Is the Convention on Biological Diversity promoting environmentally friendly solutions to pest control?

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Introduction

The Convention on Biological Diversity (CBD; www.cbd.int) was established in 1992 with three objectives: 1) to conserve nature, 2) to sustainably use biodiversity, and 3) to ensure access and fair and equitable sharing of the benefits arising from the use of the biodiversity. It was also acertained established that countries have the sovereign rights over the biodiversity and genetic resources within their (political) borders. The third objective is now commonly known as "Access and Benefit Sharing" (ABS, www.cbd.int/abs) and has given rise to much contention. Back in 1992, and to some degree still today, there is the expectation that companies from the Northern (technology-rich) countries would access biodiversity in Southern (biodiversity-rich but technology-poor) countries, and could quickly produce commercially lucrative drugs. The basic idea of ABS is that countries of origin receive a fair share of the revenues/benefits for the use of their biodiversity, to be used in conservation and development, both leading to a better conservation of natural resources. The reality proved to be much more modest than the expectations but biodiversity rich countries, for the fear of missing their share in the business, passed ABS regulations which hinder rather than enhance companies' activities, and so in fact no revenue has been generated at all. A measure of success for the CBD will certainly be that the ABS principle is widely accepted.

An International ABS Regime has not been accepted to date, but is expected to be agreed upon the next COP10 in Nagoya, Japan, in October 2010. However, many countries have already passed ABS regulations some years ago, unwilling to wait for a final agreement in the CBD, and effects are already felt.

Ruiz Muller, sketches negative impacts on the basic research in the Andean region (in Feit et al 2005). Rodriguez & Antonelli (2009) examined the effects of ABS legislation on research in the Brazilian Amazon by asking 'to what extent have current governmental regulations hindered biological research in Brazilian Amazonia'. Based on a questionnaire and anecdotal evidence they concluded that 'there is a general sentiment that the collecting permit process in Brazil impedes scientific research far more than it protects the Brazilian biota.' Brazilian scientists state in 2006 on the margins of the 8th Conference of the Parties (COP8) that 'Basic biological research is seriously hampered by many of the current national ABS regulations' (UNEP 2006:12). A similar situation is reported from India by Madhusudan (2006) and Pethiyagoda (2007)

The current national and future international regulations also apply to science and biological control, and have resulted in some unintentional effects, preventing rather than encouraging scientific research and biological control. Jinnah & Juncourt (2009) therefore ask if ABS is actually stifling essential biological research.

These observations are particularly disturbing since the CBD itself is calling for the cooperation of countries to find environmentally friendly and safe solutions for environmental problems. Biological control has done exactly that for over 100 years and we are extremely disturbed to find that some current ABS practices impede this very successful and environmentally safe pest management method based on the use of biological diversity.

Biological Control and ABS

In this contribution we examine the effects of the CBD on the work of classical and augmentative biocontrol around the world. The authors of this contribution are members of the "Global Commission on Biological Control and Access and Benefit Sharing" of the IOBC (www.iobc-global.org, International Organization for Biological Control) and have prepared two documents. One report was prepared on the request of FAO to summarize the past and current situation regarding the practice of biological control in relation to the use and exchange of insect biological control agents (BCAs) and ABS. It is a unique overview of the current state of affairs in biological control, was published by FAO in October 2009 (FAO Background Study No. 47, ftp://ftp.fao.org/docrep/fao/meeting/017/ak569e.pdf).

The IOBC Commission compiled over 30 case studies to illustrate a variety of points relevant to ABS, ranging from the difficulties that ABS already represents, to practical examples of situations where application of ABS is not straightforward, to successes and the implications for ABS sharing. A summary of the report is presented here.

The main conclusions of the report were presented by IOBC during a FAO meeting on ABS in October 2009. IOBC representatives observed that country delegates (even though from agriculture ministries) present at the FAO meeting frequently had not realized (a) how widely biological control is applied in almost all countries worldwide, (b) that in classical biological control no direct profits were accrued by companies or the biological control community performing the work, (c) how little money was involved even in commercial biological control, and (d) how dependent biological control is on exotic natural enemies, often from the home range of the pest.

There is also a lack of information and awareness on the side of the biological control practitioners. We attribute this to the fact that the CBD originated from conservation – environmental discussions and not from within the agricultural community. However, as the CBD covers all biological and genetic resources it has given itself a mandate, in essence, over all living organisms, including crops, livestock, and all organisms producing and processing food, and material. It has also quite correctly been stated that the CBD transformed into a framework convention for development (Le Prestre 2002:7). As the CBD also deals with the exchange of genetic resources it has implications on trade and patents.

So in all three cases, the CBD affects areas that so far have been under independent practices, treaties and conventions. This stimulates further conflict since there is no hierarchy or arbitrating mechanism between conventions to solve the issues. An exception to this is the International Treaty on Plant Genetic Resources for Food and Agriculture (commonly known as The Planttreaty, www.planttreaty.org) regulating the exchange of germplasm of 64 species listed in its annex and on which negotiations started even before the CBD entered into force 1993. This Planttreaty successfully negotiated a collaborative and common approach to the question of benefit sharing and currently other user-groups, such as the microbial collections and users are discussing a similar approach (see Halewood 2010 for discussion).

The IOBC report to FAO minimized political statements favouring the focus on a more factual summary. However, it was decided to present a clear view and to inform the biocontrol community on ABS which is just beginning to understand the possible implications of ABS. Therefore, the Commission wrote a forum article for the journal BioControl, entitled "Do new Access and Benefit Sharing procedures under the Convention on Biological Diversity threaten the future of Biological Control?" The full text of the paper (Cock et al 2010), including additional material, is available from the authors.

We would like to stress the importance of the major conclusion of this paper: ***"Finally, we urge biological control (BC) leaders in each country to join forces and get in touch with the CBD-ABS Focal Points of their country as soon as possible, and raise the issues surrounding the practice of BC and ABS, using local examples when appropriate, so their national delegates to the ABS discussions in 2010 are appropriately informed. Only if the BC community of practice gets involved in the discussions now, can they expect their needs to be taken into consideration.***"

Summary of the IOBC report to FAO

"The use and exchange of biological control agents for food and agriculture"

Based on the observations made in the full FAO Background Study No. 47, and detailed below, we would like to present a summary here. We draw the following conclusions regarding the practice of biological control and its needs related to ABS.

ABS regulations should recognize the specific features of biological control:

- Countries providing BCAs are also themselves users of this technology
- Biological control is widely used in both developing and developed countries, often using the same BCAs
- Many BCAs are exchanged without recoverable monetary value
- Organisms are not patented, so can be used by anyone at any time
- Classical biological control information and to a degree augmentative biological control information are publicly shared
- Most use of biological control relates to food and agriculture
- There are societal benefits for all, such as environmental and public health benefits, and reduction in pesticide use.

Recommendations

In view of these specific positive features, the following recommendations are made:

1. Governments should build on the existing multilateral practice of exchange of natural enemies for biological control on a complementary and mutually reinforcing basis, which ensures fair and equitable sharing of the benefits of biological control worldwide.
2. ABS regulations should encourage further development of the biological control sector, by facilitating the multilateral exchange of BCAs.
3. Countries are encouraged to have a single point of contact to facilitate survey missions, provision of information, institutional linkages and taxonomic support, and provide advice on compliance with regulations for biological control, including ABS.
4. ABS in relation to biological control must be based on non-monetary benefit sharing, e.g. capacity building, shared research programmes and/or technology transfer, as already practised by many organizations and also the augmentative biological control industry.
5. A document describing best practices for ABS in relation to biological control, including guidelines for joint research that are equitable but not restrictive, should be prepared and disseminated by CBD and FAO, and biological control organizations would be expected to follow these guidelines.
6. To improve transparency in the exchange of BCAs, mechanisms should be supported globally to establish and allow free access to database information on BCAs including source and target countries.
7. In the case of a humanitarian or an emergency situation for food security, governments should cooperate within FAO to fast track action in the exchange of BCAs.

We would like to highlight following specifics in the practice of biocontrol, classical and augmentative, which sets it apart from usual commercial activities in biodiversity.

The Research Process and Opportunities for Benefit Sharing

Preliminary surveys for the target pest and its natural enemies are often carried out in several countries. These surveys offer limited opportunities for financial benefit sharing, but benefit the source country through provision of training in survey methods, joint surveys, capacity building and information generated to better understand biodiversity.

Detailed studies on natural enemies to assess their potential as BCAs are (partly) carried out in the source country, while host-specificity studies involving plants or animals not naturally occurring in the source country are best be carried out in quarantine stations in the target country or even a third country. It is this stage of a biological control programme that provides great scope for collaboration, shared research and capacity building.

In source countries, local partners are essential to carry out biological control surveys and research. Some of these local partners became the leaders in developing biological control options for their country in the future.

Implementing Augmentive Biological Control and Classical BC

Two main groups of producers are involved in augmentative biological control: commercial and centralized. The former are independent companies who produce and sell BCAs to end users, i.e. farmers. Such companies have mostly operated in developed countries, but new ones are increasingly common globally, particularly supporting cash crop production in middle-income countries. The centralized production units are government- or industry-owned and mass-produce natural enemies for a particular niche, normally large-scale agriculture or forestry, which are either provided free or sold to users. In the case of classical biological control, those who implement it are normally national agencies or programmes. Classical biological control in developing countries is often carried out with the financial support of international development agencies and technical support of implementation agencies.

The Benefits to Users and Their Customers

The main beneficiaries of classical biological control are farmers who have their invasive species pest problems, reduced without necessarily actively using BCAs, by means of natural spread and reproduction. Thus, classical biological control produces a public good, as the benefits reach all who grow and benefit from the crop, without them having to actively intervene. Often they are unaware that the biological control agents are even present. The use of augmentative and classical biological control enables producers to reduce pesticide use and to meet the high standards of profitable northern export markets, resulting in job creation amongst the growers and a very significant influx of foreign exchange in developing countries. Consumers also benefit from reduced use of pesticides, and hence lower pesticide residues in food.

Biological control is environmentally friendly without the negative impacts pesticides can have on biodiversity.

The Extent of Use of Biological Control

At least 7000 introductions using 2700 species have been made to date. The most widely used BCAs have been introduced into more than 50 countries. BCAs from 119 different countries have been introduced into 146 different countries. Low-income countries have contributed slightly more BCAs than they have received. High-income countries have also been the main source of BCAs.

In augmentative biological control, more than 170 species of natural enemies are currently produced and sold, but some 30 species make up more than 90% of the market worldwide. There is a trend in augmentative biological control to first look for indigenous natural enemies when a new, even exotic, pest is recognised.

Once a BCA has been used successfully in one country the opportunity is often taken to repeat that success in other countries through redistribution of the BCA. Developing countries have benefited from access to such tested BCAs because research and implementation was carried out by developed countries. For example, the work of developed countries with subtropical and tropical regions, e.g. Australia and the USA, has directly benefited developing countries in the tropics and subtropics.

Control of Genetic Resources and Market Values

In the case of classical biological control, a national or international research institute usually carries out the research, but once established, a BCA ceases to be under its control. The agent breeds and contributes effectively to management of the target pest. The BCA will disperse to its geographic range limits, often spreading to neighbouring countries. The classical biological control ethos is to establish a free-of-charge public good. The sector has traditionally made no use of intellectual property rights to regulate access to, or use of, classical BCAs. All knowledge generated is put into the public domain, and other countries are encouraged to take advantage of this new BCA. Benefits to farmers, consumers, and the local economy, do not return to the research institute or development agency in monetary form.

In the case of augmentative biological control, a company surveys for a useful new BCA to control a particular pest. They develop rearing, distribution and release methods at their own expense. The augmentative biological control company then sells it to growers or other customers, generating profits for the company. Farmers who paid for the BCA benefit from effective pest control and improved yields, growing food without pesticides with implications for their own health, and the price they can obtain for their produce. The customers who buy the food are able to get healthy food at an acceptable price. The augmentative biological control sector does not apply for patents on BCAs, so anyone can collect and use the agents from nature. However, augmentative biological control companies may establish patents on rearing processes, but more usually handle the issue by keeping the relevant ‘know-how’ secret.

Worldwide, some 30 larger commercial producers of augmentative BCAs are active, of which 20 are located in Europe. In addition to the larger producers, some 100 small commercial producers are active, employing fewer than five people. The total market for augmentative biological control natural enemies at end-user level in 2008 was estimated at about US$100–135 million. With an average net profit margin of around 3–5%, the total commercial augmentative biological control industry profit is under US$15 million per year. Augmentative biological control is a small activity undertaken by small and medium-sized enterprises and with modest profits.

Regulation concerning the Introduction of Biological Control Agents

Currently, there is a general trend for access to genetic resources (such as BCAs) to become increasingly restrictive, for a variety of reasons, including CBD-ABS regulations and phytosanitary legislation, such as the ISPM3 (International Standards for Phytosanitary Measures No. 3) of the IPPC (International Plant Protection Convention, www.ippc.int) which sets out the responsibilities of the different players. However, the existing ethos of multilateral and free BCAs is a foundation to effectively help countries solve their environmental and agricultural problems. This international network deserves special consideration with regards to ABS.

Under the new legislation being introduced in some countries regarding access to genetic resources it is becoming a very difficult and challenging process, for both international researchers and their national collaborators, to solve agricultural problems and improve food security. In the short term this legislation remains, however, it can be revised in the future. There is a risk that an International ABS Regime not accommodating the needs of the sector simply adds another layer of regulation to the research, which is likely to slow the process.

The arrival of a new invasive alien pest in a country can be devastating. In such cases, there is an argument that an emergency response may be needed before irreversible harm is done. That emergency response could be classical biological control. In such cases fast-track procedures for access to genetic resources should be anticipated and facilitated.

User Perspectives

Much of the classical biological control community has been unaware of the potential of ABS to affect its activities. However, there is now growing awareness of ABS policies and also of the need for continued exchange of BCAs to guarantee the public good resulting from biological control.

Practitioners have long been aware that classical biological control does not bring them monetary benefits. The public-good-practice in classical biological control is based on government and donor financing to create a free-of-charge goods, but no benefits to the implementers. Furthermore, there is no mechanism to collect monetary benefits from the beneficiaries, such as smallholder farmers. For this reason, forms of non-monetary benefit sharing are appropriate, based around shared research activities and capacity building.

On the other hand, the commercial, augmentative biological control community has been more aware of the issues, perhaps because some modest commercial profits are generated. Some members of the International Biocontrol Manufacturers Association (IBMA, www.ibma.ch) and the Association of Natural Biocontrol Producers (ANBP, www.anbp.org), are developing benefit sharing in the form of knowledge sharing, training, provision of natural enemies, and other ways. In the event that a natural enemy obtained from a source country becomes a commercially successful BCA, some ‘royalties’ payments to the country of origin might be possible, but if the industry had to pay for each natural enemy collected, they are forced to discontinue with this type of work. On balance, these producers believe that shared activities and capacity building is more realistic approach, given the relatively small profit margins in the augmentative biological control industry.

Literature Cited

Cock MJW, van Lenteren JC, Brodeur J, Barratt BIP, Bigler F, Bolckmans K, Cônsoli FL, Haas F, Mason PG, Parra JRP 2009 The use and exchange of biological control agents for food and agriculture. FAO Background Study Paper No. 47. FAO Background Study No. 47, ftp://ftp.fao.org/docrep/fao/meeting/017/ak569e.pdf

Cock MJW, van Lenteren JC, Brodeur J, Barratt IPB, Bigler F, Bolckmans K, Consoli FL, Haas F, Mason PG, Parra JRP 2010 Do new Access and Benefit Sharing procedures under the Convention on Biological Diversity threaten the future of biological control? BioControl 55:199-218. DOI 10.1007/s10526-009-9234-9, Springer. (www.springer.com/life+sci/entomology/journal/10526)

Feit U, von den Driesch M, Lobin W (Eds.) 2005 Access and Benefit-Sharing of Genetic Resources Ways and means for facilitating biodiversity research and conservation while safeguarding ABS provisions Report of an international workshop in Bonn, Germany held in 2005, 8-10 November Convened by the German Federal Agency for Nature Conservation http://www.bfn.de/09/090203.htm Skript163

Halewood M 2010 Governing the management and use of pooled microbial genetic resources: lessons from the global crop commons. International Journal of the Commons 4(1): 404–436. http://www.thecommonsjournal.org/index.php/ijc/article/view/152/145

Jinnah S and Jungcurt S. 2009 Could Access Requirements Stifle Your Research? Science 323:464-465, 23 January 2009.

Le Prestre. PG (ed.). 2002. Governing Global Biodiversity: The Evolution and Implementation of the Convention on Biological Diversity. Vermont: Ashagate Publishing Company.

Madhusudan MD, Kartik Shanker, Ajith Kumar, Charudutt Mishra, Anindya Sinha, Rohan Arthur, Aparajita Datta, Mahesh Rangarajan, Ravi Chellam, Ghazala Shahabuddin, Ravi Sankaran, Mewa Singh, Uma Ramakrishnan and P. D. Rajan. Science in the wilderness: the predicament of scientific research in India's wildlife reserves. CURRENT SCIENCE, VOL. 91, NO. 8, 25 October 2006.

Pethiyagoda R, Nimal Gunatilleke, Mangala de Silva, Sarath Kotagama, Savitri Gunatilleke, Padma de Silva, Madhava Meegaskumbura, Prithiviraj Fernando, Shyamala Ratnayeke, Jayantha Jayewardene, Dinarzarde Raheem, Suresh Benjamin and Anouk Ilangakoon 2007 Science and biodiversity: the predicament of Sri Lanka. CURRENT SCIENCE, 426 VOL. 92, NO. 4, 25 February 2007

Rodriguez V and Antonelli A 2009 Biological Material Sharing in Research: The Case of Rain Forest Resources. Second Communia International Conference Global Science & Economics of Knowledge-Sharing Institutions. Breakout Session C: Scientific research commons - experiences and critical appraisal

UNEP 2006 Outcomes and recommendations of the meeting of "Biodiversity –the Megascience in Focus". Doc. UNEP/CBD/COP/8/INF/46. (Quotation p.12)