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Scientists — take action for access to biodiversity

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Biodiversity research generates critically important knowledge for the implementation of the Convention on Biological Diversity (CBD)'s goals. However, academic noncommercial scientists intending to study biodiversity experience obstacles caused by restrictive access conditions legislated by the countries that provide access to their genetic resources. Currently, a legally binding protocol on Access and Benefit Sharing (ABS) is being negotiated within the CBD without adequate involvement of the academic community. The ABS regulations were originally designed for commercial uses that generate monetary benefits from the utilization of genetic resources. Noncommercial research should expeditiously assert its interests and state its needs in the ABS negotiations. Academia has failed to market to policy makers its special dual role as user of genetic resources and as generator of essential knowledge for the benefit of the CBD and society at large.

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Introduction

At present negotiations on the system of Access and Benefit Sharing (ABS) are in progress within the framework of the Convention on Biological Diversity (CBD). The goal is to detail — in a legally binding way — first, the conditions for access to biological material ('genetic resources' in CBD terminology) and second, how to share the benefits that result from their use. Although this is a highly relevant issue for the scientific community, since it carries out research with biological resources, this community has hardly been represented in the ABS negotiations. We argue that it is essential for academia first, to increase its knowledge about the background of the CBD and the ABS concept; second, to take note of the negotiations and be aware that access for research is at stake;

and third, to take a stand in the negotiations and propose its options regarding ABS for research with noncommercial intent.

The paper summarizes the ABS-system, including controversial issues in the on-going negotiations, and how they affect academic research. We argue that academia is an important stakeholder regarding access to genetic resources and a major generator of knowledge for the achievement of the CBD's goals. However, the ABS-system, for several reasons, complicates access to biodiversity resources for researchers. Some researchers react to this by calling for streamlined access procedures, and some even for the abolition of the ABS-system [1].

In our view it is important to understand the background to the situation, which results from the divide between biodiversity rich but technology poor and technology rich but diversity poor countries. This generates the need for genetic resources providing countries to control their resources. The catchword here is 'biopiracy'.

This situation not only shapes the conditions and procedures for access in the countries where genetic resources are located (provider countries), but also strongly affects the course of the on-going negotiations. We discuss negotiation topics that affect scientific research, while we also identify points where the interests of scientists and their professional standards may conflict with the interests of provider countries.

Against this background two conclusions are drawn: first, it is essential that scientists be informed about the ABS-system and the intricacies underlying its implementation. It will increase their capacity to contribute their view of more streamlined access procedures. Secondly, it is necessary that the scientific community takes a stand in the negotiations and later on in the implementation of its outcome.

Background

We argue that the ABS-system was originally conceived for commercial research. However, owing to the broad definitions in the CBD text the ABS-system also applies to access for academic research, research that has no intention to commercialize its results or to develop marketable products.

The CBD — a brief overview

In 1992 the community of states set up the CBD. In addition to the goals to conserve and sustainably use biodiversity, the third main objective is to regulate Access

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to genetic resources and the fair and equitable *Benefit Sharing* resulting from the utilization of biodiversity (ABS). The CBD marked an important step in the area of international conventions on the protection of the natural environment for three main reasons. First, it set the goals to conserve biological diversity and use it in a sustainable manner at a global scale. Second, it integrates the genetic level into its definition of biodiversity. The CBD uses the term ‘genetic *resources*’, reflecting the conception of its economic value triggered by progress in genetic engineering technology [2**]. Third, it represents an essential paradigm shift in making the fair and equitable sharing of the benefits arising out of the utilization of genetic resources its third goal, thus integrating economic aspects.

The aim of this economic focus of the Convention is to strive at a balance between the interests of the industrialized countries to have access to genetic resources and the interests of the biodiversity-rich countries to have access to relevant technologies (CBD Art. 1) and take part in the benefits generated from the utilized resources. This can be achieved through controlling the use of the genetic resources. Besides important aspects of justice and equity, the idea behind ABS is to generate revenues that help biodiversity rich, developing countries to conserve their biological diversity [3].

Access and Benefit Sharing – the system

On the basis of CBD article 15.1, stating that countries have the sovereign right over their natural resources, the ABS-system creates rights and obligations for both providers and users of genetic resources. Provider states have the obligation to facilitate access to genetic resources for environmentally sound uses. They are not to impose restrictions that run counter to the objective of the Convention (Art. 15.2 CBD). User states in turn have to take measures to ensure sharing of benefits arising from the use of genetic resources (Art. 15.7 CBD) and have to facilitate access to technologies, in particular biotechnology (Art. 16 CBD).

The ABS-system was developed to deal with the so-called ‘bioprospecting’. This is the search for useful organic compounds in nature that are isolated, if possible synthesized, patented and developed into commercially successful products. One flagship event that may have shaped the ABS-debate in its early days was the bioprospecting contract between the Costa Rican National Biodiversity Institute and the pharmaceutical company Merck concluded in October 1991 [3,4]. The contract allocated financial compensation (up-front payments and participation in the profit from the marketing of products) to Costa Rica for providing specified amount of samples of plants, insects, and microbes to Merck. Parts of the payments were invested in research and conservation measures in Costa Rica [4]. To date, biological resources

still serve as the treasure chest for novel compounds that lead to new medicines [5] and other products and the ABS-system can serve as a tool to agree on uses and benefit sharing.

ABS applies to academic research

Owing to the CBD’s broad definition of genetic resources as ‘genetic material of actual or potential value’, encompassing any material of plant, animal, microbial, or other origin containing functional units of heredity” (Art. 2 CBD) all biological material containing functional units of heredity is subject to ABS regulations. Its collection therefore falls under the access rules, notwithstanding the intended use. Thus, all research works making use of samples containing ‘functional units of heredity’ collected abroad fall under the ABS provisions. This may make academic noncommercial scientists the most prevalent ‘users’ of genetic resources. The few ABS user group assessments focus either on industrial uses [6] or on taxonomic research [7]. Yet, the ABS-system, as it is implemented in a great number of provider countries, is not adapted to the specific needs and options of academic noncommercial research.

Critical issues for academic research concerning ABS

This section summarizes some impacts of the ABS-system on academic research. It also illustrates that biodiversity information can be conceived as moving from basic, noncommercial research, to research and development, and finally to commercialization. Each step increases the economic value of genetic resources, thus creating a value chain.

Access is difficult, research is hampered

Many countries do not currently have an operational ABS-system. For researchers trying to fulfill the ABS requirements, it may be difficult to find the responsible ABS agency. Often permit negotiations with different agencies or different stakeholder groups are necessary [8**]. Furthermore, access procedures may be geared toward industrial product development, possibly requiring unrealistic up-front payments. This generates administrative burdens and delays that hamper research [9–11,12**]. In contrast to industrial bioprospecting, academic research does not have the financial or organizational flexibility for long lasting negotiations, and needs to fulfill set goals within a set period of time. Consequently the prevalent ABS-conditions increasingly deter scientists from conducting research on genetic resources [7,9].

Mistrust against science

Lacking knowledge about scientific methods and goals makes it difficult for administrative authorities to evaluate scientific research proposals submitted for ABS access requirements. Administrators may fear political pressure

if their access permits are too lax, allowing biopiracy. They thus tend to handle ABS applications overly restrictive [13,14]. Such problems have been reported for bio-control research [15] and taxonomic research [7]. Some countries impose restrictions on local researchers studying local biological diversity [7,9,10,11,16]. Cases of denied access for taxonomic and ecological research suggest that administrators have a distrust of science [10,11]. This needs to be addressed.

Provider countries want control over their genetic resources

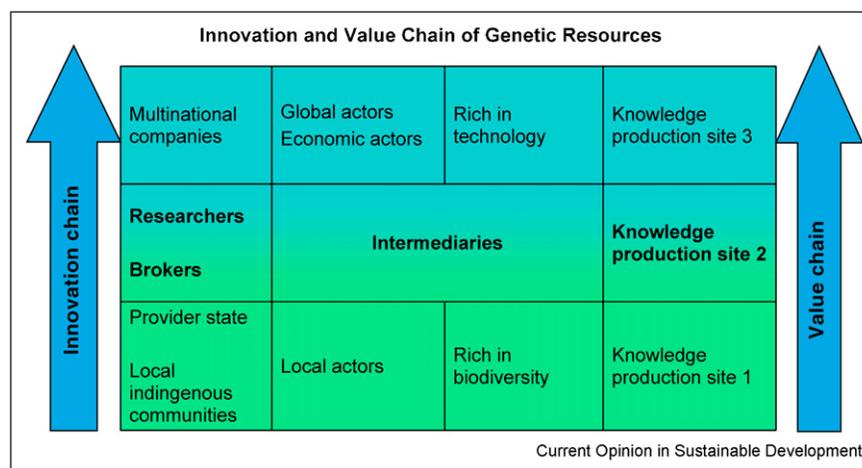
One core difficulty of ABS is the need of provider countries to control the flow of their genetic resources, thus determining their utilization and obtaining a share of the benefits generated by their use. Research generates knowledge and this increases the value of the genetic resources as the related information moves along the value chain [17**], a term used in economics (Figure 1).

In access to genetic resources, academic noncommercial research is an important stakeholder with a double role: first, it acts as an access point to genetic resources (biological material) and related traditional knowledge. According to Laird *et al.* [18**] ‘...biodiversity prospecting is at heart a scientific undertaking’... ‘Almost without exception, every biodiversity prospecting collection effort undertaken on behalf of companies is done through intermediaries. In most cases, these are research institutions, botanic gardens and universities. . .’. Second, scientists play a pivotal role as intermediaries between the various stakeholders involved in the bioprospecting

process. By doing research — from data collection through data analysis and publication of the results — they transform information, transmit it along what is called the value chain and make it available to other scientists [19**] and interested stakeholders (Figure 1). There are additional arguments for a stricter control of genetic resources that disguises the connection between the generation of knowledge and the subsequent use of that knowledge: first, there may be a substantial time-lag between the publication of results and their utilization in commercial research and development; second, there may be a geographical disconnect between the place of collection and the place of further processing; and third, there is a legal disconnect between the place where the resource originates from and the place where further studies are carried out.

For many providing countries it is therefore complicated, time-consuming, and expensive to understand and to follow the flow of knowledge about their biodiversity resources through these processes. The fear of biopiracy, that is the illicit appropriation of genetic resources and/or associated information and the generation of profitable products, is widespread in developing providing countries [20,21]. This fear is based on numerous cases of extremely profitable products, developed from illegally acquired resources, that were successfully patented and commercialized, without any sharing of benefits with the provider country [20,21]. Mistrust and feelings of bio-colonialism in biodiversity-rich countries can lead to strict and defensive access regulations.

Figure 1



The figure illustrates the flow of information and uses of genetic resources along the value and innovation chain. On the bottom line of the figure are indigenous local communities with their traditional knowledge on medicinal uses, and cultivation methods, etc. (knowledge production site 1). The knowledge is further transformed by researchers ('Intermediaries') in the next higher level for example through scientific analysis and publication (knowledge production site 2). Subsequently this information is available to other stakeholders (e.g. research and development, commercial users) in an expanded geographic area (from local to global, from a grassroot approach to a highly technological approach). This can lead to the production of commercial products (knowledge production site 3). (Based on: Brahy and Louafi [19**])

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It is important however that negotiators acknowledge that the information generated by academic research particularly meant to contribute to the conservation and sustainable use of biodiversity according to the CBD goals, is hardly ever of use in the commercial world and thus remains on the second level of Figure 1, the results being fed back to the provider countries.

Scholarly standards may run counter to provider country interests

In order to receive research funding, scientists have to publish their findings. They have to generate high quality scientific knowledge and have to adhere to scholarly standards. Publishing is a crucial step and has to happen in a timely manner. It has to disclose enough information so peers can assess its validity. Investigators have to record and store collected data and analyses for many years [22] and they are asked to submit (genetic) information to appropriate databases in order to make them accessible to the scientific community. Unique or novel biological material can be either passed on directly to peers (along with a Material Transfer Agreement) or submitted to repositories (culture collections, herbaria, musea, botanical and zoological gardens, etc.) to facilitate the availability for other researchers. As soon as information has entered the public domain (e.g. through publications) no intellectual property rights can be claimed [23^{••}]. It can be used by others and after further research and development they could apply for a patent. Appropriate mechanisms for disclosure of origin and/or sources of the used genetic resource would enable benefit sharing. If a provider country itself is interested in the commercial exploitation of a research result, it could include appropriate options in ABS agreements.

Scholarly standards for disclosure of information for scientific transparency and the exchange of material among peers collide with the need of providers to control the use of biological material since placing related research results in the public domain makes them accessible for everyone. In order to gain control, ABS discussions tend to include restrictive clauses in contracts on mutually agreed terms that can go as far as requesting precontrol of publications [23^{••}]. This could put academic research at stake.

Generated benefits: contribution to conservation of biodiversity

However, the debate about control of resources tends to disregard the benefits generated by academic research. All parties to the Convention agreed to identify and monitor the biological diversity on their territory. To this end a major research effort in basic science such as taxonomy, ecology, and conservation biology is called for. The academic research community plays a pivotal role in the implementation of the CBD goals. Academic research is simultaneously: first, a user of genetic resources; second, a provider of urgently needed knowl-

edge for the implementation of the CBD goals; and third, a provider of nonmonetary benefits such as education, training, and technology transfer. ABS regulations need to accommodate access for biodiversity research.

Interdependence of countries regarding taxonomists

In addition, the scientific community as much as the CBD itself have recognized a global shortage of taxonomic knowledge. This led to the Global Taxonomy Initiative that forms a program of work within the CBD [24] aiming at expanding knowledge on biodiversity. The CBD Bonn Guidelines [25[•]] refer to taxonomy in several sections and require that access to genetic resources for taxonomic noncommercial purposes be facilitated and special terms and conditions established. Taxonomists nonetheless experience access restrictions [7,9]. Furthermore, taxonomy is a transboundary discipline by nature, since no country in the world hosts a full set of taxonomic experts able to identify all groups of organisms found on their own national territory [10,24]. Every country depends on non-national experts in order to fulfill CBD article 7 on identification of biodiversity. And the identification of species depends on specimen exchange among specialists located around the world. Overly restrictive ABS regulations could encumber research.

International ABS negotiations

These critical issues show a segment of the challenges and opportunities inherent in the ABS-system that are of special interest to academia. Consequently scientists should contribute to the negotiations to develop a viable International Regime on ABS.

The involvement of academia in the ABS negotiations

Work on ABS was taken up in 1998 (see Box 1), but academia as a stakeholder group has hardly been involved in the negotiations. A major ABS achievement was the adoption of the CBD Bonn Guidelines (BGL) in 2002, an instrument to assist governments and other stakeholders in developing their ABS strategies, and in identifying the steps involved in the process of obtaining access and sharing benefits. The BGL include some issues relevant to noncommercial research (mainly taxonomy) and differentiate uses (taxonomy, collection, research, and commercialization) [25[•]]. However, the voluntary nature of the BGL sparked requests for more legally binding solutions for ABS.

Since 2004, negotiations for an International Regime on ABS have been on-going. It will become a protocol to the CBD. Negotiations are taking place according to a tight schedule and work has to be finalized before the Tenth Meeting of the Conference of the Parties (COP-10) in October 2010.

A fruitful workshop organized by the Barcode of Life Initiative and several science organizations was held in

Box 1 Overview of ABS negotiations under the CBD
(www.cbd.int)

1998, Fourth Meeting of the Conference of the Parties (COP-4). Establishment of a Panel of Experts on Access to genetic resources and benefit sharing (ABS) to clarify concepts and principles concerning ABS.

2000, COP-5. The parties establish the Ad Hoc Open-ended Working Group on ABS (ABS-WG) to develop guidelines and other approaches.

2002, COP-6. CBD member states adopt the Bonn Guidelines on ABS. A voluntary tool for providers and users of genetic resources.

2002, World Summit on Sustainable Development. Participants call for negotiations within the CBD for an International Regime on fair and equitable benefit sharing resulting from the use of genetic resources.

2004, COP-7 mandates the ABS-WG to negotiate an International Regime on ABS to effectively implement CBD article 15 and 8(j) and the three objectives of the Convention.

2006, COP-8 instructs the ABS-WG to complete its work before COP-10.

2008, COP-9 adopts a roadmap for the negotiations of the International Regime and agrees on three additional meetings of the ABS-WG to finalize its work before 2010.

2009, ABS-8. The Working Group meeting elaborates a single, comprehensive document, the 'Montreal Annex' that contains most of the elements needed to shape the international ABS regime.

Source: International Institute for Sustainable Development, 2009 [26].

November 2008 in Bonn, Germany. It analyzed ABS in noncommercial biodiversity research and fed its results into the ABS negotiation process [23^{••}]. Although the participants could not agree on a clear definition for noncommercial research, they agreed that commercial research projects can be distinguished in practice from noncommercial research projects by several criteria. The benefits of commercial research findings are normally held privately while noncommercial researchers release them in the public domain through publications, presentations, and data release. Other criteria of commercial research include: first, retention of monetary benefits from sale; second, transfer of material to commercial third parties; and third, terms of agreements that reserve rights to file patents. Workshop participants also agreed that several communities of research disciplines play a particularly relevant role for conservation and sustainable use. They are usually not involved in commercial research activities, but devoted to the production of new knowledge, public goods, and services generating benefits shared by all [23^{••}].

The way forward

Postulates of science

The debates about ABS issues reveal various obstacles for academic research: overly burdensome access regulations

or procedures discourage research and lead to losses of noncommercial benefits.

We propose a set of postulates for the current ABS negotiations:

- (1) Simplified procedures: given the financial and time frames of academic research, researchers crucially depend on a clear set of rules that govern access to biodiversity resources. This applies particularly to the legal conditions and procedural modalities for access. It is also important that contact points be accessible during the project-planning phase.
- (2) Adapting ABS framework to research needs: the most distinct communities of noncommercial research are focused on taxonomy, ecology, and evolutionary biology [23^{••}]. It also has to be considered that academic research, even in the areas of for example phytopharmacology or genetic engineering, may remain purely scientific in intent and must not necessarily lead to marketable results. Accordingly, ABS regulations could include varying approaches to different research sectors, as proposed by several authors [6,9] and with clear criteria regarding the differences between access for basic research and for commercial purposes [17^{••}]. For instance with simple agreements containing transfer conditions of samples to third parties and regulating benefits for unanticipated commercial benefits [23^{••}].
- (3) Inclusion of scientists in national ABS permit granting committees [9].
- (4) Linking benefits to conservation and sustainable use of biological diversity.

Messages to scientists

Respect the rules, increase awareness on ABS

Knowing and respecting the rules of responsible conduct in research [27–30] and those on ABS regulations for scientists [12^{••},23^{••}] are essential compliance activities. The Swiss Academy of Sciences published a good practice tool and a website addressing academic noncommercial research with genetic resources [31^{••}]. A similar guideline has become a supplement to the general requirements for research funding by recipients of the German Research Foundation [32]. The CBD Website lists more instruments (e.g. issued by botanic gardens, collections of micro-organisms, and professional societies) at <http://www.cbd.int/abs/instruments/>). Granted access holds a danger of misuse of resources. Academic research should aim at building trust through transparency regarding research goals and methods and through research cooperation with partners in developing countries [23^{••},33]. If unanticipated discoveries show potential for commercial research, ABS arrangements have to be renegotiated. Sharing of resources with third parties must

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be done only according to the terms and conditions of ABS agreements.

Engage in a dialog with national delegates and the negotiation process

Investigators in developing and industrialized countries should engage in a direct dialog with their national ABS–CBD delegations [12^{••}], and participate directly in the negotiations [12^{••}]. Scientists should articulate the contribution of their research toward the implementation of the CBD goals through the generation of basic knowledge on biodiversity. It should clarify that academic noncommercial science has to adhere to inherent scholarly codes on good scientific practice in order to generate transparent and credible knowledge and publications while accepting the need of developing countries to protect their resources.

Conclusions

Conservation and sustainable use of biodiversity are decisive factors for the development of society's well being and a sustainable world calls for more responsibility toward ecosystems. In the implementation of the CBD goals, academic noncommercial research is a producer of essential knowledge and an important partner. However its method of work is often based on an international network of experts (especially taxonomists) that need access to biodiversity including non-national origin. More awareness needs to be generated about the international scientific interdependence, since no country holds all the needed experts to fulfill national CBD commitments.

It stands to reason that appropriate measures are necessary to prevent the misuse of genetic resources for commercial purposes without adequate compensation. The measures can also be seen as a way to counterbalance the practice of industrialized countries to protect their intellectual property rights that create restrictions on the use of genetic resources. To date overly restrictive access regulations are in place and they do not differentiate between commercial and noncommercial intent. Regulations include onerous access procedures with multiple layers of bureaucracy, slow decision taking processes, extra costs, and lack of transparency. This hampers noncommercial research and reduces nonmonetary benefits for provider countries.

At the international level, negotiations are on-going for a legally binding protocol on access to genetic resources and the fair and equitable sharing of benefits (ABS) as stipulated by the CBD. The outcome will have significant impact on research since the current ABS regime primarily focuses on commercial uses of biodiversity. We call upon scientists to get involved in these decisive negotiations and voice their needs while respecting the need

of provider countries to protect potential benefits of their genetic resources.

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