

Indigenous Knowledge and Sustainable Development in Brazil

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INTRODUCTION

A few decades ago, biology courses usually began with an overview of “the diversity of life forms”. From protozoa to mammals and from single-cell bacteria to flowering plants, a variety of examples of shapes and forms were described, with the objective of highlighting the diversity of life, or the biodiversity of species on the surface layer of the Earth, the Biosphere. The term Biosphere was proposed in 1875 by the geographer Suess and redefined in terms of global ecology in 1926 by the Russian scientist Wladimir Vernadsky. Late in the 20th century, genetic diversity was incorporated into the concept of biodiversity (Halfiter, 2005).

At UNESCO’s “Conférence Intergouvernementale d’experts sur les bases scientifiques de l’utilisation rationnelle et de la conservation des ressources de la biosphère (Paris, 1968)”, the main concepts that would be later adopted at the Rio Conference of 1992, were established. Among the basic assumptions, it stated that :

“L’une des caractéristiques marquantes de la biosphère est la diversité extrême des organismes vivants qu’elle enferme, diversité qui est elle-même l’aboutissement d’une longue évolution [...]. L’interaction des organismes vivants entre eux et avec l’environnement est un phénomène que l’on retrouve constamment aussi bien au niveau de la population qu’au niveau de la biosphère.”

In 1973, when a global interest in the ecology of conservation and its implication in economic development arose, Dasman *et al* used almost the same words as the opening article in the UNESCO Conference, when he wrote:

“A particular feature of the humid tropics is the enormous diversity of life. [...] The complexity of interactions between soil, climate and the great numbers of plant and animal species, contributes to the stability of the forest ecosystem under natural conditions”.

Nowadays, a large number of governmental and private organizations are concerned with the protection of the world’s biodiversity. This movement began officially with the First International Congress for the Protection of Nature,

held in Paris, from May 31 to June 3, 1923. More recently the rights of property of native societies over traditional knowledge became an important issue (Costa Neto, 2005b). One of the most important treaties to this effect is the Annex 1C of the “Marrakesh Agreement Establishing the World Trade Organization”, signed in Marrakesh, Morocco on 15 April, 1994, which deals with “The Agreement on several Aspects of the Uses and Abuses of Traditional Knowledge.” Modern conservationist legislation in Latin America was the object of a former article (Avila-Pires, 2005), and here we will be concerned with the case of Brazil, where genetic resources, bioprospection and pharmacology of natural products are the object of specific legislation.

BRAZIL AND BIODIVERSITY

The Brazilian Constitution of 1988 establishes in Article 225 § 1^o the government’s responsibility in preserving the diversity and integrity of the country’s genetic patrimony and supervises all activities related to, and institutions involved in, research and manipulation of genetic resources.

One of the outcomes of the Rio Conference was the “Convention on Biological Diversity” approved on June 5, 1992, which stated in its Preamble the preoccupation with

“the intrinsic value of biological diversity and of the ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components”.

In Brazil it was referended by Decree n^o 2 of 1994. Four years later, a law disciplined the access to genetic resources and established a special Commission for Genetic Resources with the power to propose, coordinate, and implement the national policies and to supervise, control, and evaluate the activities and access to genetic resources. In 1997, a Commission on Bio-piracy was established, with strong political motivation, but unable to tackle the complex questions involving both national and international legitimate, and spurious interests. And since 1993 norms were drawn by the Ministry of Health (Secretary for Sanitary Surveillance) for the

utilization of the development and registration of phytotherapeutic drugs in Brazil, although those norms became operational only in 2000.

At the time, discussions involving such diverse subjects as genetic engineering, cloning, and the use of trunk cells led the government to issue Provisional Decrees of the Executive Power where these widely different subjects and issues were treated as related themes. They led to the establishment of the Council for the Management of the Genetic Resources (Conselho de Gestão do Patrimônio Genético), which had its powers regulated by Decree 3495 of September 28, 2001. Since that date, a succession of Provisional Decrees intended to regulate the access and utilization of biodiversity erected a bureaucratic barrier and established confuse and conflicting regulatory measures that brought great difficulties to the routine activities of zoologists, botanists, and anthropologists, who were even prevented from returning specimens borrowed from foreign natural history museums, including type species. Fieldwork and the exchange scientific materials became to this present day, all but impossible. Biochemistry, molecular biology and pharmacology were defined as “bioprospection” and still wait for a definite coherent legislation (Zancan, 2005). A more thorough analysis of the Brazilian legislation is found in Scholze (1998), and in Cordeiro and Chamas, Eds. (2005).

On September 11th, 2003 the Cartagena Protocol on Biosafety (<http://biodiv.org>) went into effect, but was termed an absolute disaster for scientists (Agres, 2003). Nowadays, over 1,5 million species of animals and 300 thousand plants have been described and named but recent estimates of the total number of existing organisms varies from a conservative 10 million to 50 million.

Tropical regions offer a more diversified choice of ecological niches and provide for increased biological activity and as a result, ecological webs are more complex and biodiversity greater than in other latitudes. South and Central America lies in the Neotropical Region, with the greater portion of Mexico in the Nearctic. The largest continuous rain forest of the Globe is found in South America, although other biomes are important for sustainable exploitation (Halffter, 2005).

INDIGENOUS KNOWLEDGE (IK)

Indigenous knowledge presents a rich field

of investigation and it is not my intention to quote the extensive bibliography on this complex subject (see Baldus, 1954; Schaden, 1976; Ribeiro, 1995). It would lead us to explore the techniques of agricultural practices (Garlick and Keay, 1970; Faust, 1998; Atran *et al*, 1999), ceramics (Barata, 1952), weaving (Casado, 1959), art and artifacts (Ribeiro, 1957, Ribeiro, 1989), food and drink (Baldus, 1950; Pereira, 1974 the rights of property of native societies over traditional knowledge (Costa Neto, 2005b: 74), musical instruments (Camêu, 1962), navigation (Camara, 1976), housing, hunting and fishing (Velard, 1942).

When dealing with native peoples, we tend often to generalize, and to overlook the fact that local conditions demand distinct solutions. As an example, I quote a comment by Faust (1998) on the Mayan processes of technological change. Faust describes how the techniques involved in water management and agricultural practices in ancient Mayan settlements differed from one community to another to fit specific ecological regional requirements. Distinct techniques demanded different forms of socio-political organization and change in response to differences in climate, the diffusion of ideas, local inventions, and the growth or decline of populations. Another good example is the case of traditional prehispanic ecotechnologies developed for conservation agricultural management in Latin America, specially in the South American Andean Mountains, was published by Monasterio (1994), following the Rio Conference.

In this article, we will be concerned with the appropriation of indigenous knowledge in the case of Brazilian Amazonia, related to the rights of the intellectual property of indigenous lore of minerals, plants, animals, and processes used in the promotion of health and the cure of diseases. A more complete analysis of the religious, magical and mystical aspects of health and disease, the ceremonies of initiation, and the practice of folk medicine is found in Araújo (1977) and Elisabetsky and Setzer (1986).

Definition of Knowledge

Knowledge is organized and systematized experience. Knowledge is not wisdom, and it is not science. Knowledge is traditional not because it is old or restricted, but because it was developed in a certain way and used in a definite social context (Draft Report on WIPO, 1998-1999).

Antiquity of knowledge does not make it true. Actually, some traditional knowledge is recent, newly acquired or developed recently. Traditional, indigenous, folk or popular knowledge is based mostly on empirical observations and immediate correlations, not upon evidence-based theories. Gorges Simenon aptly wrote that “*Le public décide d’instinct, poussé par des considérations sentimentales et par une logique élémentaire*”. They have their own internal logic or coherence, which is different from those of scientific logic. Science is not the knowledge of facts and it is to be confused with expertise. Science is *explanation*. It is know-why, not know-how.

According to Moles (1967), in our society traditional and modern knowledge are now interwoven in a mosaïque of notions dominated and spread by mass-media communication. We could say that it tends towards a *Mac-culture* of simplistic notions of universal shallowness.

Indigenous Knowledge

IK arises inside a social group, within a cultural logic system of its own, combining locally developed experience with knowledge acquired from other sources, usually through diffusion and assimilated into the local cultural repository. For example, Indians of the Xingu River basin, in Central Brazil, distinguish nowadays those diseases that are solely amenable to treatment by indigenous sorcerers, medicine men or *pagés*, and those who a white doctor may successfully treat.

Traditional or indigenous knowledge refers to non-formal cumulative knowledge systems. It is construed by empirical observation and by experience passed orally from one generation to another or registered in monuments and ideograms, and it is part of a cultural complex of taxonomies, beliefs, rituals, magic and religion. Formal systems are developed and transmitted within academia and aims at being universal. (SciDevNet, 2002). Traditional Knowledge or IK is not geographically restricted to areas where native populations remain, but it is found alongside or even interwoven with formal knowledge even in large cities, and they are complementary. It is the ethics of tapping indigenous knowledge in native settings that concerns us in this conference paper.

The World Conference on Science organized by UNESCO and ICSU in 1999 was held in Budapest, Hungary, The manifold and complex

questions involving modern science and traditional/indigenous knowledge were discussed at length. Also an attempt was made to distinguish traditional from indigenous knowledge, but this is irrelevant in our present context. The proceedings are available on line on the internet (UNESCO, 2000).

It is a difficult task of ascertaining to what culture, people, tribe or society certain knowledge belongs. But the enormous financial profits obtained by pharmaceutical industries with drugs isolated from plants traditionally used by native tribes (Kreig, 1964) made people aware of the potential value of certain types of indigenous lore. Research on records of ethnological and botanical museum collections and on journals of field naturalists has since directed investigations towards possible sources of new agrochemical, pharmaceutical, nutritional and seed products (Grenier, 1998) and raised a number of questions about property rights and the ethics of research and development. It is this aspect that is our present concern.

Some categories of knowledge are not widespread among the members of a tribe or a society, but are passed on to certain members of that group through a process of initiation. Healers, xamãs, sorcerers, herbalists, sage-femmes, are guardians of specialized knowledge. Distinct kinds of knowledge pertain to individuals or groups of individuals of distinct gender, age, rank, role, social status, and experience. In technological societies also, professional knowledge and actions or performances are restricted to certain members of professional cadres.

Who are Indigenous Peoples?

To identify indigenous people, we may adopt the definition found in Art. 1 of the International Labour Organization’s Convention 169 on Indigenous and Tribal People in Independent Countries (ILO 169) of 1989, which states:

1. This Convention applies to:
 - (a) Tribal peoples in independent countries whose social, cultural and economic conditions distinguish them from other sections of the national community, and whose status is regulated wholly or partially by their own customs or traditions or by special laws or regulations;
 - (b) Peoples in independent countries who are regarded as indigenous on account of their

descent from the populations which inhabited the country, or a geographical region to which the country belongs, at the time of conquest or colonisation or the establishment of present State boundaries and who, irrespective of their legal status, retain some or all of their own social, economic, cultural and political institutions.

2. Self-identification as indigenous or tribal shall be regarded as a fundamental criterion for determining the groups to which the provisions of this Convention apply.

Indigenous, native, aboriginal or tribal groups are discontinuous and not uniform. The process of acculturation and miscigenation makes it difficult to identify who is and who is not a native Indian, in most areas of the planet. And no definition is satisfactory in all cases. All European countries, for instance, have been colonized at some time, by Greeks, Romans, Huns, Arabs, Normands, Celts, and nowadays, the revival of rites of cultural heritage and language could lead to the characterization of the inhabitants of a country's region as a tribal group, as it is the case of the Basques, Catalãs, Bretons, Tuaregs, Kurds. This may be the reason why the United Nations Draft Declaration on the Rights of Indigenous Peoples (1994/45) do not define who are to be considered Indigenous Peoples, and possibly why the UNESCO Conference of Budapest (UNESCO, 2000: 432) distinguishes traditional from indigenous knowledge.

A recent (2005) analysis of the demographic tendencies in Brazil, using data from the national censuses of 1991 and 2000 showed an increase of 150% in the self-declared indigenous peoples during this ten-year period. No explanation exists yet, but it poses another problem to the question of the rights to traditional and indigenous knowledge. For the purposes of this paper and to simplify matters, I will consider as indigenous, native, aboriginal or tribal groups, those defined in Art. 1*a* of the ILO Convention quoted above.

THE EARLY DAYS OF EUROPEAN COLONIZATION IN THE AMERICAS

From the early days of the colonization of the American continent, when native amerindians discovered Europe – discovery is a double process - indigenous habits, customs, social organization and knowledge has been duly recorded, sometimes in great detail. Traveling

naturalists and religious missionaries collected and compiled native prescriptions and data on the particular medicinal properties of the native flora and fauna (Pardal, 1957).

In colonial times, from 1500 to 1759, the care of the sick was in the hands of members of the Catholic church, in special the Jesuits, especially the instruction not to meddle with the lay hospices and the practice of medicine. The first Jesuits who arrived in 1549, set up schools and “surgeries” and wrote prescription manuals, describing diseases and corresponding medicines, which became an importance source for historical knowledge of the early medical practices. In 1759, they were expelled from Brazil, but their manuals remained in use in the first hospitals or “Santas Casas” (Leite, 1938; Gomes, 1974; Santos F^o, 1977, 1991).

Until the late 19th century, native drugs appropriated from the indians, and the medicine practised by captive or freed slaves, brought from Africa were complementary to those of the few medical doctors who went to study in Europe or who had received a degree from one of the two medical schools established in the first decade of the 19th century in Bahia and in Rio de Janeiro. The popular pharmacopeia found on street markets nowadays originated from both continents, Africa and America, plus a number of plants recently imported from Europe and Asia.

The current rise in importance of alternative or complementary practices of medical treatments found all over the world shows how blurred have become the limits between formal, evidence-based medicine and traditional practices.

NATURAL PRODUCTS AS SOURCES OF PHARMACEUTICAL DRUGS

While pharmacology of natural products searches for active drugs using the research methods of conventional chemistry, biochemistry and molecular biology, ethno-pharmacology searches for drugs in “traditional knowledge”, or in human products and artifacts. Not only the records of common usages are important as a starting point but also a detailed knowledge of the general context in which natural products, plants and animals are collected, prepared and used, is of fundamental importance. Morán (1990) argues that the adoption of ideas from other societies must be adapted and absorbed into, the structure and culture of the new society. Accord-

ing to him, ethnocentrism inherent to every culture represents an obstacle to the diffusion of ideas and practices, unless they are reinterpreted in terms of the structural logic of the society that absorbs it. A good example is the incorporation of acupuncture by formal medical practitioners, its possible effectiveness being ascribed to nervous stimulation rather than to restoration of equilibrium through the manipulation of certain points along the meridians. The conception of health and disease in each culture is a key factor when searching for drugs of universal usage (Elisabetsky, 1987).

Since some indication is better than no indication, the search for information on the uses of native products in travel records and in botanical/zoological/anthropological collections constitutes a good starting point, far better and less costly than blind testing. The first and foremost problem we face is the correct taxonomical identification of the natural products used as medicines, specially plants and animals, and the correct diagnosis of medical conditions, which vary in distinct cultures. A study of native systems of classification of both diseases and medicines is vital. Botanists in general use local plant hunters and "mateiros" for a preliminary identification of tree species. An exceptional instance was mentioned by ornithologist Ernst Mayr (1953) of the tribe of Papuans, in New Guinea, who recognized 137 species of birds, of the 138 described by taxonomists. But, as a rule, herbalists who sell their products on the streets are not to be completely trusted. Many popular names of plants and animals in the Americas were given by European explorers and colonizers, based on a remote resemblance to non-related species of the old world, and many plants sold in local markets and on sidewalks are of foreign origin (Meneses, 1957; Araújo, 1977; Prelazia de Coari, 1986; Santos e Muaze, 2002).

In most traditional systems, the power of cure resides not only in the product and in its physical or natural properties – plant, animal, mineral, but in the time and the manner it is collected, prepared and administered. With medicinal plants, the right time for collection of roots, leaves, fruits, flowers or bark, as well as the ceremonials involved in harvesting are also important. Furthermore, plants transplanted from one geographical site to another may have their characteristics changed. Wine lovers know that the same variety of grape will produce wines with distinct bouquet in two

adjacent territories, and more so when introduced in other regions. Incantations are an important ingredient for the cure. By itself, a plant would be a mere plant, just as a host, without consecration is no more than a flour wafer.

FORMS OF PRESENTATION AND USES OF NATURAL PRODUCTS

Natural products and drugs from the ethno-pharmacognosia can be used "*in natura*" (seeds, leaves), as infusions (chá, tisanes), as simple extracts, and as purified extracts. More complex manipulations include the chemical isolation of active principles, the addition of several other substances, the synthesis of new homologous or analogous molecules, and the design of other derivative molecules. And at last, the design of molecules adapted to cell receptors the drugs bind to, by a novel computer technique called Computer-Aided Molecular Design (CAMD) (Doucet and Weber, 1996). It is not rare that isolated principles lose some or all curative properties due to the synergistic combination of more than one active principle in the natural product. It is most important that we have in mind these distinctions, as they are seminal to our discussion on property rights. In general, phytotherapy has received more attention from researchers, but mineral and animal based medicines occupy an important role in the study and in the commerce of natural medicines (Costa-Neto, 2005a). It is to be noted that in many ethno pharmacological complex preparations some of the ingredients have no active value, as it is the case with the preparation of the curare arrow poison.

WHO HOLDS THE RIGHTS TO WHAT?

In the month of August 2002, an agreement between researches from the Federal University of São Paulo and Craô Indians from the region of the Tocantins River was denounced. Fieldwork, began in 1999, had identified 138 medicinal plants used by the Indians and the contract contemplated payment of royalties to the tribe. In 2001, the work had stopped because of a dispute around who would be the legal representative of the Indians. In 2003, a new dispute arose, because the agreement had been made with only 3 of the seventeen Craô settlements (aldeias). The Craôs from Tocantins demanded the payment of R\$ 25 millions (~US \$ 8 million) for the supposed undue

use of their indigenous knowledge, while another association, claiming to represent all settlements of the Craô ethnic nation demanded R\$ 20 million (~US\$ 7 million) as “bioprospection tax” plus R\$ 5 million (~US\$ 1.5 million) as compensation for “moral damages”. In addition, the Indians claimed that the royalties should be split among those groups who spoke the timbira language, as they also held the common knowledge about the use of those medicinal herbs (Lopes, 2002).

One of the characteristics of the human species, which was responsible for its rapid and notable cultural evolution, was the diffusion of knowledge and inventions across borders and wide territories. In an article on the rural ecology and development in Java, Soemarwoto (1974) remarked that no village is completely isolated, even if distance and bad roads hamper exports and imports. Specialization evidently occurs everywhere, forming a basis for trade, as different tribes specialize in pottery, canoes, or handicrafts (Ellen, 1970; Fish and Fish, 1970). It also takes place in our technologically advanced nations. In trying to ascribe the rights of property of native medicinal discoveries to the discoverers or to their rightful heirs, we face two sets of problems - the same ones that historians of science and technology must solve.

Who Discovered It?

What was the original source of a given knowledge, process or invention? We may have found or learned about it at a certain location, but was it the result of cultural diffusion? (Hudson, 2001). Who owns it? Is it common knowledge among all members of a tribe, family, clan, or it belongs to certain individuals only? Does the concept of ownership of other societies tally with our own?

What Precisely was Discovered?

Historians face this difficult question when trying to distinguish anachronism from legitimate interpretation (Prudovsky, 1997; Hudson, 2001). What when natives uses concoctions and extracts for a condition but it is really active for another? Can we recognize intellectual properties and rights to a product derived from a concoction with properties the native users are not aware of? Or to a molecule isolated from the hundreds present in a natural product that shows unsus-

pected properties? Or when we use a synthetic molecule derived from a natural matrix? Of course, I do not mean to say that to be ascribed property rights, indigenous peoples should have been able to isolate a molecule with healing properties, or use advanced technological processes, but at least that the principle is present in their preparations and used for the appropriate health condition.

PROTECTING INTELLECTUAL PROPERTY, GENETIC RESOURCES AND TRADITIONAL KNOWLEDGE

A global organization concerned with intellectual property policies is the World Intellectual Property Organization (WIPO s/d). But special concerns over the rights of indigenous peoples at the United Nations began with the appointment of a Working Group on Indigenous Populations in the Sub-Commission on the Promotion and Protection of Human Rights. An introduction to the main issues under consideration states that: *“There are an estimated 300 million indigenous people in more than 70 countries worldwide. Indigenous peoples¹ are the inheritors and practitioners of unique cultures and ways of relating to other people and to the environment. Indigenous peoples have retained social, cultural, economic and political characteristics that are distinct from those of the dominant societies in which they live. Despite their cultural differences, the various groups of indigenous peoples around the world share common problems related to the protection of their rights as distinct peoples”*. On June 27, 1989 the General Conference of the International Labour Organisation (ILO) at its seventy-sixth session adopted the Convention No. 169 concerning Indigenous and Tribal Peoples in Independent Countries, which would enter into force on September 5, 1991. Although the actual protection of traditional knowledge is not specifically addressed, one of the Convention’s articles indirectly applies to this objective:

Article 2

1. Governments shall have the responsibility for developing, with the participation of the peoples concerned, co-ordinated and systematic action to protect the rights of these peoples and to guarantee respect for their integrity.
2. Such action shall include measures for:
 - a. Ensuring that members of these peoples

benefit on an equal footing from the rights and opportunities which national laws and regulations grant to other members of the population;

- b. Promoting the full realisation of the social, economic and cultural rights of these peoples with respect for their social and cultural identity, their customs and traditions and their institutions.

Only in 1994, The Sub-Commission on Prevention of Discrimination and Protection of Minorities passed a much needed declaration (1994/45) concerning this subject. The Draft United Nations Declaration on the Rights of Indigenous Peoples states in its

Article 24:

“Indigenous peoples have the right to their traditional medicines and health practices, including the right to the protection of vital medicinal plants, animals and minerals. They also have the right to access, without any discrimination, to all medical institutions, health services and medical care.”

And Article 29 says that:

“Indigenous peoples are entitled to the recognition of the full ownership, control and protection of their cultural and intellectual property.

They have the right to special measures to control, develop and protect their sciences, technologies and cultural manifestations, including human and other genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs and visual and performing arts.”

The whole question turns around what is known as *knowledge economy*, the granting of patents being one of its aspects. (SciDevNet2001). In the life sciences, precise definition of what it is to be considered an invention adds to the conflicts that arise, when traditional knowledge is in question.

Most questions addressed in this article have been aptly dealt with by Dutfield (2000), who raised some pertinent questions like how to define who holds property rights to restricted knowledge in traditional or indigenous communities, as everything is *not* shared with everybody, and the inherent difficulties in applying the legal patent system to traditional knowledge.

The Case of the Amazons

In 1978, Brazil, Bolivia, Colombia, Ecuador,

Guiana, Peru, Suriname and Venezuela signed a “Treaty for Amazonian Cooperation” for environmental protection. In 2003, the “Organization for the Treaty for Amazonian Cooperation” was established with the objective of implementing a joint effort of the Amazonian countries for the conservation of natural resources.

Representatives met in Rio de Janeiro on June 26, 2005 under the OTCA (Organization for the Treaty for Amazonian Cooperation) to discuss possible strategic actions for the protection of resources and traditional regional knowledge. Formerly, isolated actions adopted by individual countries, as it is the cases of Brazil and Peru, are currently the object of a joint effort to counter attempts by foreign governments to patent native products. In South America, Peru has the most advanced legislation, implemented in 2002. In all those initiatives, fundamental questions as those addressed above have not been considered.

PATENTS, RIGHTS OF OWNERSHIP AND TRADITIONAL KNOWLEDGE

According to WIPO, a patent is an exclusive right granted for an *invention*, which is a *product* or a *process* that provides, in general, a new way of doing something, or offers a new technical solution to a problem. The protection is afforded to its owner.

Many scientists agree that the right to profits generated by the patent system should not preclude the essential right to health and to life (Rosenthal and Scheffer, 2005). The current HIV/AIDS pandemic has brought to light many issues that attest to the complexity of the problem (Cambrón, 2004; Dutfield, 2005). Then the breaking of patents by governments of several countries, among them Brazil and other African nations, raising legal questions in international courts. The production of generic drugs in Brazil is another much discussed consequence of this affair.

As patents the world over are awarded to *inventions* or *processes*, not to organisms and they are intended as compensation to reward an investigator or inventor for his time, efforts and expenses, the question of awarding them to plants, animals or mineral used as drugs by traditional or indigenous peoples is debatable. Brazilian legislation states that native flora and fauna are the property of the nation. To apply our concept of patents to traditional knowledge, we should first determine who owns the rights to

processes, preparations, and usages. But then, who owns the rights to compensation if we find a field collector's notes on a botanical specimen, informing that such and such tribe uses a concoction from that plant to treat a given condition ?

What about food items ? Why pay for the knowledge about medicinal plants and not for edible plants, animals and minerals ? Many food items were introduced in Europe from the Orient and from the Americas. Complex manipulations are needed to make natural products edible. Why are those processes to be excluded ? The process of making cassava edible is a very complex one, as the raw plant is highly poisonous. All the juice must be extracted and the pulp dried before it becomes edible. Why not pay for the invention of such complex procedures ?

Contradiction Arises

As the movement, increases in favour of the recognition of "patents" or payment of royalties for the use of traditional knowledge, an opposite strive towards the free diffusion of information and knowledge, grows among scholars. Editors of scientific journals are being pressed to open the access to articles, if not when they appear, at least in a short period of time therein (SciDevNet, 2005; Chan *et al*, 2005). Recipients of the Wellcome Trust grants, after October 1st, 2005 must agree to have their papers posted on the free-to-access life sciences archive PubMed Central. From 1 October, 2006, all existing Wellcome Trust grant holders will have to deposit future papers into PubMed Central (BioMed Central Update, October 18, 2005).

The philosophy behind the movement towards "free access" of scientific information is a recognition of the importance that knowledge has for progress and for the well being of all humanity. Vital information contained in articles published in scientific journals and the patents awarded to the manufacturers of drugs and pharmacological products restrict their access and raise their prices. Estimates of expenses incurred for research and development by drug companies and the profits obtained, are difficult to calculate (Cambrón, 2004). Another instance of the economy of knowledge is what happens in our universities and research centres. Scientific laboratories are the source of new knowledge, and the people who come to learn, do not pay a compensation for the months or years they spend in them. Even when they build an industrial plant

and become millionaires, with the basic knowledge acquired during their training.

CONCLUSIONS

Although much has been achieved in our endeavour to recognize and protect the intellectual property of native peoples, existing legislation, both national and international, remains confuse and sometimes, conflicting. Indigenous tribes living in territories belonging to different nations, as on the border between Brazil and Venezuela, have their rights subjected to distinct codes of law.

Furthermore, a serious discussion on how to define authorship and ownership of property is needed. In our technological societies, patents are awarded to processes, but not to organisms. If our international patent legislation does not apply in the case of traditional or indigenous knowledge, would "consultation fees" be in order? One last aspect to be considered is the movement towards the free access to scientific information and publication (PLOS), which seems to contradict the recognition of private rights to traditional knowledge. Whether all knowledge must be free to benefit all humanity, or else, we must recognize patents and restrictions to the free access of information. Conferences as this one are certain to advance our knowledge and our awareness of such complex questions.

ACKNOWLEDGEMENT

To Prof. Dr. Emmanuel Boon, organizer of this Conference, for his kind invitation, that allowed me to participate and share a great experience.

To Prof. Dr. Luc Hens, friend and colleague, and to the Department of Human Ecology of the VUB, for hosting this Conference.

To Norka Malpartida, also a participant in this Conference, for her preliminary ideas for the preparation of this paper.

To Caroline Braibant, for her dedication to the organization of the Conference and constant e-mail contact with participants from distant regions.

To Alondra Oubre (medanthro@egroups.com) January 4, 2001, for the additional bibliographic references.

NOTES

1 There is a significant difference between the words

“indigenous people” and “indigenous peoples”. “Peoples” - with an “s” - implies that there are distinct groups of indigenous people in the world, each of which is a “people” with distinct characteristics and legal character. Thus we can talk about the Cree People or the Yanomami People and when you group together more than one “people”, you have “peoples”. This emphasises the collective character of indigenous culture and rights. It is particularly important when talking about self-determination, because Article 1 of the Charter of the United Nations recognises the “principle of equal rights and self-determination of peoples”.

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KEYWORDS Biodiversity; Brazil; conservation; development; pharmaceuticals; indigenous knowledge; intellectual property; Traditional Medicine

ABSTRACT Biodiversity conservation, exploitation of natural resources, patents, and intellectual rights are key issues on the international political agenda. From being the subject of discussion in a number of international conferences that officially begun with the First Congress for the Protection of Nature, held in Paris from May 31st to June 3rd, 1923, it is nowadays the object of a complex network of national and international conflicting laws. Although much progress has been achieved in cooperation between governments, the overall situation remains critical. Definitions and concepts must be improved and perfected if we want to establish a reasonable and fair system of compensation for native societies who hold traditional knowledge that is the source of highly valuable products.

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