Bioprospecting: Effects on Environment and Development

The Convention on Biological Diversity (CBD) was one of two legally binding treaties that were put out for signing at the Rio Summit in 1992. More than 180 nations have ratified the Convention so far. The signatories to the Convention are obliged to set up legislation and regulations to meet the objectives of the CBD, these being i) the conservation of biodiversity, ii) the sustainable use of its components; and iii) the fair and equitable sharing of the benefits arising out of the utilization of genetic resources (Article 1). The CBD introduces a new regime of source countries’ national sovereignty over genetic resources, where there has generally been open access to these resources without restrictions or regulative charges involved. The ownership, control, and distribution of benefits from the use of biodiversity have been contested vigorously—through economical, political, legal and even military means—for centuries. In recent years, especially since the coming into force of the CBD, more formalized and internationally sanctioned mechanisms have begun to emerge. Chief among these are the use of contracts and other agreements between source countries/institutions and recipients, who seek access to biological resources for the purpose of research, development, and commercialization.

Today, pharmaceutical companies constitute an important group of actors focusing on bioprospecting (biodiversity prospecting). This activity includes the collection of plants taxonomically identified and/or screened for medically active components. It is well established that the tropics are rich in biodiversity. More than two thirds of all plant species are also located in the Third World, attracting bioprospectors searching for medicinal plants (1, 2). Collection is in part based on ethno-directed sampling with the use of local and/or indigenous knowledge, as well as random and taxonomically directed sampling (3, 4).

**WIN-WIN OR BIOPIRACY?**

Some observers characterise bioprospecting as a win-win situation (5–9). A sustainable use of biodiversity promotes the conservation of these resources. Through bioprospecting countries in the Third World are faced with the opportunity of earning foreign currency relatively easily, while building capacity for a technologically more advanced industry. Income can be generated for such development purposes as well as for the conservation of biodiversity. On the other hand, observers criticize bioprospecting as a new type of colonialism where developing countries are exploited by the activity as well as by the involved patents, and that biodiversity is threatened by over-exploitation (10–14). The bioprospecting debate has generated the production of two polarized discourses in which narratives of specific cases are constructed as either win-win stories of mutual gains or ‘biopiracy’ stories with a cast of villains and victims (15).

Due to the multitude of factors and actors involved and the variation of claims regarding bioprospecting, it is impossible to obtain valid pictures of effects and causes in specific cases without independent analyses based on sound empirical investigations. Today, the volume of the claims can be characterized as inversely proportional to the existence of such analyses. The scope of our ongoing project is to contribute to a more scientific based picture by focusing on a few case studies using an interdisciplinary approach. In these cases, we examine the effects of bioprospecting on conservation and development: i.e. the conservation of biodiversity; the sustainability of collection; and the economic and social development in source countries. The project brings together a core team of researchers and students in biology-ecology, sociology and law, with input from scientists from different disciplines serving as a reference group. We integrate elements ranging from ecological examinations of the methods applied in the collections and study of plants, through sociological studies of local benefits and the production of discourses, to studies of the legal framework around bioprospecting arrangements. The project receives funding from the Research Council of Norway. We will in the following exemplify the approach of this study with central but very different cases of bioprospecting.

**TOLYPocladium inflatum:** A Precious Fungus from Norway to Novartis

Bioprospecting is claimed to generate substantial income for source countries for purposes such as conservation of biodiversity, health care, and social and economic development. Various individuals totally reject these arguments, or warn against too high an optimism. The range and magnitude of benefits from present arrangements on access to biological resources and benefit sharing will not be known for many years. There is also a lack of public information available on the details in present bioprospecting contracts.

Our project first focused attention on an “old” bioprospecting case. In 1969, the microfungus *Tolypocladium inflatum* was collected in a soil sample from the mountain plateau Hardangervidda in Norway and brought to Switzerland for pharmaceutical screening. *Tolypocladium inflatum* was found to produce cyclosporin, an immunosuppressant with positive effects for patients with organ transplantsations. Today, medicines containing cyclosporin constitute the major pharmaceutical product for the life science company, Novartis. The collection was in this case completed a long time in advance of the establishment of the CBD and, thus, within an open access bioprospecting regime, implying that there is no benefit sharing with the source country from present sales of cyclosporin medicines. We estimated the source country’s loss of benefits in comparison with present norms and expectations concerning bioprospecting arrangements. Annual royalties of 2% would have been a reasonable claim in this case, and in 1997 this amounted to USD 24.3 million.

Thus, in cases of discoveries of blockbuster drugs, the gains from bioprospecting for source countries may be substantial. Such examples are nevertheless rare, and the sharing of benefits depends upon the ability of the source country to establish a legal framework and related regulatory procedures. Our project examined the effects of patents related to cyclosporin medicines as well. Despite strong claims concerning bioprospecting, in general, and the focus on patenting as a cause of unfairness for source countries, patents related to the medicinal development were in this case not found to be a significant reason for the lacking benefits (16).

**Norway and Tanzania: Bioprospecting without Regulations**

At the end of the 1990s, German researchers were collecting sponges for the screening of bioactive compounds from sponges in Norwegian coral reefs. At this time, there were still no regulations in place to secure...