RAFI COMMUNIQUE

RURAL ADVANCEMENT FOUNDATION INTERNATIONAL

September/October, 1995

Biopiracy Update: A Global Pandemic

Issue: Genetic resources, and indigenous knowledge about them, are being appropriated and patented by industrial corporations in the North. Recent examples from Gabon, Thailand, Ecuador, and Peru illustrate biopiracy activities on a global scale. We also report on efforts by local communities to defend their cultural integrity and confront biopirates.

Policy Implications: Bilateral genetic prospecting agreements, sanctioned by the Biodiversity Convention, generally operate beyond the control of source communities and countries. Governments convening in Jakarta for the November, 1995 Conference of Parties (COPs) to the Convention on Biological Diversity are faced with a glaring contradiction: The Convention sanctions the intellectual property of industrial corporations without recognizing and rewarding the contributions of rural people of the South. Intellectual property rights can only be discussed and adequately addressed by COPs in the context of indigenous people's rights.

Economic Stakes: Estimates place an **annual** value of US $32,000 million on medicinal plants from the South used by the North's pharmaceutical industry.[1] The most recent estimate of the value of "undiscovered" plant-based pharmaceuticals in the tropical forest alone is conservatively put at US $147,000 million.[2] The genes from plants, animals, and microorganisms that flourish in the South are the strategic "raw materials" for the development of new agricultural, pharmaceutical, and industrial products.

Introduction

On the eve of the Jakarta Conference of Parties to the Convention on Biological Diversity, biopiracy has kicked into high gear. This issue of *RAFI Communiqué* is a collection of examples of biopiracy from around the world. RAFI's list of bioprospectors/biopirates (pages 7-10) shows that there are few places on earth where rural people are not facing biopirates who aim to extract their knowledge and resources.

The reasons are clear: it is difficult to overstate the value of the South's biodiversity. The Clinton Administration recently pointed out that foreign germplasm adds over US $10,000 million to the $28,000 million annual maize and soybean production in the US.[3]

It is against this ominous backdrop that the Conference of Parties continues its work to protect biodiversity and indigenous knowledge. Intellectual property is high on the agenda; but the conflict cannot be resolved without squarely addressing the issues of indigenous people and knowledge. Will COPs listen and act?

GABON

West African Sweetener Patented by the University of Wisconsin

Researchers at the University of Wisconsin have received two US patents for a protein isolated from the berry of *Pentadiplandra brazzeana*. They call the protein "brazzein" and report it to be 2,000 times sweeter than sugar. Unlike other non-sugar sweeteners, brazzein is a natural substance and does not lose its sweet taste when heated, making it particularly valuable to the food industry.

It is no coincidence that researchers happened onto *P. brazzeana* in Gabon, where its qualities are well known. Far from a secret or new discovery, the plant is locally known as *J'oublie*

International Office: Suite 504 - 71 Bank St., Ottawa, Ontario K1P 5N2, CANADA, Tel: 613-567-6880 Fax: 613-567-6884 E-mail: rafican@web.apc.org
RAFI-USA: P.O. Box 655, Pittsboro, NC 27312, USA, Tel: 919-542-1396 Fax: 919-54-0069 E-mail: rafiusa@igc.apc.org

("I forget") - a reference to children's typical answer to their mothers when they become too absorbed in eating the berries. People aren't the only ones who eat *P. brazzeana* - the plant's berries are also enjoyed by animals.[4]

After observing people and animals eat *P. brazzeana*, University of Wisconsin researcher Goran Hellekant came to the predictable conclusion that "there was something of value there," adding "call it scientific intuition."[5]

Laboratory research then identified, isolated, and sequenced the DNA encoding for the production of *P. brazzeana*'s sweet protein. Subsequent work has focused on making transgenic organisms that produce brazzein in high-tech labs,[6] thereby eliminating the need for it to be collected or grown commercially in West Africa.

With patents in hand, the University of Wisconsin now has exclusive rights to brazzein that it intends to license to corporations. Wisconsin believes that it can make inroads into the US $100 billion dollar a year worldwide market for sweeteners, and reports that corporate interest in brazzein is strong.

Because there are no plans for benefit-sharing, Gabon's contribution to the development of the new sweetener will go uncompensated. Despite the sweetener's origin and inspiration, a University of Wisconsin spokesman told RAFI that brazzein "is an invention of a UW-Madison researcher," and "Wisconsin has no connection to Gabon."[7]

THAILAND-GUYANA-AMAZONIA

The Foundation for Ethnobiology: Oxford Dons or Plant Predators?

Karen villagers in northern Thailand were the latest indigenous people to receive visits from the Foundation for Ethnobiology (Oxford, UK), a research group that ranges across the tropics seeking access to and information about medicinal plants.

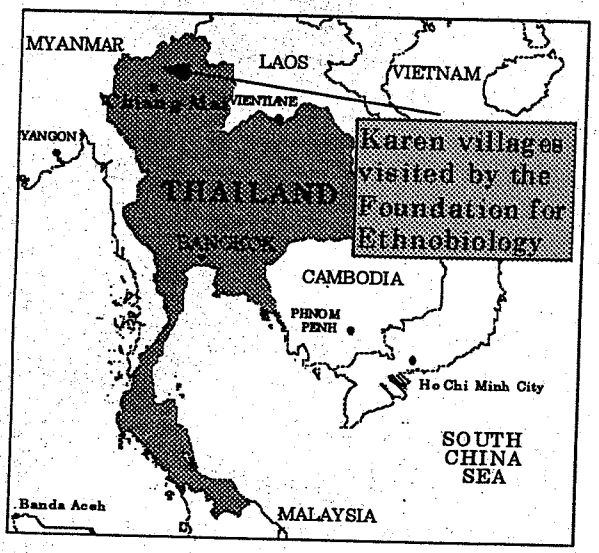
In response to a request from a Thai NGO, RAFI has investigated the Foundation's links with for-profit activities in the pharmaceutical industry. RAFI's research reveals that the Foundation's President, Conrad Gorinsky (an ethnobotanist who specializes in the Amazon), has recently received industrial patents at the European Patent Office on two medicinal compounds with Amazonian origins - Cunaniol (EP 610059) and Rupununine (EP 610060). Patents in the US and elsewhere are pending.

Cunaniol is a derivative of the well known *barbasco* plant (*Clibadium sylvestre*), a highly toxic (and useful) plant cultivated by indigenous people for use in animal poisons. *Clibadium* species were briefly in high demand from industrialized countries in the 1950s and 1960s as the source of the crop pesticide rotenone. Rupununine, the other compound patented by Gorinsky, is derived from the nut of the Guyanese *Ocotea rodiei* tree, a species under heavy threat from logging.[8] Gorinsky has claimed broad uses for the two compounds including their applications in cardiology, neurology, fertility and tumor control, as well as use on skin lesions.[9]

The names of both compounds reflect their roots in indigenous knowledge. "Cunaniol" is a word taken from Brazilian indigenous peoples, who call *C. sylvestre* "cunani."[10] "Rupununine" is a name taken from the heavily indigenous Rupununi region of Guyana, located just east of Boa Vista, Brazil.

Gorinsky has recently entered into a joint venture with Canadian corporation Greenlight Communications to produce and sell the patented compounds. The joint venture, called "BioLink, Ltd." is attempting to sell rights to the Amazonian plants to industry giants Zeneca and Glaxo and has hired a pharmaceutical company insider formerly with Burroughs Wellcome to do the job.[11]

In the "Riche Monde Initiative for Ethnobiology in Thailand," the Foundation for Ethnobiology proposed to exhaustively inventory the ethnobiological knowledge of the Karen people. Riche Monde, Ltd., the project's financier, is a Thai subsidiary of Moet Hennessey Louis Vuitton, a Paris-based luxury goods manufacturer with strong financial interests in plant breeding and cosmetics.



In late July, a group of Thai NGOs led by the Project for Ecological Recovery and NorthNet made a public appeal for termination of the project. The weight of the NGOs arguments, and subsequent media coverage, was so strong that the scheme was quickly halted when Riche Monde withdrew, citing the glare of unfriendly publicity.

In addition to RAFI's findings, the Thai NGOs discovered that the project had not been submitted for approval by Thailand's National Science Council and that groups listed on the Foundation for Ethnobiology's proposal as "being consulted" (including NorthNet) included people that opposed the project. Some "persons being consulted" denied ever even speaking to Foundation for Ethnobiology representatives.

At a press conference in Bangkok, Dr. Phennapa Sapcharoen, a Thai herbalist, chastised the Foundation's researchers who claimed that the project was only an academic exercise to "systematize" indigenous knowledge:

> "...in fact everyone knows quite well why Karen villages were chosen. The real reason is that Karen culture is unique... This is one way to search for new medicine... Don't insult the beliefs of villagers."[12]

Thai NGOs also pointed out that, despite the project leaders' insistence that there were no commercial aims, Karen were asked to sign contracts that allowed Foundation for Ethnobiology researchers access to all Karen "environmental insights."

The controversy surrounding the project has also sparked debate in Thailand about the country's plans to ratify the Biodiversity Convention. Fears have been raised that the convention would exacerbate an already difficult problem of foreigners appropriating Thai resources without the public's knowledge.[13]

RAFI made repeated efforts to interview a Foundation for Ethnobiology representative for this report; but received no reply to fax, mail, and telephone requests.

ECUADOR

Pfizer Makes a Startling Bid for the Country's Plant Diversity

Ecuadorean NGOs were alarmed in early June when details of a bioprospecting proposal by Pfizer (Groton, USA) became public. The Pfizer proposal aims to capture exclusive rights to patent a large portion of Ecuador's diversity, "sweetening" the loss for Ecuador with a sugar pill of poorly-distributed, trivial royalties.

Pfizer (Connecticut, USA), a pharmaceutical company with 1993 annual sales of nearly US $7,500 million, has entered bioprospecting agreements with two laboratories in the US to search for new pharmaceuticals in marine microbes and targeted traditional knowledge in other work with the Academy of Traditional Chinese Medicine.[14]

The new Ecuadorean project calls for Pfizer's local partners (*Fundación Tropica 2.000* and *Fundación Jatun Sachá*) to buy 100 hectares of land in each of Ecuador's three major biomes (Pacific coastal, Andes mountain, and Amazon basin) and comprehensively inventory and sample the plant species found in each area. Plans then call for the shipment of samples of each plant (very conservatively estimated at

9,000 extracts) to Pfizer for its exclusive use in medical and veterinary product development.[15]

Pfizer's up-front investment to acquire control over the samples would be just under US $1 million. In the longer term, Pfizer would commit to paying a paltry royalty of 1-2% of net sales directly to *Fundación Tropica 2.000*. The proposal ignores Ecuadorean law prohibiting private organizations from negotiating royalty rates on plant genetic resources, which are considered a public good in Ecuador.

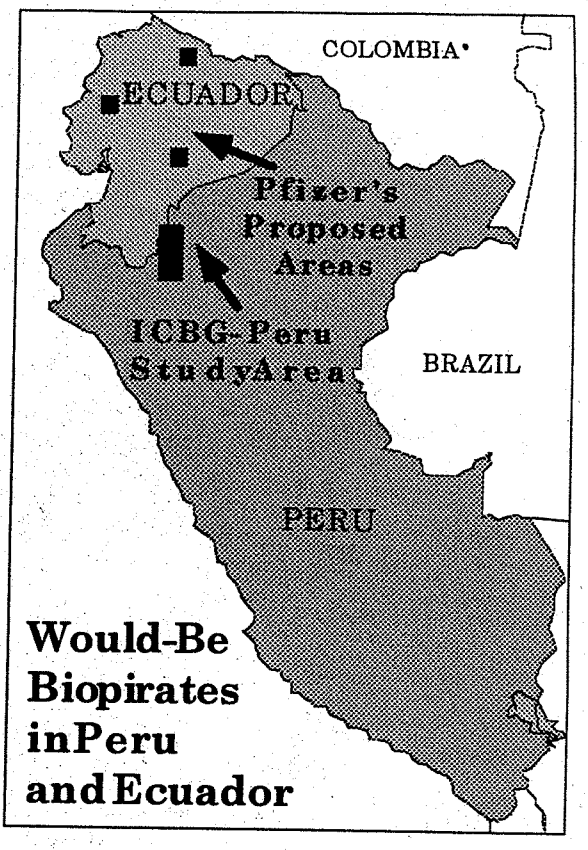
Pfizer's up-front payment will be used exclusively for the purposes of plant collection. While the project calls for the "long-term protection of the habitat[s]," notably, such "protection" is limited to Pfizer's collection areas and includes forest guards, presumably to keep people out.

The project also proposes to directly pay the salary - for the duration of the project - of a government official to "monitor and supervise" the collection of samples, raising a potential conflict of interest and calling into question the independence of Government oversight.

Pfizer's partners have come under fire from a variety of sources in Ecuador as being inappropriate for the purposes of biodiversity protection. *Fundación Tropica 2.000* is headed by a professional exotic plant exporter.

Fundación Jatun Sachá is run by David Neil, a US citizen who has cooperated with petroleum companies to collect plant samples along the highly destructive seismic lines cleared during the oil exploration process. *Jatun Sachá* also runs the Ecuadorean National Herbarium, which is curiously listed in the Pfizer proposal as a "separate" governmental entity supporting the project. Neil also works for the Missouri Botanical Garden and apparently dons whichever hat necessary to propel botany projects forward.

While the proposed deal has met with strong opposition from Ecuadorean NGOs, academics, and, at least initially, government officials, Pfizer is reportedly lobbying a very high ranking member of the Ecuadorean Government for the project's approval.



PERU

Indigenous People "Just Say No" to Bioprospector

Faced with pressure to sign a dubious "benefits sharing agreement" negotiated without their participation (see *RAFI Communiqué* Nov., 1994), Peru's Aguaruna and Huambisa Council (CAH) has strongly condemned and is seeking termination of a Washington University (St. Louis, USA) ethnobotany project that aims to commercialize Aguaruna and Huambisa medicinal plants and knowledge.

The Washington University ICBG-Peru program is one of five ethnobotany projects initially funded in 1993 under the International Cooperative Biodiversity Group (ICBG), a collaboration between the U.S. Government's National Science Foundation, the National Institutes of Health (NIH), and the Agency for International Development (USAID).

Through late 1994 and early 1995, CAH repeatedly requested a Spanish language copy of the contract that they had been asked to sign by ICBG-Peru. Washington University, despite a multimillion dollar project budget, pleaded poverty and refused to translate the agreement

and related documents. CAH - facing strong pressure to agree to the contract - could not read its contents and thus did not consent to its implementation. In early 1995, however, without consultation with or approval from indigenous people, Washington University researchers unilaterally decided to initiate collection of samples and ethnographic material (to be provided to chemical giant Monsanto) in remote native communities in northeastern Peru.

The ICBG program's activities brought a swift reaction from indigenous people, who on March 10th issued a letter signed by over 100 community representatives. The strongly worded appeal to NIH reads in part:

> "We energetically reject the lack of transparency, impositions, and manipulations of [Washington University's] team and demand that they immediately withdraw from Aguaruna and Huambisa territory... We propose [that] the National Institutes of Health and USAID.... correct and redress the aggressions made against indigenous peoples' rights in relation to Amazonian plants and expropriated indigenous knowledge."[16]

CAH's indictment of Washington University's behavior has met only a muted response from NIH, which has frozen the Washington University project; but so far refuses to terminate it. NIH apparently feels that CAH's clear indication of "NIC" (No Intention of Consenting) is insufficient reason to stop the appropriation of Aguaruna and Huambisa plants and knowledge.

In order to uphold ICBG's goal of adhering to the principles of the Biodiversity Convention, ICBG-Peru is scrambling to come up with another indigenous "partner" who is more susceptible to pressure to accept the program's scanty sharing of benefits. CAH's appeal to NIH has prompted an US Government investigation into Washington University's handling of the project.

When questioned by researchers, ICBG management has repeatedly been unable to define what they consider to be an appropriate indigenous party to their benefits sharing agreements. The *de facto* definition of an ICBG partner increasingly appears not to be based on representation or legitimacy of indigenous organizations; but rather their malleability to the corporate and research interests of ICBG.

The Biopirate Air Cavalry?

Armed Plant Robbery Proposed in Ecuador

Eerily like a page out of an updated conquistador's handbook, two US companies have floated a shocking proposal to forcibly subdue a group of Ecuadorean indigenous people in pursuit of their plant knowledge - while capturing it all on film for a US video audience.

Loren Miller of "The International Plant Medicine Corporation" and filmmakers Bryant Productions (both of California, USA) propose to use military helicopters to airlift soldiers, a film crew, and botanists into remote Tagaeri villages in the Ecuadorean Amazon. Miller and Bryant say they want to:

"...show how the Tagaeri come into contact with a group of white men supported by soldiers, Ecuadorean helicopters and members of the Huaorani people... so that they can then teach a botanist which plants they use as medicines."[17]

The Tagaeri are a small, largely uncontacted subgroup of the Huaorani people. Several years ago, as oil companies entered Huaorani land, the Tagaeri chose to avoid Western influence on their culture and establish settlements isolated from contact with outsiders.

Miller and Bryant Productions' proposal has provoked a harsh retort from COICA (The Coordinating Body of Indigenous Peoples' Organizations of the Amazon Basin), which has appealed to Ecuador's President to stop the project. COICA has also publicly denounced the forced acculturation and armed robbery of medicinal plants from the Tagaeri, saying:

"[Bryant and Miller] propose to integrate the Tagaeri into 'civilization', buying them with the supposed benefit of being a curiosity for tourists. Even worse... they propose to appropriate the ancient knowledge of these people of medicinal plants... The right to no contact and to any individual or group's privacy is a basic human right that cannot be violated with impunity by anyone."[18]

UPDATE:

Sequana Cashes in on Asthma Genetic Research

German Pharmaceutical Company Gets Exclusive Worldwide Rights to Asthma Genes

In the May/June, 1995 *Communiqué*, "Gene Hunters in Search of 'Disease Genes' Collect Human DNA from Remote Island Populations," RAFI reported on the activities of "genomic companies" like Sequana Therapeutics who are using human DNA to identify, isolate and patent human disease genes. Our report focused on the remote island of Tristan da Cunha, where blood samples taken by Canadian researchers from nearly every resident of the island were later turned over to Sequana Therapeutics (California, USA). Because the people of Tristan da Cunha exhibit one of the highest incidences of asthma in the world, Sequana Therapeutics is using the Tristanians' DNA to pinpoint the genetic mutation that predisposes people to the disease.

The commercial value of Tristanian DNA is no longer in question--but the people of Tristan da Cunha do not stand to profit. Sequana recently announced that it has signed a deal worth up to $70 million dollars with pharmaceutical giant Boehringer Ingelheim (Germany). Boehringer gets exclusive worldwide rights to develop and commercialize therapeutics based on asthma genes discovered in the collaboration. Sequana retains rights to diagnostics.[19]

DIAGNOSIS: Global Pandemic

RAFI's List of Bioprospectors

The following is an extensive list of bioprospecting endeavors documented by RAFI. To RAFI's knowledge, there are no other lists of similar depth that are publicly available. Our list includes dozens of operations worldwide; but it is by no means exhaustive. RAFI believes that it represents only a small proportion of global bioprospecting activity.

[1] RAFI, Conserving Indigenous Knowledge: Integrating Two Systems of Innovation, report commissioned by UNDP, 1994, pp. 21-22.
[2] Mendelsohn, Robert and Michael J. Balick, "The Value of Undiscovered Pharmaceuticals in Tropical Forests," in *Economic Botany*, Vol. 49, No. 2 (1995), pp. 223-228.
[3] Letter from Secretary of State Warren Christopher urging the US Senate to ratify the Convention on Biological Diversity, 16 August 1994, p. 1 of attached "Memorandum of Record".
[4] *Wisconsin State Journal*, 7 April 1995.
[5] Hellekant quoted in the *Wisconsin State Journal*, 7 April 1995.
[6] *Industrial Bioprocessing*, May 1995, p. 8.
[7] Telephone interview with Ronald M. Kudla, Director of Patents and Licensing, Wisconsin Alumni Research Foundation, 6 September 1995.
[8] Steege. et al. "The effects of man made gaps on germination, early survival, and morphology of *Chlorocardium rodiei* seedlings in Guyana," *Journal of Tropical Ecology*, 1994, pp. 245-260.
[9] Claims are from the EPO patent text.
[10] Clark, J.B. "Effect of a polyacetylenic fish poison on the oxidative phosphorylation of rat liver mitochondria," *Biochemical Pharmacology*, Vol. 18, 1969, pp. 73-83.
[11] See *Canada NewsWire*, 3 February 1995, "Greenlight Communications, Inc." and *Canada NewsWire*, 20 February 1995, "Healthlink Communications Inc. and BioFactors Limited (UK) Form BioLink Corp."
[12] Quoted in The Nation (Bangkok), 7 Aug. 1995, p. C1.
[13] See The Nation (Bangkok) "Biodiversity studies: boon or threat to minorities," 25 July 1995, p. A2.
[14] *BioWorld Today*, 28 August 1995, p. 1.
[15] Details of the proposal from "*Inventorio floristico y potencial farmacologico de las zonas boscosas del Ecuador*" proposed to the Ecuadorean Government by Pfizer's local partners, n.d. (c. May, 1995).
[16] Exerpted from CAH's appeal to NIH, 10 March, 1995.
[17] Quoted in InterPress Service (IPS), "Ecuador: "Civilization" and the Native Peoples," 27 July 1995.
[18] Quoted in IPS, 27 July 1995.
[19] Shrine, Jim, "Sequana Files for IPO, Signs Potential $70 Million Asthma Deal," *BioWorld Today*, 15 June 1995, Vol. 6, No. 115, p. 1.

NEW OCCASIONAL PAPER

The Hidden "Hot Zone":
An Epidemic in Two Parts

More deadly than the infamous Ebola virus, *Phytophthora infestans* (late potato blight) is making a stunning comeback in new and even more devastating forms. One hundred and fifty years after the Great Potato Famine, *P. infestans* again poses a worldwide threat.

RAFI's paper traces the return of *P. infestans*, and its mutation into virulent new forms, starting with its appearance in Europe in 1981 through its global spread in the 1990s. Food security, especially in Africa, Asia, and Eastern Europe, is severely threatened. The blight is outwitting known chemical controls and even flame throwers have been used in attempts to kill off the deadliest strains.

As NGOs and governments from around the world prepare for the fiftieth anniversary of the UN Food and Agriculture Organization, will *P. infestans* force governments to finally wage a true war against hunger?

Paper copies may be ordered from RAFI-USA for US $10 each (prepaid). Internet users may access the paper via RAFI's home page at:

http://www.charm.net/~rafi/rafihome.html

BIOPROSPECTING AND BIOPIRACY ACTIVITIES
RAFI's LIST OF COMPANIES/INSTITUTIONS AND INTERMEDIARIES[1]

Company/Organization and/or Intermediary	What Collecting?	Geographic Location	Use of Indigenous Knowledge/ Indigenous Peoples or Territories	Additional Information
Abbott Laboratories (USA)	microbes, plants			
Adheron Corp. (USA)	marine bacteria and other organisms			US $5 million research agreement w/ Univ. of Maryland.
American Cyanamid (USA)	arid land plants for crop protection agents and pharmaceutical development	Chile,Argentina, Mexico	Priority given to plants with rich ethnobotanical background	ICBG agreement with: Univ. of Arizona, Institute of Biological Resources of Buenos Aires, National Univ. of Patagonia, Catholic Univ. of Chile, National Univ. of Mexico, Purdue Univ., Louisiana State Univ.
AMRAD Corp. (Australian Medical Research and Development Consortium) Australia	drug discovery from marine organisms	Australia, Oceans		Collaborating w/ Australian Institute of Marine Science, which is providing AMRAD with 20,000 samples over the next 5 years.
AMRAD Corp. (Australia)	drug discovery from marine organisms and microbial soil sources	Antarctica	Special focus on organisms from harsh environments	Collaborating withAntarctic Cooperative Research Centre (Hobart, Tasmania). Special focus on organisms from harsh environments
AMRAD Corp. (Australia)	Australian aboriginal bush medicines, microbial and soil samples from Bathhurst and Melville Islands	Australia, SE Asia	Targets plant medicines used by Australian indigenous people. Wants anti-viral, immunomodulatory , and anti-cancer compounds	Has signed a deal with the Northern Land Council to pay $12-$15 dollars per sample and undisclosed royalties if drugs are developed, has deal with Seattle, USA-based Panlabs Inc.
Boehringer Ingelheim (Germany)	plants, microbes			Agreements with Univ. of Illinois and New York Botanical Garden to obtain plants.
Bristol-Myers Squibb (USA)	insects and related species	Costa Rica - dry tropical forests of Guanacaste Conservation		U.S. government supported ICBG agreement with National Biodiversity Institute (InBio) of Costa Rica, Univ. of Costa Rica.
Bristol-Myers Squibb (USA)	rainforest plants w/ medicinal properties, especially Ancistrociadus (source of anti-HIV agent), and agents against malaria,	Cameroon (Korup forest range) and Nigeria (Oban Hills rainforest	Ethnobotanical information from traditional medical practices will be used to prioritize collection of plants	U.S.govt.-supported ICBG agreements must include benefit sharing with source countries, but terms are not available to the public. Also participating: Walter Reed Army Institute of Research (US govt.), Smithsonian Insitution, Univ. of Yaounde, World Wildlife Fund, Nature Conservancy, World Resources Institute, Shaman Pharmaceuticals.
Bristol-Myers Squibb (USA)	fungi, microbes, plants, marine organisms			Ranked 2nd largest pharmaceutical corp. in USA. Contracts with third parties to collect specimens, including Scripps Institute and Oncogen
Bristol-Myers Squibb (USA)	rainforest plants for drug development; non-medicinal plants for sustainable commercial harvest	Suriname	Ethnobotanical uses of plants by indigenous peoples to be documented. Specific terms of "Benefit sharing agreement" not made public. Conservation Intl. will set up "Shaman's Apprentice" programme..	U.S. govt. supported ICBG agreement w/Virginia Tech. Univ. of Blacksburg, Missouri Botanical Garden, National Herbarium of Suriname, Bedrijf Geneesmiddelen & Conservation Intl. Primary contributor to "indigenous peoples' fund" that recieves benefits; but is majority non-indigenous.
Caapi Associates (USA)	Amazonian medicinal plants	Brazil	Primary focus to collect Amazonian medicinal plants and provide work for poor, presumably drawing upon indigenous people for both identification and collection	Claims that its marketing of plant extracts may be nothing less than an answer to Brazil's financial troubles, a deterrent to mining, a way to "teach" the Brazilian government the value of its resources, and a means to prevent the destruction of the Amazon.
Ecogen, Inc. (USA)	entomoparasitic nematodes for biocontrol agents	Malaysia		Has R&D agreement with Malaysian Research and Development Institute.
Ecopharm (USA) (a division of Pharmagenesis)	microorganisms associated with medicinal plants	worldwide		Explores potential pharmaceutical leads from nonpathogenic microbes that live in mutually beneficial relationships with medicinal plants.

[1] Compiled by RAFI with assistance from Jack Kloppenburg, GRAIN, Acción Ecológica, and Darrell Posey.

Ecoscience Corp. (USA)	screening of soil samples for fungal strains to be used in pest control	China		Ecosicence will pay Chinese Institute Biological Control.
Eli Lilly Co. (USA)	plants, algae			Major pharmaceutical corporation. Recently purchased Sphinx Pharmaceuticals.
Ethno-Medicine Preservation Project (Peru + ?)	plants	Peruvian Amazon	Seeks "new and important weapons in the age-old battle against disease" by working with traditional healers	Also aims to preserve knowledge by encouraging a new generation of healers.
Foundation for Ethnobiology (UK)	medicinal plants worldwide, drug and agricultural applications	South America, Asia	Specifically targets indigenous peoples' knowledge, including Surinamese people and Karen people in Thailand	The Foundation purports to be an academic endeavor. Its president holds two patents on drugs isolated from Amazonian medicinal plants and it works with companies with financial interests in plant resources.
Glaxo Group (UK)	plants, fungi, microbes, marine organisms	Asia, Latin America, possibly other areas		Has obtained materials from Kew Royal Botanical Gardens, Biotics Ltd., Univ. of Illinois, National Cancer Institute, contracts with Carnivore Preservation Trust to collect plants in Laos.
Instituto Nacional de Biodiversidad (InBio) Costa Rica	plants, insects, microbes	Costa Rica - Guanacaste Park & other protected areas	Possibly collecting in Talamanca Indian reserve, unclear to what extent obtaining infomation from indigenous peoples.	Private organization that has entered into high profile contracts with Merck, Bristol Myers Squibb, and possibly other major pharmaceutical companies.
International Marine Biodiversity Development Corp.	deep ocean research to collect exotic species for biotech applications	international waters		10-yr. research project undertaken with Russian Academy of Sciences.
International Plant Medicine Corporation (USA)	Amazonian medicinal plants	Ecuador	Targets indigenous people's knowledge of medicinal plants, seeks to obtain Tagaeri plant knowledge	Has proposed to forcibly extract medicinal plant information from indigenous people.
International Organization for Chemical Sciences in Development - IOCD (chartered in Belgium)	"rare trees, bushes, insects, amphibians, fungi, microbes, and other natural species"	Plans to start work in Africa or Latin America, and then move worldwide	Will depend on indigenous people for leads and promiese to deal with them "equitably and ethically" by mobilizing local capital to "sustain bioprospecting at a commercial scale"	IOCD says it "is working to establish the Biotic Exploration Fund, a new world-level agency that aims to catalyze a great increase in the quantity of bioprospecting in developing countries." Claims marketing samples will be motor of local development beneficial to indigenous people.
Ix Chel Tropical Research Foundation (Belize)	plants	Belize	Exports samples of plants identified by traditional healers. Has exported 1,500 such plants.	Participant in US National Cancer Institutes's phytomedical screening program. NCI discoveries are transferred to US companies where they may become patented pharmaceutcals.
Johnson & Johnson (USA)	novel chemical compounds			Funds chemical prospecting at Cornell Univ. ,training of scientists from the South in prospecting
Knowledge Recovery Foundation International (USA)	Proposes to gather and analyze indigenous knowledge to explore the potential for developing new drugs	Amazon Basin region, Tropical Asia		Proposes to develop a well-documented, well-preserved library of plant extracts that can be "rented" to pharmaceutical firms.
Magainin Pharmaceuticals (USA)	African reptiles, marine fish & organisms			Developing human pharmaceuticals from African clawed frog and antibiotic steroid from dogfish shark.
Marine Biotechnology Institute (Japan)	marine organisms	Micronesia		Consortium composed of Japanese govt. and 21 Japanese corporations.
Martek Biosciences Corp. (USA)	microalgal strains for developing nutritional, pharmaceutical, and diagnostic products.	worldwide		Merck & Co. will screen extracts from Martek's collection of more than 1600 microalgal samples. Merck pays Martek to supply extracts.
Maxus Ecuador, Inc. (part of Maxus Petroleum-USA), owned by YPF - Argentina	1200 plant species have been gathered; 18 new to scientific world, 200 new species in Ecuador	Ecuadorean Amazon	Plant collection and inventory traverses Yasuní Natl. Park and Waorani Ethnic Reserve	Contracts with Missouri Botanical Garden for plant collection & inventory during construction of 120-km road in tropical moist forest.

Merck and Co. (USA)	fungi, microbes, marine organisms, plants	Latin America	Indigenous knowledge from Urueu-wau-wau of Brazil; holds patent on anti-coagulant derived from their plant material	Major pharmaceutical corporation. Contracts with N.Y. Botanical Garden, MYCOSearch, Martek Biosciences; high-profile contract with InBio of Costa Rica (made up-front payment of $1.2 million)
Missouri Botanical Gardens (USA)	plants (extremely large scale)	everywhere, especially tropics	Does not officially emphasize use of indigenous knowledge; but uses indigenous people to assist its work. Collaborates with ethnobotanists, as well as loggers and oil companies	One of the world's largest collectors of plants. Does not conduct its own product-oriented research; but assists those that do and provides plant samples to researchers
Monsanto Corporation (USA)	plants	Peruvian Amazon	Exclusive focus on indigenous people's medicinal plants	Plans to receive 1,000 samples with accompanying ethnobotanical information via Washington Univ. (St. Louis, USA) as part of US govt-sponsored ICBG-Peru program. Local indigenous peoples' organization opposes the project.
Myco Pharmaceuticals (USA)	screening of fungi for drug development	collecting worldwide		Company will identify, develop and commercialize drug leads. Also developing screening technologies.
National Cancer Institute (U.S. government agency) USA	Plants, microbes, marine organisms. NCI's natural products repository contains over 500,000 samples collected primarily in Africa, Asia and Latin America	collecting worldwide	Uses indigenous knowledge to identify some materials	Contracts w/ Univ. of Illinois to collect in Southeast Asia; Misouri Botanical Garden collects in Africa; N.Y. Botanical Garden collects in Latin America. Marine organisms collected by Coral Reef Research Found. in Indo-Pacific. Microbes collected by various organizations.
New York Botanical Garden (USA)	everything	worldwide, special focus on Latin America	Leading centre for ethnopharmacology and ethnobotany research, uses indigenous knowledge to collect	NY Botanical Garden contracts with many private companies for collection of bio-materials. Personnel prominent in the field.
NPS Pharmaceuticals, Inc.	Animals, insects (especially spider and scorpion toxins)	Madagascar		Malagasy govt. has given NPS exclusive rights to research animal resources for medical uses.
Oceanix Biosciences Corp. (USA)	Enzymes from marine sources	Deep sea thermal vents, polar waters, etc...		Has joint research agreement with Univ. of Maryland. Seeks a variety of exotic enzymes, including treatments for central nervous system diseases.
Pfizer, Inc. (USA)	plants	USA	collections based partly on existing ethnobotanical leads	3-yr., $2 million research collaboration with N.Y. Botanical Garden
Pfizer, Inc. (USA)	plants	Ecuador (proposed)	May use indigenous people as "parataxonomists" to assist plant collection andd identification.	Proposes to pay US 1 million to receive a comprehensive set of samples (and exclusive rights to them) from each of Ecuador's major biomes.
Pfizer, Inc. (USA)	plants	China	Exclusive focus on traditional medicines.	Has agreement with China Academy of Traditional Chinese Medicine in Beijing to study traditional Chinese herbs as sources of potential new drugs for human and animal health
Pharmacognetics (USA)	natural products for drug development	Latin America	Hopes to rely entirely on leads from indigenous peoples in identifying plants; interested in developing line of cosmetics based on indigenous peoples' products and uses	Company founded 1993; partly-owned by Pan American Development Foundation, a non-profit organization that works with rural and indigenous groups in L.A. Will use these connections to organize plant collection and identification.
Pharmagenesis (USA)	plants	Asia	Focus on traditional medicinal plants - especially Chinese	
PharmaMar (Spain)	bioactive materials from marine sources to develop drugs for cancer and AIDS	worldwide		PharmaMar researchers travel aboard the ships of Pescanova, one of the largest fishing fleets in the world.
Phytera, Inc. (USA)	plants	worldwide		Specializes in plant cell technology, holds one of world's largest plant cell collections. Uses technology to provide large quantities of a compound from small tissue sample.
Phyton Catalytic, Inc. (USA)	plants	agreements in Africa, Asia, Europe, Americas		Focuses on production and supply of plant-derived compounds through cell culture

PhytoPharmaceuticals Corp. (subsidiary of Escagenetics, Inc.) USA	plants	negotiating agreements with groups in Brazil, China, Africa, India, E. Europe		Will acquire plant samples from collaborating institutes. Collaborators will retain rights on drugs developed from plant materials collected and receive royalties.
Research Corporation Technologies (USA)	bacteria	Latin America		Brokering bacteria with nematocidal and antifungal properties isolated from Costa Rican soil sample.
Rhone-Poulenc Rorer (France)	microbes, plants, marine organisms			Samples obtained from Univ. of Hawaii, Shangha Medical Univ Beijing Medical Univ., Tianjin Plant Institute
Sabinsa Corp. (USA)	plants	India	focus on plants with established medicinal uses in Indian cultures	New company hopes to broker/introduce botanical and pharmacological resources of India to North America. Will develop, process and market standardized extracts of Indian plant materials.
Shaman Pharmaceuticals (USA)	plants for drug development	Latin America, Africa, Asia	Shaman's strategy is to identify promising plants by using indigenous knowledge; traditional healers are primary informants. Shaman has non-profit Healing Forest Conservancy to facilitate reciprocal flow of benefits and support conservation.	Shaman has had remarkable success in identifying potentially valuable drug leads based on indigenous knowledge. Has received 2 patents on drugs in clinical trials (anti-fungal and anti-viral). Strategic alliances with Eli Lilly, Merck, Bayer, and Inverni della Beffa of Italy.
SmithKline Beecham (USA)	microbes, plants, marine organisms			In-house collectors; also obtains materials through Biotics, Kew Royal Botanical Gardens, Univ. of Virginia, Scripps Institute of Oceanography, Morris Arboretum, MYCOsearch.
Sphinx Pharmaceuticals (subsidiary of Eli Lilly) USA	fungi, algae, plants, marine organisms			Has obtained materials from Biotics.
Sterling Winthrop (USA)	microbes, plants, marine organisms			Has obtained materials though Mississippi State Univ., Brigham Young University, N.Y. Botanical Garden
Syntex Laboratories	microbes, plants			Has obtained materials from the Chinese Academy of Sciences.
Upjohn Co. (USA)	microbes, plants			Major pharmaceutical corporation. Has obtained materials through the Shangai Institute.
Xenova Ltd. (UK)	microorganisms and plants; has in-house collection of 23,000 live microorganisms (lichen, bacteria, fungi), and in labs of collaborators	worldwide		Alliances with Genentech, Warner-Lambert Co., Genzyme and Suntory Ltd., and other academic institutions.

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