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Plants, People, and Partnership in Madagascar: How Pharmaceutical Companies and Bioprospecting Ventures Must and May Positively Benefit the Communities Whose Resources They Use

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Plants, People, and Partnership in Madagascar:

How Pharmaceutical Companies and Bioprospecting Ventures Must and May Positively Benefit the Communities Whose Resources They Use

“Given the potential of traditional medicines to address issues of local access to healthcare, it is vital to address barriers to their development, as well as to identify good practices and potential policy interventions to mobilize the developing world’s pharmaceutical potential.” –Puri et al. 2010

Introduction:

For centuries, traditional medical practitioners around the world have understood the tremendous wealth of medicinal power that can be found in the natural environment. In Madagascar, traditional practitioners have both used and cared for their natural environment, which in turn has given them a wide array of medical knowledge. According to the World Health Organization (WHO), “approximately 80% of the world’s inhabitants rely predominantly on traditional medicines for their primary health care” (Cao et al. 2009). Traditional medical knowledge has relatively recently come to the attention of the international medical market. This “recent ‘rediscovery’ of medicinally useful plants” (Sheldon et al. 1997) has led to increases in bioprospecting around the world. Bioprospecting is the term used now to refer to “the search for wild species and their products, with actual and potential usefulness to humans, where the products were commercial or non-commercial” (“Bioprospecting and Strategies” 2000).

As both the home of extraordinary biodiversity and traditional knowledge, Madagascar is an ideal location for bioprospecting ventures. In Madagascar, there are 200 families of flowering plants, and about 9000 out of 12000 of the flowers found on the island are endemic (Lecture: Dr. Bernardin 6/14/11). But, the excessive and often abusive exportation of medicinal plants by questing pharmaceutical companies may be considered partially responsible for the decline of Madagascar’s biological diversity. Any bioprospecting ventures on the island must take the appropriate measures to foster and conserve the natural medicinal resources of the island, both for the Malagasy people and the global population.

However, the wealth of Madagascar’s medicinal resources is not just in the flora and the fauna, but also in the people who live and work on the land. Approximately 1 million tons of medical plants are exported per year, (Lecture Dr. Solo 6/20/11), at a value of about \$3.59

million dollars (Lecture Dr. Tolotra 6/20/11), but the Malagasy people themselves see very little of the profit directly, in monetary value, or through community initiatives. Although pharmaceutical companies and bioprospecting ventures seek to benefit much of the world's population by creating new and life-saving medications, the end result is too often achieved at a high social, economic, and ecological cost. If pharmaceutical companies and bioprospecting ventures irresponsibly exploit the natural resources of countries, like Madagascar, to produce medicines desired by Western markets, they run the risk of depriving the people not only of their natural resources, but also of their sources of health care. The relationship between those who wish to export resources and the communities they exploit must be more than one of simple economic exchange. The relationship must be a partnership, and in the long-run, both parties will benefit. As an international conference on bioprospecting in 1997 emphasized:

“Any discussion about the industrial exploitation of forests for medicinal purposes must address three central issues: firstly how to enhance the public's general awareness that environmental conservation is essential, feasible and does not compromise economic benefits; secondly that an (administrative) structure be introduced which ensures that indigenous communities are equitably compensated, based on the kind of quantity of material being extracted, as well as its market value, thirdly, that indigenous knowledge and wisdom be recognized, acknowledged, recorded and compensated and that a system be introduced which facilitates those vital steps” (“Bioprospecting and Strategies” 2000).

This study will be an analysis of how pharmaceutical companies and bioprospecting ventures have positively benefited the communities whose resources they use today, and what community members would like to see improved upon in the future.

Methods:

The information analyzed in this paper comes from lecturers from the SIT: Traditional Medicine and Health Care Systems Program, in addition to information gained from one-on-one interviews after class. A review of the available literature on pharmaceutical medicinal plant use and exportation is used, as well as information gained from a tour of the Société de Transformation Malagache Exportation (SOTRAMEX), a Malagasy research company for the exportation of medicinal plants for international pharmaceutical companies, and Centre National d'Application des Recherches Pharmaceutiques CNARP, a public Malagasy research center. Twenty-five interviews with traditional practitioners, pharmacology students from the University

of Antananarivo, and other local people were conducted to begin to understand what some Malagasy people may want from a relationship with medicinal plant exporters. All interviewees have been given a pseudonym for the purposes of privacy. The information gained from these interviews should only be treated as a preliminary survey, because not enough people were interviewed for their opinions to represent those of the Malagasy people in general. Although the language barrier should not have had a large effect, some interview questions were asked in French, translated into Malagasy with the help of two pharmacology students, retranslated into French, which I then translated into English. Some of the nuances of the answers may have been lost along the line. A general outline of the interview questions is found below, but most of the interviews were conducted in a more free-flowing conversational format, useful to access the diverse perspectives the interviewees had on the subject as a whole, beyond the scope of my questions. Six of the interviews with students were conducted by passing around a form with space for free responses. Most of these students wanted to continue to talk about the issue beyond what they had written, so we had a brief group discussion after. The written survey was good to allow students time to think about responses and eliminated translation errors, but that benefit may have stood at the price of the amount of information gained from each interviewee.

INTERVIEW QUESTIONS:

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| <ol style="list-style-type: none">1. In your opinion, how much of a problem pharmaceutical exportation is for the Malagasy People: no problem, a small problem, a large problem?2. In your opinion, what are the benefits of pharmaceutical exportation of medicinal plants for Malagasy People?3. In your opinion, what the pharmaceutical companies' do to best help the communities whose resources they use? | <ol style="list-style-type: none">1. Á votre avis, est-ce que l'exportation pharmaceutique est (aucun problème), (un petit problème) ou (grand problème) pour les gens malgaches2. Á votre avis, ce qui est les avantages d'exportation pharmaceutique de plantes médicinales pour les Gens malgaches?3. Á votre avis, qu'est-ce que la mieux façon que les compagnies pharmaceutiques peuvent faire d'aide les communautés dont ressources qu'ils utilisent? |
|--|---|

Interviewee breakdown by occupation:

Pharmacology Students: 12

Traditional Healers: 4

Professors: 3

Those whose job relates to biodiversity and plant use: 3

Assorted others: 3

Analysis

“Health and environment? They are inseparable.” –Dr. Nat Quansah, 6/30/11

The follow sections look at what several companies involved in the exportation of medicinal plants have done to form positive community relations, and what some Malagasy people have said they would like to see strengthened in the future.

I. Several Pharmaceutical Companies and Bioprospecting Ventures With Programs for Positive Community Development

A. International Cooperative Biodiversity Group (ICBG)

ICBG was founded in an “effort to integrate biodiversity conservation and drug discovery with economic development...includ[ing] capacity building as well as research” (Cao et al. 2009). The group works in Suriname and Madagascar, producing pharmaceutical products from medicinal plants, and includes researchers from the Missouri Botanical Garden (MBG), Virginia Polytechnic Institute and State University (VPISU), Centre National de Recherches sur l’Environnement, Conservation International, Centre National d’Application des Recherches Pharmaceutiques (CNARP), Centre National de Recherches Oceanographiques (Cao et al. 2009). A large portion of the financial support of ICBG for “conservation and development” (Cao et al. 2009) comes from Eisai Research Institute and Dow AgroSciences, which, along with Bristol-Myers Squibb Pharmaceutical Research Institute (BMS) from 1993–2002, then are allowed to do “screening and isolation studies on extracts of interest to them” (Cao et al. 2009). Once the plants are collected in Madagascar, they are brought to CNARP to be made into extracts. Once in the dry extract form, they are shipped to Virginia Polytechnic Institute where they undergo further testing for toxicity and bioactivity. As of 2010, ICBG has discovered approximately 80 new compounds that showed anti-cancer activity, reaping extraordinary benefits from Madagascar’s biodiversity (Cao et al. 2009). In return, between 1998 and 2003 ICBG implemented several community projects, including construction of a bridge, grain storage buildings, a primary school, “associations for market gardening and farming” (Cao et al. 2009), watering places and wells, reforestation, dam construction, and the creation of several Protected Areas (Cao et al.

2009). Recently, ICBG also helped to establish an anti-malarial research laboratory at CNARP and trained “several Malagasy scientists in botany, microbiology, and chemistry” (Cao et al. 2009). With its conservation and capacity building efforts, ICBG can stand as an example of the diverse and relatively low cost projects that international pharmaceutical companies and bioprospecting ventures can do to create a more balanced relationship with the communities whose resources they so benefit from.

B. Société de Transformation Malgache Exportation (SOTRAMEX)

SOTRAMEX, whose clients are international pharmaceutical companies, mainly chooses the plants it collects through a review of the available literature under the direction of its clients, but also works with local traditional medical practitioners when available (SOTRAMEX tour 06/22/11). The plants are collected by local collectors, who are paid at minimum 500 Ar. per kilo of plant collected, about 25 cents, a wage that they standardize against the average physical laborer’s wage of 5,000 Ar. per day, about \$2.5 dollars. They raise the price per kilo according to the value of the plant collected (SOTRAMEX tour 6/22/11). Once the plants reach the research center, they undergo a process of extraction, filtration, evaporation, and a freezing process to prepare the plant chemicals for testing (SOTRAMEX tour 6/22/11). SOTRAMEX is first and foremost a business, emphasizing the maximization of profit and the fulfillment of its clients desires, but it has reportedly built twenty primary schools around Madagascar and has run several local community initiatives, such as supplying potable water (SOTRAMEX tour 6/22/11). Although its community initiatives are a good step in building positive community relationships, none of their products, their research, or their profit is accessible to the local community.

C. Institut Malgache de Recherches Appliquées (IMRA)

IMRA was founded in 1958 by Dr. Albert Rakoto-Ratsimamanga using the royalty money from his previous discovers (Puri et al. 2010). After his death in 2001, IMRA has been headed by his wife, Suzanne Ratsimamanga. The institute’s goal is both to research and develop affordable drugs and “to promote Malagasy culture and preserve local biodiversity” (Puri et al. 2010). IMRA is divided into four sections: (1) the research and development department: a non-profit

department that also trains Malagasy researchers by collaborations with universities in Madagascar and abroad; (2) the biodiversity department, which has a garden and “lab for collecting and preserving endangered medicinal plants” (Puri et al. 2010); (3) production, quality control, distribution and exportation department for drugs and cosmetics: for-profit division separately incorporated as Soamadina Limited; (4) a health clinic with free medical consultations for Malagasy people (Puri et al. 2010). The majority of IMRA’s revenue, about 60%, comes from exports, mainly to European partners, and the rest comes from local sales in hospitals, its own clinic, and pharmacies around the country (Puri et al. 2010). But, IMRA would not be viable without the profit generated from its exportation of medicinal plants, and the profits gained from exportation help keep the prices of their local products affordable, but maybe not affordable enough (Puri et al. 2010). IMRA’s commitment to working with local traditional healers and using some of their resources to the benefit of the Malagasy people demonstrates one way that local and international interests can be successfully combined.

D. Centre National d’Application des Recherches Pharmaceutiques (CNARP)

Like IMRA, CNARP is also a Malagasy research institute, but a public one, partially funded by the state. CNARP’s goal is to reinforce and valorize the traditional medicine system and scientifically prove the efficacy of traditional remedies. CNARP works with the Ministry of Health, OMS, and ICBG and its partners. The center focuses on the local market working to synthesize products for sale in Madagascar in priority areas such as stomach and respiratory illnesses, and malaria. They also have a laboratory for synthesizing their own pharmaceutical products, and an endangered plant garden, which experiments with the possibilities of cultivation of certain species. In collaboration with international groups, they have helped with a green education program in primary school students, but, as the director laments, it does not include the concept of sustainable or traditional use of natural resources. CNARP’s profit is only 2% of their budget, and relies on partnerships with ICBG and other international pharmaceuticals interested in malaria and essential oil research. Without too much clout within the government, especially during political crises, it is often hard for CNARP to get its products to market. However, as an organization devoted to benefiting the Malagasy people, CNARP is an example of what is possible for other Malagasy researchers and international bioprospectors (CNARP tour 6/24/11).

II. Advantages of Positive Community Development

The phrase “international pharmaceutical company” has often become synonymous with some equivalent of “the big bad wolf,” but this is not always, and does not have to be, the case. Medicinal plant research and development institutes, both internationally and in Madagascar, do create sources of local employment and a source of revenue for the country. In Madagascar, the government receives a royalty for each new plant exported, and collectors, cultivators, and local researchers also receive varying levels of income from the industry (Nat Quansah Interview 6/28/11). Beyond economic benefits, the drugs developed by bioprospecting entities have been beneficial in curing or reducing the death toll of many diseases from cancer to malaria. For the people of Madagascar, medications developed from local biodiversity are “at worst five to ten times less expensive than pharmaceutical products” (Nat Quansah, Lecture 6/30/11), giving local people not a replacement for their well tested traditional remedies, but a complement.

Using biodiversity in the development of medications is also beneficial because it “reinforces people’s links with nature” (Nat Quansah, Lecture 6/30/11), giving then a tangible and immediate reason for its conservation. However, if we are to continue to access the resources we desire, conservation is vitally important. As Sheldon et al. writes, “the incentives for preserving plant populations falls behind the immediate monetary incentives of highly profitable medications and the rush to produce before the patent expires” (Sheldon et al. 1997). In the case of *Prunus Africana*, a tree whose bark is a major component in medications that treat benign prostatic hyperplasia, excessive and careless exploitation put the once common tree on the endangered species lists (Dr. Solo 6/20/11). When asked about *Prunus africana*, Dr. Solo shakes his head. He says the tree used to grow every kilometer or so, and now there are very, very few (Dr. Solo Interview 6/20/11). With the demand for the bark of the tree created by the international market, people began cutting down the whole tree and stripping it, rapidly depleting the natural resource and threatening the survival of the once common tree (Nat Quansah Interview 6/18/11). According to one unverified source, SOTRAMEX paid so much money for the collection of the bark because of its highly profitable exportation to Italy that its collectors carelessly over-exploited the tree to near extinction (CNARP tour 6/24/11). Although they may not directly have a hand in depleting the biodiversity of the countries they harvest their resources

from, pharmaceutical companies create a concentrated demand on several targeted species, such as the *Prunus africana* and must ensure that there are adequate mechanisms to prevent the loss of the biodiversity that both they and the local community relies upon. That being said, simple preservation of the local biodiversity is not enough. Too often, the creation of untouchable nature preserves prevents local access to their own resources (Nat Quansah Lecture 6/30/11). Depriving local practitioners from their resources is harmful both to positive community relations and to local health. Companies that wish to maintain their access to both local resources and knowledge must work towards conservation and sustainable use of their resources, whether those resources are plants or the knowledge of their uses.

Because of its important place in local and international health, medicinal plant research, exportation, and development must be conducted in a responsible and renewable manner for both the present and the future. In the long run, all parties involved will benefit. How are these benefits seen? Here is one story: Brian, who visited IMRA under the advice of a family member, felt his experience there was a good one. He was thrilled that his medication came from natural sources; croc oil for his cough, some leaves for his stomach. The only problem, he said, was that going there takes the whole afternoon. He came at 1200 and left at 1700. Although the consultation is only a small fee, he said, the medication itself was really expensive. He paid 60,000AR for the medication, a price too expensive for many Malagasy people (Brian, Interview 2011).

One pharmacology student spoke of Madeglucyl, IMRA's star product, a drug effective for reducing the amount of insulin needed to manage type I and II diabetes (Puri et al. 2000). Madeglucyl is only sold in Madagascar, but is available on the international market now as Glucanol Forte™ (Puri et al. 2000). The only problem is that since the international pharmaceutical company that markets it abroad has changed the name, none of the international sales revenue goes back to IMRA, the first to manufacture the drug (Ellen, Interview 2011). Perhaps if IMRA and other local institutions could sell their products overseas, their increased profit margin would allow them to lower their local drug prices to a more affordable range. It is easy to see the cascading impacts of international pharmaceutical exportation of Madagascar's resources. Once the remedies leave the country, there is little return for the Malagasy people. But, the exportation companies need IMRA and other Malagasy institutes like it just as much as

IMRA needs the exportation companies. Due to governmental regulations, only Malagasy companies are allowed to do the medicinal plant collection and extraction (Nat Quansah, Interview 6/28/11), and, by the same token, one student says that the Ministry of Health makes it difficult for Malagasy companies to get the AMM certification they need to sell their product overseas if they had the resources to synthesize it (Sadie, Interview 2011). International pharmaceutical companies stand to benefit in working with partners like IMRA, which in turn benefits the Malagasy people, because positive community relations increase the likelihood of successful bioprospecting.

As Puri et al. writes, “‘capacity-building’ may prove costly in the short-term, but is vital in the long-term to ensure that local scientists possess the ability to conduct significant research” (Puri et al. 2010). Increasing local research capacity, or “invest[ing] in human capital” (Puri et al. 2010) will benefit international companies as well because they must use local sources like SOTRAMEX, IMRA, and CNARP to perform preliminary analysis and collection of medicinal plants of interest. Building relationships with local traditional healers and community members also saves time and money. One small example of this principle is as follows: a trip to a healer itself may be viewed by both the healer and the patient as part of the healing process. As Puri et al writes, while “a visit may facilitate a ‘hoped for result’ (i.e. a cure that has a biomedical basis), it always affects an ‘expected result’ (i.e. a confirmation of the illness which in turn reinforces the worldview of the given society)” (Puri et al. 2010). A researcher who simply demands to know what medicinal remedies are given in which circumstances and leaves, not only misses an opportunity to form a constructive and mutually beneficial relationship, but also may miss that “the cure [that the traditional remedy] elicits could be culturally specific and have no biological basis” (Puri et al. 2010). While traditional healers are a tremendous source of knowledge, they are also people who must be treated with respect, equality and dignity, not as encyclopedias to be opened and closed at will. Certainly, the developing positive community relations, creating mechanisms to respectfully conserve local biodiversity and knowledge, and increasing local capacity stands to benefit to all parties involved in medicinal plant research and drug development.

III. Some Malagasy Voices: What Companies Can Do To Best Help the Communities

As those who wish to see increased benefits from the exportation of their natural resources, the Malagasy people themselves have the right and the responsibility to decide what kind of benefits would be most welcome. The data analyzed here is compiled from 25 Malagasy voices (see data table below for the full analysis). Many of those interviewed saw the benefits of medicinal plant exportation as primarily to help people around the world. As one man said, “nature serves life, we cannot guard our resources, it’s egotistic” (Mr. Nick, Interview 2011). Only one of the traditional healers interviewed saw exportation of medicinal plants as a problem that might threaten biodiversity or the community; the rest saw no effect of exportation on their lives or practice. All the traditional healers said that they would be more than happy to share their knowledge of medicinal plants with anyone who was interested, hoping to benefit mankind (Aggregate Interviews 2011). Other top benefits included the creation of jobs and sources of income, and the validation and advancement of medical knowledge (Aggregate Interviews 2011).



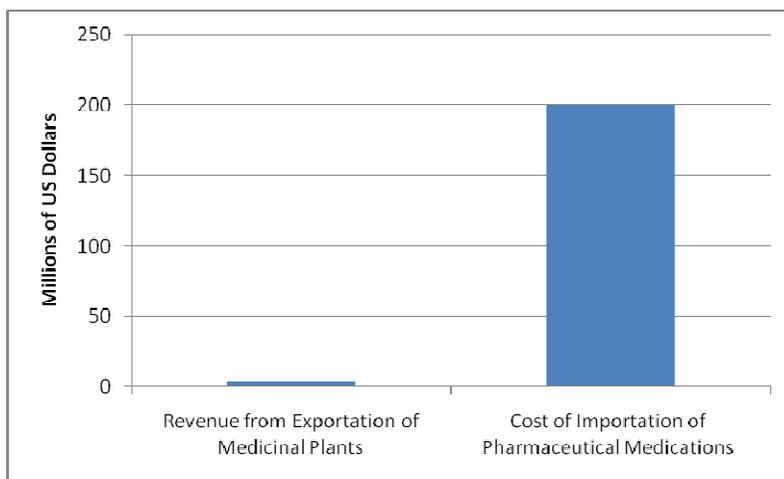
Despite the benefits that many of the interviewees acknowledged, ranked from large, small or no problem, the majority of all those interviewed believed that the exportation of medicinal plants was a large problem for the Malagasy people (Aggregate Interviews 2011). Why? The interviewees cited three issues most frequently: the profit from exportation falls into the hands of very few and the majority of Malagasy people do not see profit, traditional medicines are exported and pharmaceuticals are imported and

sold at a high price, and exportation regulations are not sufficient/equal: not everyone can export (Aggregate Interviews 2011).

While the issues of unequal exportation regulations and the other problems cited are large hurdles, the interviewees were also able to see ways that international bioprospectors could

ameliorate the situation. One fortunate man has figured out how to circumvent the issue of unequal exportation. Steve plans on cultivating and selling Ravinstara, a plant whose leaves produce a coveted essential oil, to European pharmaceuticals. According to his calculations, he stands to make a profit of 229,800 Euros in four years when his crop is ready, making him a millionaire in Madagascar. To start his venture, he created a Society (as SARL, Society Responsible Limite), a necessary step for exporters, opened a bank account, and will be buying the appropriate extracting technology for 70,200 Euro. He says it's a simple process and foreigners come to Madagascar to do it all the time. Fortunately he has both the knowledge to make the extract and the capital to purchase it (Steve Interview 2011). However, while this dream may be possible for him, it is an unimaginable reality for most medicinal plant cultivators because of the comparatively immense start up price, and lessening the inequalities in the system of exportation would enable more people gain the benefits of their resources.

By far the most desired change to the current system would be for the international pharmaceutical companies to help increase the scientific infrastructure, helping Malagasy researchers develop their own pharmaceutical products (Aggregate Interviews 2011). As Dr. Tolotra says, Madagascar spends \$200 million US dollars on medications produced elsewhere



(Dr. Tolotra Lecture 6/20/11), and pharmaceutical products are often too expensive for most people to afford. Increasing the capacity of local research companies would decrease Madagascar's reliance on imported medications and increase health care availability.

At the same time, increasing the capacity of local companies will increase their ability to investigate and sell new medications to international companies.

After increasing research capacity of local institutes, interviewees suggested educating the Malagasy people about their wealth of resources and the necessity of their conservation; communicating with the community members about the importance of their environment as a

source of food, shelter, income, and health (Aggregate Interviews 2011). In this way, education would build the capacity of the people themselves to value and conserve their natural resources.

Conclusion:

As it stands, the system of international exportation and bioprospecting ventures already has several benefits for the community, but can and must be improved upon. Future discussion should increase the scope of the data collected, interviewing more students as their status as future pharmacologists, and analyzing more exportation companies. Companies such as ICBG, IMRA, and CNARP, and others not analyzed here, which follow their model, do work to establish positive community relationships. SOTRAMEX and other more business oriented companies would ultimately benefit both themselves and the communities they work with by following these models. All international exportation and bioprospecting companies might consider the voices of the Malagasy people interviewed above, taking into account their suggested solutions and believed issues with the current situation. Just as establishing positive community relations benefits all parties involved, so too does improving those relations. As Nat Quansah says, we must work together not just for the present, not just for the future, but for “the today to come” (Nat Quansah, Lecture 6/30/11).

Number of people	Severity of problem	Number of people	Problems	Number of people	Benefits	Number of people	Solutions
14	very large	6	exportation regulations are not sufficient/equal: not everyone can export	5	help people around the world	9	finance infrastructure for in country research--> reduce need to import and purchase expensive medications
6	Small	6	traditional medicines are exported and pharmaceuticals are imported and sold at a high price	4	creates jobs and brings in money	5	education: teach people about their wealth of resources and the necessity of their protection
5	no problem	5	profit from exportation falls into the hands of very few; the majority of Malagasy people do not see profit	3	validates and advances knowledge of medicinal plants	3	build primary schools
		5	loss of biodiversity for next generation	2	aids in Madagascar's development	1	develop phytomedicines
		3	only pharmaceutical companies see the value of the resources	1	creates many medicines used in Madagascar and abroad are made from plants	1	buy the plants for their value as pharmaceutical products
		2	products not manufactured in Madagascar	1	source of profit for Malagasy people	1	let people study and learn in foreign countries and return
		2	not in touch with the community	1	relations with other countries	1	reduce the price of imported medications
		1	if companies learn to synthesize the molecule, they no longer need the molecule or Madagascar	1	none	1	create a center where all can access knowledge of medicinal plants
		1	stolen knowledge and resources			2	Better regulate the system of exportation/give everyone equal opportunity to cultivate and sell
		1	exploitive contracts with community			1	educate people in sustainable methods of collection
		1	promotes valorization of pharmaceutical products over traditional remedies			1	find honest intermediates between companies and people
						1	translate books on medicinal plant knowledge into Malagasy
						1	educate the whole world about the value of medicinal plants and biodiversity

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