Case Study – Bioprospecting in Suriname

The Suriname Project of the International Cooperative Biodiversity Group (ICBG)[1]

This study examines a variety of innovative benefit-sharing mechanisms implemented in Suriname and demonstrates how they can be used in connection with bioprospecting to promote biodiversity conservation. The project started in 1993 and is expected to provide a long-term compensation sharing mechanism for revenues arising out of genetic resources and ethnobotanical knowledge.

1 Main Actors Involved

The International Cooperative Biodiversity Group (ICBG) is a U.S. government funded program sponsored by the National Institutes of Health (NIH), the National Science Foundation (NSF), and the United States Agency for International Development (USAID).[2] In 1993, the ICBG awarded a grant to five different institutions which submitted a joint project proposal for Suriname. The program is led by Dr. David Kingston of the Virginia Polytechnic Institute and State University (VPISU), a state-funded university in the United States. The other participants include Conservation International (CI), an international non-governmental conservation organization; Bedrijf Geneesmiddelen Voorziening Suriname (BGVS), a pharmaceutical company owned by the Surinamese government; the Missouri Botanical Gardens (MBG), an American botanical research institution; and Bristol-Myers Squibb Pharmaceutical Research Institute (B-MS), an American pharmaceutical company.[3] Each institution carries out a specific role in the Suriname ICBG program including, botanical and ethnobotanical collections and inventory, extraction, screening, chemistry, and drug development. The formation of this group illustrates the international cooperation called for by the CBD in Article 5 (with international conservation organizations), Article 10(e) (between governmental authorities and the private sector), and Article 18(5) (through joint research and joint ventures).

The Suriname ICBG group works with local tribal people to conduct some of the bioprospecting activities. The majority of the local participants are Bushnegros, or Maroons, who are descendants of runaway African slaves that escaped Dutch plantations on the coast over three hundred years ago and settled along the river in central Suriname. Six distinct Maroon tribes live in the interior and depend on their extensive knowledge of forest resources for their survival. When the Maroons first fled into the forest, they experimented with medicinal uses for the plants, and through a process of trial and error identified plants which were effective for various illnesses. They based their experiments in part on their memories of the healing traditions and plants in their native Africa and on information learned from Amerindians in Suriname's interior. This knowledge has developed into a rich and expansive understanding of the medicinal qualities of Suriname's forest plants. A strong relationship between the ICBG and the Saramaka Maroons can serve as a basis for the successful preservation of the knowledge, innovations and practices of these tribal communities, and can also influence the promotion of a wider application of customary uses of biological resources, as called for by Articles 8(j) and 10(c) of the Convention.

2 Description of the Context

The Republic of Suriname (formerly Dutch Guiana) is located in the northern part of South America, between Guyana and French Guiana. The second of the Guianas in size and population, it has a human

[1] With kind permission of CI this is based on a 20-page study entitled "Bioprospecting in Practice: A Case Study of the Suriname ICBG Project and Benefits Sharing under the Convention on Biological Diversity" by Marianne Guérin-McManus, Lisa M. Famolare, Ian A. Bowles, Stanley A. J. Malone, Russell A. Mittermeier, and Amy B. Rosenfeld, all at Conservation International, Washington, and Paramaribo in Suriname. The full version can be downloaded at http://www.biodiv.org/doc/case-studies/cs-abs-sr.pdf

[2] Griffo, supra note 8. See also Original Request for Applications: RFA:TW-92-01, Released June 12, 1992. International Cooperative Biodiversity Groups Program, National Institutes of Health, National Institute of Mental Health, National Science Foundation, U.S. Agency for International Development.

[3] ICBG Proposal: "Biodiversity, Utilization, and Conservation in Tropical America" to the National Institute of Health. Project Period: 9/30/93 to 9/29/98. Principal Investigator: Dr. David Kingston, VPISU, Blacksburg, VA.

population of approximately 400,000 in an area of 166,000 square kilometers, making it one of the least densely populated tropical countries in the world. Furthermore, 95% of the population is concentrated in the capital city of Paramaribo, and small towns of the coastal region. Only about 5% of the population lives in the interior, most of it in small scattered villages along the three major rivers. [4]

From a constitutional standpoint, Suriname is a parliamentary democracy, and has recently emerged with renewed political stability and support for sustainable development policies. A new biodiversity plan outlines these policies, but until now the country's regulation of genetic resources has been limited to a permitting system which is required for flora and fauna collection and export, but not for export of extractions.[5]

The Republic of Suriname has one of the highest percentages of tropical forest cover in the world with 14,855,000 ha, nearly 90% of the total area, covered by forests. Suriname, which is about the size of the New England region of the U.S., is home to a number of ecological life zones and therefore a wide variety of biodiversity, including 674 species of birds, 200 species of mammals, 130 species of reptiles, 99 species of amphibians, and roughly 5,000 species of plants.[6] By conducting bioprospecting in biologically rich Suriname, the ICBG project promotes the identification, assessment, and in-situ conservation of biological diversity in accordance with Articles 7 and 8 of the CBD.

3 Purpose/Objectives of the Benefit-sharing Arrangements

The first goal is to record and secure the value of tribal knowledge. The botanical knowledge of the Maroon people is rapidly disappearing as young people move away in search of work and the population become more dependent on western medicine. In many ways, the Suriname ICBG project is a race against time to record the hundreds of years of medicinal learning that is stored in the minds of shamans, some of whom are more than 80 years old.

The second goal, to build local capacity for pharmaceutical production, increases Suriname's ability to benefit from its biological resources. Suriname's communities, students, and scientists benefit from research and training, as required by Article 12, CBD; access to and transfer of technology, as required by Article 16; the exchange of information, as required by Article 17; and technological and scientific cooperation, as required by Article 18 of the Convention. By giving Suriname and its indigenous communities a greater role in the drug development process, the value of biodiversity, traditional knowledge, and genetic resources becomes more apparent – giving them an incentive to preserve this traditional knowledge and use their resources sustainably.

The third goal, to develop commercial drugs from plant extracts, helps to demonstrate the economic value of natural resources. With an annual world market worth billions of dollars for plant-derived drugs, pharmaceutical companies have an incentive to ensure the conservation of these resources, while their recognition and compensation of tribal contributions can set ethical standards in the private sector. Because there is no cure for so many diseases, and because some cures become ineffective as pathogens develop resistance to them, the development of a commercial drug also serves a perpetual need in human health -- the proliferation of new medicines.

The fourth goal is to attempt to create a long-standing conservation financing institution. The Forest People Fund aims to ensure up-front benefits from bioprospecting go to Suriname and its tribal communities. It is also intended provide a well established structure to channel potential future royalties.

4 Process for Establishing the Arrangements

The development of a drug, from the initial collection of plant samples to the marketing of an approved product, takes between ten and twenty years. To address the immediate needs of some participants and

[4] SURINAME PLANATLAS: prepared by the National Planning office of Suriname (SPS), Regional Development and Physical Planning Department (HARPRO) with Technical Assistance of: Organization of American States (OAS), Executive Secretariat for Economic and Social Affairs, Department of Regional Development (DRD), (Washington DC: 1988).

[5] National Strategy for the Sustainable Use and the Conservation of Biological Diversity in Suriname: Draft - January 1998 - Subproject of project # RLA/92/G32 - Amazonian Cooperative Treaty.

[6] See Russell A. Mittermeier et al., Conservation Action Plan For Suriname, (Suriname: STINASU, CI, LBB, WWF, University of Suriname, 1990).

encourage the involvement of different stakeholders, it is essential that upfront compensation ensures that some benefits accrue to the host-country immediately. The ICBG awarded the Suriname project funding for five years in the end of 1993. Early in 1994, the Letter of Intent between CI and the Saramaka Maroons was executed, and B-MS pledged the start-up money for the Forest People's Fund. The Suriname-ICBG has applied for another five year grant which will fund the continuation and expansion of the bioprospecting efforts to include agrochemistry.

The Saramaka Tribe's participation in this project was formally requested in May 1994, when a "gran Krutu" (important meeting) was held in the village of Asindopo, residence of the Paramount Chief, or Granman, of the Saramaka Tribe. Representatives at the meeting included the Paramount Chief, tribal captains of the Saramaka people, representatives of CI-Suriname, and the Surinamese District Commissioner and District Secretary of the Sipaliwini District. After three days of discussion and negotiation, the Granman created a letter of intent to work on the project with CI for a trial period of one year.

One month later, CI's representatives returned to Asindopo and held a series of meetings with the village leaders. During these meetings, the elders chose the initial eight participating shamans. At the same time, on-site interviews were conducted with tribal communities, traditional healers, and the academic community to gain input regarding the type of compensation sharing and distribution mechanism which would most effectively provide fair remuneration as well as incentives for the conservation of biological diversity and sustainable growth. Attorneys with expertise in natural resource agreements involving less developed countries relied on these interviews to assist CI in the determination of a framework for distributing royalties which would be acceptable to all parties.

By the end of the first year, most of the project's preliminary goals had been accomplished. VPISU and BGVS had established the capacity for plant extraction in Suriname, MBG had carried out numerous general botanical collections, and CI had collected the first ethnobotanical samples. In 1995 the Granman and village captains signed a cooperative agreement permitting CI-Suriname to pursue sample collection and conservation initiatives in their communities for the next ten years.

5 Content and Implementation of the Arrangements

5.1 Implementation of the ICBG Agreement

5.1.1 Collection

The ICBG Research Agreement designates the duties of each participant in the collection, preparation, and screening of the plants. While random botanical samples can be collected more quickly than ethnobotanical samples, the parties to the Suriname ICBG believed that ethnobotanically collected specimens could provide more active compounds. Thus both forms of sample collection have been used to increase the overall likelihood of success. Further, another goal of the project is to compare the "hit rates" of these sample collection processes to verify whether ethnobotanically collected samples do indeed provide a higher "hit rate", i.e. the percentage of samples which show biological activity in a given series of chemical screens. The group has since found that conducting a scientifically viable study is difficult, in part because of the large number of ethnobotanical collections necessary to establish a statistically valid sample base for comparison to the screen. An additional reason is that screens at BMS are constantly changing (on an average of every three months). Matters are further complicated by disagreements within the scientific community about the definition of a "hit" and the fact that there are no uniform screening methods for ethnobotanically collected samples.

Random botanical collection is a process by which the collectors gather a wide variety of plant species, without regard to any known uses of the plants. The goal is to obtain a comprehensive sampling from each of the different areas in Suriname. MBG has trained students from the University of Suriname and members of tribal communities in "random" botanical collection techniques, and employs them in amassing the specimens.

CI is responsible for collections using ethnobotanical knowledge (traditional use of plants). The ethnobotanical collections take place with the Saramaka Maroon tribe located along the Suriname River.

All field operations are coordinated by Surinamese ethnobotanists trained under this project and assisted by community members who have also been trained in ethnobotany.

Over the course of the last four years, CI-Suriname collecting teams have traveled to the Saramaka region every other month, for approximately three weeks at a time. At the onset of each expedition, the Granman must be updated on the project and grant permission to continue the ethnobotanical research. The collectors then contact the shaman with whom they will be working on the expedition and formally request permission to work with him. To date, twenty-four shamans have been involved in this project.

Each shaman has his own medicinal "garden" outside of the village. Within this "garden" and in the forest surrounding the villages, the shaman directs the collecting team to specific plants and describes their various medicinal uses. Using a field collection form developed specifically for the project, the team records information about the area where the sample is found, the portions of the plant utilized and the habitat, soil, visibility, abundance, and local names of the plant. Also recorded is detailed ethnobotanical information including biographical data on the shaman, which diseases the plant is used to treat, how the medicine is prepared, and the dosage, method of application and side effects of its use. All information collected is put into a conservation database and GIS at the CI-Suriname office in Paramaribo.

Initially 500 grams of roots, bark, twigs and leaves of each plant was collected (resulting in approximately 200 grams of dried material). After discussion in the second annual meeting, it was determined that smaller samples would be sufficient for the extraction process which lead to the current sample size of 100 grams. After drying, specimens are placed in cotton bags and sent to CI-Suriname in Paramaribo.

5.1.2 Encoding and Distribution

To guard against the possibility of corporate partners seeking resupply of samples showing activity from other countries, and to keep confidential whether a sample is of random botanical or ethnobotanical origin, an encoding system was developed. This coding system prevents the pharmaceutical companies from having access to the ethnobotanical information during the initial screening process. Although this may slow down the initial screening process, the parties agreed that securing the traditional information was worth the tradeoff. Coded plant samples are deposited at the BGVS lab for extraction and distribution to ICBG partners in the United States. Further, three voucher specimens of each plant collected are deposited into the National Herbarium of Suriname.

5.1.3 Extraction

The coded samples are sent to BGVS, the state-owned pharmaceutical company in Paramaribo. The samples are prepared for BGVS at the Center for Agricultural Research (CELOS), a scientific agricultural research foundation based at the University of Suriname. At CELOS, the dried samples are ground and mixed first with ethyl acetate and then with methanol to begin the extraction process. After evaporation, they are put into 200 mg. plastic vials. One of each of the vials is sent to VPISU and to B-MS for screening, and the rest is stored at CELOS and BGVS to be used in future tests and screening.

To date they have processed more than 3,000 plant extracts. Although most of the remedies used by the Saramaka are combinations of plants, sometimes using as many as 15 different ingredients, all of the testing so far has been done on extracts from single plants. However, CELOS has begun looking at mixtures of plant extracts, some of which have registered hits where their individual components did not.

5.1.4 Screening and Fractionation

B-MS is obligated to test all the samples for anticancer and anti-infective activity. B-MS has the right to apply any other tests to the extracts, but must provide VPISU and BGVS a confidential written list of the therapeutic areas in which extracts will be screened. Every three months, B-MS sends a confidential written notice to VPISU indicating whether extracts are "active" or "inactive." VPISU sends copies of each notice to BVGS, CI-Suriname, and MBG. Within a defined time period from the receipt of an extract, B-MS must declare whether or not it has a continuing interest in the extract. If B-MS expresses no interest, B-MS loses its exclusivity of use over the sample and the extract becomes part of a pool of samples that can be offered to other potential partners.

As a result of the encoding system, B-MS, BGVS, and VPISU do not initially receive information regarding the identity, description, locale, and traditional uses, if any, of the plant. If a party is interested in acquiring more samples of a specific plant for retesting, they must notify BGVS with the code number, and if the plant is an ethnobotanical collection, BGVS notifies the CI-Suriname project coordinator. The collection team then goes back to the shaman, and with his help, they collect in the same area, a challenge that often proves difficult. However, this method ensures that B-MS cannot look for additional samples elsewhere and that Suriname and its local people are compensated for their contributions.

If an extract shows activity, it must then undergo fractionation, which is the process of isolating the biologically active substances from the sample. B-MS, BGVS, or VPISU are each responsible for performing fractionation, depending upon the number and types of screens in which an extract shows activity. More than one of the parties can carry out fractionation if all of the parties agree. CI-Suriname has agreed to release the plant names to VPISU and/or B-MS when or as soon as possible after the extract is requested for fractionation studies. CI must also obtain permission from the shaman before this information is released, pursuant to the ICBG Agreement and to the CBD's requirements for informed consent.

5.1.5 Confidentiality and Third Party Use

All participants must obtain written consent from VPISU before making extracts available to any third party. If BGVS is to provide extracts to a third party, VPISU must also receive notice that B-MS, VPISU and BGVS are no longer interested in the extract. VPISU may provide extracts to third parties, but must notify B-MS in writing if B-MS has not yet screened the extract.

The ICBG contract also guarantees confidentiality, so as to protect the potential profits of all parties should a drug be developed. The parties may not share information, results and data from the project for five years after the contract terminates, unless the recipient of the information already has legal access to it. The contract also requires that each party be able to review a manuscript prior to its publication and that all parties be jointly credited.

5.1.6 New Developments in the ICBG Agreement

While the discovery of any drug could potentially facilitate conservation and development in Suriname, the ICBG participants recognized screening for anti-malarial activity was a high priority for Surinam and one which B-MS could not accommodate. The Walter Reed Army Institute of Research (WRAIR) has agreed to begin testing those plants used by the Saramaka people as a treatment for malaria. VPISU has signed a confidentiality agreement with WRAIR, and a separate agreement between BVGS and VPISU provides for the supply and testing of extracts by outside screeners. The same royalty provisions which exist in the main agreement apply to any resulting drug developments.

In addition, the Suriname ICBG is examining the possibility of screening for other therapeutic areas, including tuberculosis and leishmaniasis. Similar side agreements will detail particular issues regarding confidentiality and the parties' responsibilities.

5.2 Mechanisms for Sharing Benefits

The appropriate design of mechanisms for benefit-sharing is one of the most important factors for the success of the project. Each participant contributes essential skills, knowledge, and capacities to the project, and if the benefits of bioprospecting are not equitably shared, there is little incentive for cooperation and conservation. Because the parties have different interests, it is necessary that the benefit-sharing mechanisms be multifaceted. The mechanisms in the Suriname ICBG project include a long-term Research Agreement which controls the ownership, licensing, and royalty fee structure for any potential drug developments; a Statement of Understanding between the Granman, CI-Suriname, and BGVS which further defines the parties' intentions regarding the distribution of royalties among Surinamese institutions; a trust fund (the Forest People's Fund) capitalized in part with upfront payments; and, the transfer of technology and other forms of non-monetary compensation to Suriname.

The linking of the various participants is facilitated through a series of oral and written agreements. First, a Letter of Intent between the Granman of the Saramaka tribe and CI staff embodies the fiduciary relationship existing between CI and the Saramaka people.[7] The Granman is the Paramount Chief of the Saramaka tribe, representing more than 17,000 Maroons living in villages along the Suriname River. In the Letter of Intent, the Granman granted his permission to CI to begin ethnobotanical research in cooperation with the Saramaka people, which is based on informed consent, as required by Article 15 of the CBD. This consent was given on the condition that CI would represent the interests of the Saramaka people in the execution of the project. Renewal of consent by the Saramaka people is also done periodically through formal discussions with representatives of the tribe. Just as CI explained the research project, its objectives, the requirements, the potential benefits, and the intentions of the participants in order to receive initial permission to begin the project, CI also made sure that informed consent was obtained from each participating shaman before a collection expedition began.

The responsibilities of CI, B-MS, BGVS, VPISU and MBG are laid out in the International Cooperative Biodiversity Grant Research Agreement.[8] This Agreement, which was executed in September 1993, specifies each participant's rights to the licensing and royalties of any drug products that result from the project.

5.2.1 Ownership of Inventions, Licensing, and Royalties

In addition to designating each participant's responsibilities in the bioprospecting process, the ICBG Research Agreement governs the means by which the benefits from inventions, or patentable products, are to be distributed. The contract requires all parties to report inventions to a designated official of each party. The parties are obligated to discuss the subject invention and to determine inventorship and ownership of the invention according the importance of each scientific contribution to its development. Decisions regarding inventorship and ownership are made according to United States Patent Law. [9]

The ICBG contract provides that where the product is a result of collaborative work with the shaman, the patent shall be filed for joint ownership. This provision affirms a legal right of the tribal people of Suriname which has often gone unrecognized, (i.e., that their contribution must be fully disclosed in a patent application). Where B-MS is one of the joint partners of the patent, B-MS has agreed to pay all costs of patenting and prosecuting patent violations.

B-MS alone has the option to obtain an exclusive, worldwide, royalty-bearing license to any invention produced from the ICBG collaboration in which they are involved. If the option to license by B-MS is not exercised within a one (1) year period starting on the date that the first patent application was filed, or if the parties cannot reach an agreement on suitable license terms within six (6) months of B-MS exercising its option, then the sole or joint owners of the invention are free to license their rights in the invention to other parties. The owners of the invention must first inform B-MS of their offer and allow B-MS a 30 days period to decide whether to acquire the right to the invention under the terms that have been offered to the third parties.

Considerations for calculating the royalty include the type of patent claims granted, potential product sales, the level of development and potential costs of subsequent research and development, marketing exclusivity available to B-MS, the competitive impact of related market products, and the extent of the contribution of ethnobotanical knowledge or uses. The agreement applies to plant-based inventions as well as to analogs of natural products, which are synthetic or semi-synthetic. As a result, fees payable by B-MS are reduced as the scientific differences between lead compound and the natural product

[7] INTENTIEVERKLARING, Asindopo, May 14, 1994. Signed by Paramount Chief Songo Aboikonie, Stan Malone, CI Director Guianas Program, Hermes Libretto, District Commissioner for the Brokopondo Region

[8] Contract between CI, B-MS, BGVS, VPISU and MBG, signed on September 1993.

[9] The U.S. Supreme Court has held that a discovery of some new, natural product is not patentable. *See* American Fruit Growers, Inc. v. Brogdex Co., 283 U.S. 1 (1931). Also, any patent issued must meet three criteria outlined by Congress in the Patent Act. First, a patent must be either a new and useful invention or any new and useful improvement of an existing invention. Second, an invention may not have been previously known, used, or patented by others in the U.S., nor described in any publication more than one year prior to the patent application. Third, an invention must be distinct from all prior art, such that it would not have been obvious to a person having ordinary skill in the field. *See* 35 U.S.C. §102 (1988).

increases. The amount to be given to Suriname is calculated by means of a decimal fraction (Suriname Factor). The Suriname Factor is multiplied by the royalty rate, which is kept confidential among the parties.

Royalties are payable for the life of the patent, or in the case where there is no patent, for 5 years after the first commercial sale. If a third party acquires rights to the product, that party becomes responsible for the royalties which B-MS would otherwise have had to pay. B-MS is responsible for all accounting and book-keeping of royalty statements. CI and the licensor may select an independent certified accountant to verify the accuracy of these accounts.

5.2.2 Statement of Understanding

A "Statement of Understanding" between the Granman of the Saramaka people, CI-Suriname, and BGVS details the division of future royalties allocated to Suriname. The Understanding consists of two payment structures according to whether the drug is derived from ethnobotanical collections. The various Surinamese institutions to receive royalty payments are the Forest People's Fund (FPF), BGVS, the Foundation for Nature Preservation in Suriname (STINASU) – a non-profit organization responsible for the management of national parks, the National Herbarium of Suriname, the Suriname Forest Service, and CI-Suriname. In addition, a portion of money is set aside for future institutions that evolve from the increased bioprospecting activities.

Derived From Ethnobotanical Collections		**Derived From Random Collections**	
FPF	50%	FPF	30%
BGVS	10%	BGVS	10 %
STINASU	5%	STINASU	10%
National Herbarium	10%	National Herbarium	10%
Forest Service	5%	Forest Service	10%
CI-Suriname	10%	CI-Suriname	10%
Future Institutions	10%	Future Institutions	20%

5.2.3 Forest People's Fund

While the ICBG contract and the Statement of Understanding govern the means by which future financial gains from bioprospecting are to be distributed, a separate trust fund was established to ensure that the tribal communities would benefit immediately from the access granted to their forest resources. The fund compensates these communities for their ethnobotanical contributions to the ICBG project, creates conservation incentives, finances sustainable management projects, provides research and training exchanges, and supports other socially and environmentally sound projects.

The Forest People's Fund was established in 1994 with a $50,000 contribution from B-MS, followed by another $10,000 donation in 1996. The Forest People's Fund Foundation is headquartered in Paramaribo, Suriname, and administers the Forest People's Fund according to the Foundation's by-laws. These by-laws were written by the Surinamese participants and are governed by the laws of Suriname.

The by-laws require the Board to meet at least four times a year and whenever deemed necessary to manage the fund's day-to-day operations, finances, and handle legal arrangements. The Board of Directors is comprised of five members, including two representatives at large, two representatives from CI, and one who is nominated by BGVS. One Amerindian and one Maroon must fill the position of the members at large. Each member is limited to a five-year term and may cast one vote in the Board's decisions.

The main activity of the Board of Directors is to review project proposals. Any tribal person in Suriname, community or foundation that has an idea for a project can submit a proposal. CI-Suriname staff are available to assist interested parties in their project design and proposal. The Board then determines whether to grant funding according to whether the project advances the purpose of the fund, which is to "stimulate residents of the interior and related living persons who contribute to and participate in the preservation and long-term protection of biodiversity and to provide them with social, educational, and economic assistance." Money and supplies are mostly allocated to communities through their leaders or village foundations.

5.3 Benefits Realized

First, drug development is well underway. Since the beginning of the project, 961 samples have been collected and submitted to BGVS for extraction. BGVS, in turn, has sent a total of 2688 extracts and 87 resupplies to B-MS. In the spring of 1996, the Granman granted permission to the Suriname ICBG to release for publication the name of a plant in which two new molecules have been discovered of scientific, but not of commercial value.

While the chemical results and efficacy of many of the plants collected are not yet available, the advances made over the course of the past four years are undeniable. Through the development of the ICBG Research Agreement activities, the Forest People's Fund, a Shaman's Apprentice Program (in which members of the younger generation within the tribal community are learning the knowledge of the shaman), and other related projects, the Suriname ICBG program has made headway in advancing the issue of international intellectual property rights for local people. Though the project takes place in a cultural and legal setting that is unattuned to the concept of protecting community knowledge and natural products, the ICBG project has highlighted the importance of indigenous contributions and the need for compensation.

5.3.1 Benefits from the ICBG Research Agreement Activities

Although the development of a drug often takes ten or more years, benefits from the bioprospecting activities have already been realized by local communities and by the country as a whole. There have been many direct benefits to the communities that are involved in bioprospecting, including employment, equipment and training. Among these benefits are employment and regular incomes for shamans, field collectors, and other support staff for the collecting team when they are based in the village.

The project has led to employment and important training and technology transfer in Paramaribo as well. Two employees of the National Herbarium of Suriname have spent seven weeks of training each at the Missouri Botanical Garden. Ten Surinamese botanists have been employed and trained in collecting, vouching, and drying of the plant samples. At a national level, the project is making an important contribution toward building Suriname's national botanical inventory and increasing botanical knowledge of certain areas of the interior. Before the National Herbarium was founded by the Forest Service in July 1947, most of the botanical samples that were collected on expeditions to the interior were shipped to botanical gardens in Utrecht, London or New York. As a result, the botanical garden in Utrecht has about 100,000 samples of flora from Suriname while the National Herbarium in Paramaribo has only about 27,000. Several of the plants collected thus far in the project have been species which were previously unrepresented in the National Herbarium.

The project has also given Suriname global exposure. Even if a medicine does result from the project, there could be interest in further exploration and exploitation of Suriname's forests. For that reason, it will be important for Suriname to update its forestry legislation and develop clear guidelines about how to manage genetic resources. There is currently a working group within the government to draft a national biodiversity plan that will address these issues. The observations, information, and experience gained through the ICBG project have helped the government formulate its policies.

5.3.2 Benefits from the FPF

The Forest People's Fund further supports local communities in the interior of Suriname in projects involving community development, biodiversity conservation, and health-care.

To date, the FPF has funded five major projects, including three sponsored by Afinga. The first project organized by Afinga was designed to transport people and goods bound for Paramaribo by boat to Ajonia, the furthest village accessible by road from Paramaribo. This project facilitated travel for people living in the interior while avoiding the creation of new roads, which cause environmental damage in the forest. A sewing project, organized by Afinga, acquired sewing machines and material to make clothes, and an agricultural project, also organized by Afinga, helped to buy machetes, pickaxes and chain saws. CI-Suriname's assistance was requested by the community to provide training on how to use this equipment and additional leadership and organizational training.

Another FPF project involved a visit of tribal leaders from Suriname, both Maroon and Amerindian, to Belem, Brazil, to observe various types of community-based development projects. The fifth FPF-sponsored project was a 1996 meeting of Amerindian leaders held to work out problems among the various communities.

5.3.3 Benefits Derived from Related Projects

CI is working on a GIS component of the project in Paramaribo. Using data from an atlas of Suriname, CI-Suriname has created maps with data on the country as a whole, including rivers, rainfall, protected areas, and forest concessions. Then, with the data collected by the bioprospecting teams, smaller regional maps of the specific areas in which CI works have been created, marking cultivated areas, soil types, and locations of specific kinds of plants collected. A second table includes biographical information about the shamans involved in the project, including their therapeutic specialties. ICBG in Suriname is focusing on the identification of products which can be used as the base for small, extractive industries at the community and family level. Potential products will be analyzed in detail to determine their viability as part of a sustainable marketing project.

6 Policy, Legislative and Administrative Context

Although the U.S. Federal Government is not a direct party to the ICBG agreement, the support of the government has been essential to the successful operation of the project. Their involvement include funding, policy guidance, easing local fears regarding project goals as well as assisting and raising the project profile within the Suriname government.

The government of Suriname requires a permit for the collection and export of plants. BGVS obtained the permit for the ICBG project, subject to particular conditions, and the exercise of the rights granted under permit are subject to supervision by the Ministry of Natural Resources. The permit requires that three plant specimens be deposited with the National Herbarium and that the ICBG report to the Head of the Forest Service and Director of the Department of Health on the scientific and economic feasibility of developing the botanical materials into pharmaceutical products. Also, collection must take place with the written permission of the owner and/or manager of the land and must respect the rights of the inhabitants. These restrictions illustrate the government's commitment to conservation and development and mostly reiterate obligations already taken by the participants. The right given to Forest Service employees to supervise the collection activities ensures that lower levels of government are also involved.

7 Impact on Conservation

Some immediate and long-term benefits of bioprospecting to the environment are already apparent. The Suriname project has increased the knowledge of the flora of the region, helped prevent the loss of traditional knowledge of plant-derived medicines, provided educational opportunities for Surinamese scientists and students that emphasize the benefits of intact forest ecosystems, and promoted sustainable economic development in Suriname's interior.

While the ICBG project has as one of its primary objectives the conservation of biodiversity, it is important to ensure that the bioprospecting activities themselves do not threaten the environment. First, only flowering plants which are not known to be endangered are collected. Because many plants used ethobotanically are cultivated and/or relatively common, the risk that endangered plants will be taken is more likely to occur during random botanical collections. In many places, escalating consumer demand is resulting in the indiscriminate harvest of wild plants. Plant collectors are thus instructed in collection techniques which ensure sustainability, and may only collect plants of which there are a sufficient number present. Should a drug be developed which requires the input of raw material, it will be important for the participants to ensure a sustainable harvest.

The project has already produced immediate conservation benefits. Plant inventory information and specimens provided to the National Herbarium and to MBG have helped the identification and documentation of Suriname's biodiversity, which at the beginning of the project was the least documented in all of South America after Bolivia. The Shaman's Apprentice Program and CI-Suriname's community awareness activities have dramatically increased local interest in conservation and the preservation of indigenous knowledge. Growing interest and support within the national government is also apparent.

Recent rejection by the Government of certain timber concession proposals may also be seen as a conservation benefit that the ICBG has promoted.

The project has also laid the groundwork for future conservation benefits. Not only do the projects funded by the FPF demonstrate to the local communities that there are immediate benefits to cooperative bioprospecting efforts, the money also helps establish economic activities which can be alternatives to the unsustainable use of forest resources. In-country plant collection and extraction, and the concomitant training and technology transfer, also foster the development of sustainable resource use.

8 Policy Relevant Conclusions: Lessons Learned and Replicability

Lessons learned

While the potential profits from drug development are enormous, and initial expectations were high, it has become apparent over the course of this project that the actual chances of a drug being developed is relatively low. Therefore in order for bioprospecting to be successful, other benefit-sharing mechanisms that provide immediate incentives have become even more important. For example, challenges have arisen with regards to the operation of the Forest People's Fund. Many local communities have expressed a desire for more guidance and a more structured process for how to submit proposals to the FPF. CI-Suriname is addressing these problems, and despite the difficulties, the fund has already supported a variety of community initiated projects.

Even when each participant is adequately compensated, successful cooperation requires clear communication, reliability, honesty, and trust by all. In the case of the Suriname ICBG, initiating trust between the parties, particularly between the corporate and private sectors, was a challenge that has taken almost the full duration of the project.

The time frame for drug production highlights the fact that long-term relationships among the participants are important. Also, the long-term outlook, patience, and foresight of the source-country government and the parties are essential.

Finally, it should be recognized that the ethical and legal basis for many of the benefit-sharing mechanisms stems from the Convention on Biological Diversity's recognition of each nation's sovereign right to control access to its resources. The project in Suriname demonstrates that, for the present at least, land and resource rights are essential to both income generation and conservation.

The design of the ICBG-Suriname project is unique among bioprospecting projects. In many respects, the program was tailored to the particular conditions of Suriname and of the Maroon communities involved. However, many of the mechanisms developed in this project can provide inspiration and ideas for new bioprospecting projects and the lessons learned in Suriname could potentially benefit future bioprospecting projects everywhere.

Policy Advice

Many countries are just beginning to design policy strategies which focus on the development, sale, and export of genetic resources. As governments implement the Convention, they should ensure that benefit-sharing principles are incorporated into national legislation. Such guidelines for bioprospecting should take into account the experience developed in a number of countries where bioprospecting projects have been developed. A study of the Suriname project shows that, properly carried out, bioprospecting activities could serve as (1) economic incentives to protect, rather than destroy, biodiversity; (2) have the potential to bring revenues and technological capacity to developing countries; and (3) could provide a mechanism for avoiding perceived inequities of the past in which scientists and corporations used the biological diversity and knowledge of indigenous peoples without professional acknowledgment and financial compensation. Among the prerequisites for a successful bioprospecting project are careful customization to the particular conditions of the country and communities involved, the active participation of local and national stakeholders, and the design of equitable compensation mechanisms.