photo © 1998 Susan Nelson.



Indigenous Ashanika culture group discussing management of *Uncaria tomentosa* and *Croton lechleri*, and that they should be part of benefit sharing for Peruvian medicinal plants that are exported. Photo © 1998 Elsa Meza.



significant impact on the plants, environment, countries, and indigenous peoples from whom knowledge and plants are accessed. In Germany alone in 1996, the annual retail sales of over-the-counter herbal remedies were US \$3.5 billion (Blumenthal *et al.*, 1998). Among the countries of Germany, France, Italy, Spain, the United Kingdom, and the Netherlands the total phytomedicines sales were approximately US \$7 billion in 1996 (Blumenthal *et al.*, 1998). One of the consequences of this volume of sales is a significant impact on the plants, the environment, the countries, and the cultures from whom this knowledge and sometimes these plants are obtained (Lange, 1997; Leaman *et al.*, 1997; Masood, 1997). Herb and phytomedicine companies pay a low price for large volumes of medicinal plant biomass, package it in their own facilities, then sell the products at a much higher price in northern countries.

Such trends are well documented in Europe and are fostered by the rapidly growing consumer market in the U.S. The authors surveyed one of the largest herbal and phytomedicine stores in San Francisco, California. We examined the labels of products that are manufactured with 10 medicinal plants that have a long history of use by indigenous and traditional cultures (see Table 1).

We found approximately 100 companies selling products based on Table 1 plants. We also searched the Internet for companies selling these medicinal plant products. Among 100 company product labels, we found that only one division of one company indicated that they were concerned about the conservation of medicinal plants and the importance of affected cultural groups receiving benefits from the marketing of products derived from indigenous knowledge.

Patents have been filed on most of these plants. The patents

cover pure compounds, standardized extracts, formulations, or mixtures combining several plants. These patents are held by individuals in academia and industry. The patents assigned to the companies are generally phytomedicine or herbal medicine companies, mostly in Europe. The fact that these plants and their chemical components have been patented has not, unfortunately, provided for investments in benefit sharing with the countries or cultures that first discovered their healing properties. More and more patents are being filed on well-known medicinal plants that are already traded in stores by companies all over the world, especially those in the U.S., Europe, and Japan.

In Peru during 1995, 726 tons of uña de gato (*Uncaria tomentosa*) were harvested and exported to foreign countries (Dejong *et al.*, 1997). The price paid to the producers, local indigenous people, and commercial collectors was generally quite low, between \$0.30 and \$0.65 per kilogram. The price for bulk unprocessed uña de gato in the U.S. in January 1999 is approximately US \$11/kilogram. To the best of our knowledge, with one possible minor exception, there were no product-generated benefits returned to Peruvian indigenous cultures, who are the originators of the knowledge regarding use of this plant.

Another similar example is pygeum bark, *Prunus africana*. In the early 1700s Europeans learned from South African tribes of the effect of this bark on bladder pains (Simons *et al.*, 1998). Similarly, the Bakweri people of Cameroon told Europeans that the bark of this species was good for "old man's disease" (Mbai, 1998). The plant product is now sold for Benign Prostatic Hyperplasia (BPH). In the past few years, the annual harvest of *P. africana* has been

### Phytomedicines Discovered by Indigenous Peoples

Herb/ Phytomedicine	Geographic Regions	Scientific Name	Therapeutic Category
Echinacea	United States	<i>Echinacea angustifolia</i> , or <i>E. purpurea</i>	immunostimulant to treat upper respiratory infections
Wild yam	North America	<i>Dioscorea villosa</i>	hormone therapy for women
Goldenseal	North America	<i>Hydrastis canadensis</i>	antimicrobial
Maté	Argentina, Brazil, Paraguay, Uruguay	<i>Ilex paraguariensis</i>	stimulant
Pygeum	Central, East, and West Africa; Madagascar	<i>Prunus africana</i>	benign prostatic hyperplasia
Pau d'arco	Brazil, Peru, Colombia, Ecuador	<i>Tabebuia impetiginosa</i> , or <i>T. heptaphylla</i>	tumors, cancer, upper respiratory infections
Uña de Gato	Peru, Bolivia, Ecuador	<i>Uncaria tomentosa</i>	cancer, immunostimulant
Yohimbe	West Africa	<i>Pausinystalia johimbe</i>	aphrodisiac, stimulant
Saw palmetto	United States	<i>Serenoa repens</i>	benign prostatic hyperplasia
Kava kava	South Pacific	<i>Piper methysticum</i>	sedative, anxiolytic



around 3,500 metric tons, much of it coming from Cameroon and Madagascar (Cunningham and Mbenkum, 1993; Cunningham *et al.*, 1997). The price paid to producers of this material was between \$0.20 to \$0.35 per kilogram (Simons *et al.*, 1998). *Prunus africana* is now included in the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II list in an attempt to control over-harvesting (Sunderland and Nkefor, 1997). An unpublished survey counted 8,000 standing, but dead, trees on Mount Oku in Cameroon, and 80 percent of mature trees on Mount Kilim die as a result of poor harvesting techniques (Simons *et al.*, 1998). There are many important sustainable management initiatives underway by the WWF/UNESCO/KEW People and Plants initiatives as well as the International Center for Research in Agroforestry (ICRAF). These initiatives should have been funded and implemented by the corporations engaged in the marketing and sales of pygeum bark products many years ago.

There are at least 24 companies in Europe and in the U.S. selling products based on this species. The international market in over-the-counter products for pygeum bark was estimated at US \$220 million per year (Cunningham *et al.*, 1997). Yet none of these companies return benefits to the cultures or countries from which the knowledge and material was taken. This is another case of a violation of the Convention of Biological Diversity (CBD) goals. There is both a negative impact on the biological diversity of the species, and no benefit sharing with the cultures and the peoples who originally discovered the use of the plant.

Another example is kava kava (*Piper methysticum*), also sold widely throughout Germany and other countries in Europe. In the U.S. the market projection for kava sales in 1998 is \$50 million (Grady 1998). This plant has documented sedative and tranquilizing effects. Its origin is the South Pacific, where indigenous peoples use it for ceremonial purposes. The ritual context of the use of kava kava is highly complex and significant to the cultures of origin. Attempts to initiate large scale cultivation that can add some benefits to local peoples are in process. Cultivation and sustainable management of this species is one way in which local people can benefit. In general, however, despite the massive marketing of this plant in Europe and in the U.S., there are few conservation activities

for kava kava and virtually no benefit sharing for the cultures from which its medicinal use came.

A recent commercial meeting, "Green Pharmaceuticals 98," was sponsored by the Intertech Conferences in Vancouver, British Columbia. This meeting consisted of three days of workshops, lectures, and training sessions on new opportunities to develop and market "Green Pharmaceuticals." Representatives from throughout the world discussed this rapidly expanding business opportunity, but of the 25 presentations, none focused on conservation, management, or benefit sharing. This is common throughout the herbal phytomedicines industry—promotion of indigenous use, but no return of benefits to these people or conservation activities to manage biodiversity.

SB is developing a product based on the principal ingredient (SP-303) derived from the sangre de drago plant (*Croton lechleri*) used by traditional people throughout Amazonia. This company has invested US \$1 million into studies of the long-term sustainable management and harvest of *C. lechleri*. We developed a Spanish language manual in collaboration with indigenous groups and other conservation experts in Latin America to optimize sustainable methods of managing this species as part of income-generating activities (Meza *et al.*, 1998). Nine additional technical studies on the basic biology and ecology of this species have also been published in Spanish (Meza 1999).

In conclusion, the international conservation community is neglecting the huge impact that the botanical medicine industry has on tropical people, plants, and ecosystems. The global phytomedicine economy is aggressively commercializing indigenous knowledge and medicinal plants. The U.S. market alone for nutraceuticals, in this case foods and medicinal plants that may be used for health, is around US \$17 billion per year (Mannion, 1998). This sector is undergoing explosive growth in the development of new business, markets, and consumers (Brevoort, 1995). Despite the Convention of Biological Diversity, the phytomedicine and herbal industries are enjoying a period of uncontrolled, undocumented, and poorly managed free access to medicinal plants and cultural knowledge throughout the world. Organizations concerned with the sustainable development and equitable sharing of benefits from medicinal products must create

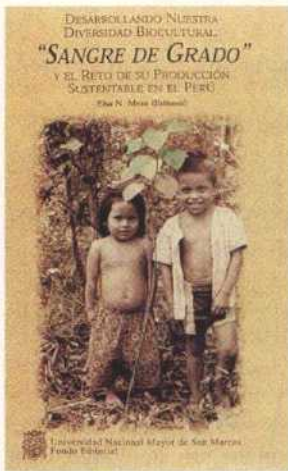


These women healers are from the Maninka cultural group in Guinea, West Africa. Healers from this culture have used *Pausinystalia johimbe* as an aphrodisiac and a stimulant for centuries. Photo © 1999 Thomas Carlson.



This healer is also from the Maninka cultural group in Guinea, West Africa. Photo © 1999 Thomas Carlson.





Shaman Botanicals.com collaborated with indigenous groups and other conservation experts to develop this Spanish language manual: *Developing our Biocultural Diversity: "Dragon's Blood" and the Challenge of its Sustainable Production in Peru* by Elsa N. Meza, Editor.

models of equitable benefit sharing that also contribute to the flourishing and sustainability of biological and cultural diversity. The management and cultivation of non-timber forest products in tropi-

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cal ecosystems can lessen the pressure on fragile, complex, and biologically diverse ecosystems. It is hoped that this brief article will provide stimulus for a broader approach to the CBD and the development and conservation of medicinal plant products.

The authors of this article have written several articles describing SB's process for multi-stage benefit sharing with governments and traditional cultures (King, 1994; Chinnock *et al.*, in press; King *et al.*, 1996; Carlson *et al.*, 1997; Moran, 1997 and 1998; Carlson *et al.*, submitted). Additional articles describe the importance of investing in the sustainable management practices for plant resources as part of long-term product development (King *et al.*, 1998; Meza, 1999).

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