MAY 2005 Policy Brief

OECD ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Preserving Biodiversity and Promoting Biosafety

Introduction

Biodiversity – the variety of life and of habitats on Earth – is vital to human welfare. The loss or degradation of biodiversity can have important economic, environmental, and social consequences. Altering a watershed (the area draining into a common waterway), for example, not only leads to the potential loss of an ecosystem – through loss of habitat – but may also create economic costs for water filtration in cities using its water.

And it is not enough simply to preserve those biological resources that are known to be useful to humans now – we may also be losing potentially beneficial compounds and materials that are, as yet, undiscovered (*e.g.* genetic resources for use in pharmacological or agricultural applications).

Biodiversity loss also has social consequences, in its impact on people's livelihoods and lifestyles – this is the unmeasured cost of losing cultural traditions.

The loss of key elements of an ecosystem can alter the balance between its components and lead to long-term or permanent changes. Biodiversity loss can also affect human health, as our health is largely dependant on the quality of the ecosystem in which we live – loss of plant or animal species can affect the quality of water or soil, for instance.

The main pressures on biodiversity result from land use changes (usually associated with increasing populations); unsustainable use and exploitation of natural resources (especially fisheries, agriculture, and forestry); global climate change; and industrial pollution. At the same time, biotechnology is introducing new organisms and their effect on existing organisms and habitats also needs to be considered.

In some instances, these pressures can actually be positive for biodiversity. Agricultural activity sometimes improves the habitat and even helps increase the variety of species; the Mediterranean basin is considered a biodiversity "hot spot" in part because of its human-induced agricultural biodiversity.

However, the available evidence suggests that, in most regions of the world, the effects of economic activity are negative for biodiversity. This *Policy Brief* looks at what governments can do to place a value on and help preserve biodiversity and ensure biosafety. ■

Observer oecd

What is biodiversity worth?

Few would dispute that governments should aim to maintain biological diversity as well as encouraging economic growth. But how much biodiversity protection is needed and what is the most efficient way to deliver it? These are fundamentally economic questions, which is why the OECD has been examining the links between economic activity and biodiversity management for the past decade.

Some would argue that, as incomes rise over time, preferences for improved environmental quality lead automatically to better conservation and better use of biodiversity-related resources. Proponents of this argument note the improvement in air and water quality that has accompanied the advanced stages of industrialisation in most countries. This observation, however, seems limited to those environmental amenities where collective action is easily accomplished, such as air quality in large cities. Biodiversity in general is more dispersed and less easily targeted for collective policy. There is also less room for error – if air becomes more polluted, steps can be taken to reduce the pollution, but if an ecosystem is compromised by human encroachment, its loss may be permanent. Given that our knowledge of the complexity and inter-linkages of ecosystems are only cursory, loss of biodiversity may be more important than any immediate gains.

Before policy makers take decisions about whether to risk destroying a habitat for economic gain (such as a housing development), they need to be able to set a relative value for those gains and for the biodiversity at risk. But most environmental amenities or biodiversity – landscapes, species of insect, forest habitats – are not bought or sold and therefore a price cannot be set on their use without some form of policy intervention. Without collective action, over-exploitation of such common assets is the likely result. In the case of biodiversity, at the extreme this leads to such destructive practices as "slash and burn" farming on fragile soils. Overall, there is a good case to be made for vigorous policy intervention to help preserve both the extent and the quality of biodiversity. ■

What policies for biodiversity?

Once governments decide to act to protect biodiversity, they need to choose policies that reflect the relative value people place on it. Placing a market value on biodiversity may sound difficult, but the strength of people's desire to maintain biodiversity can be tested at many levels. For example, evidence can be gleaned from people's willingness to visit natural areas and the pleasure they derive from nature hikes and other non-destructive outdoor activities. The rapid growth of the global eco-tourism industry also demonstrates a strong willingness by people to pay substantial amounts of money to see natural phenomena that are not available locally. Many studies have been conducted to quantify the value people place on biodiversity-related goods and services relative to other economic outputs.

Governments can use this information to craft public policy that will encourage the use and conservation of biodiversity in a way that reflects its relative value. OECD work on the economic aspects of biodiversity explores the types of policies and instruments that will lead to uses of

biodiversity-related resources that best reflect relative preferences. Part of this work seeks to ensure that the biodiversity-related impacts of economic activity are an explicit part of the day-to-day decisions that consumers and producers face. For example, imposing a higher cost on products using virgin resources than those using recycled resources could be used to reflect impacts on biodiversity. When biodiversity policy accounts for both private and public values of biodiversity, as well as for the consequences on all affected individuals (including future generations), the use of biodiversity resources will be consistent with achieving the greatest net benefit to society over the long term.

The choice of policy instruments is complex and depends on specific institutional, economic and social needs. Policy options should be systematically analysed to minimise the costs of public administration, monitoring and enforcement, as well as the private costs of implementation. Since market-based instruments that change the prices of biodiversity-impacting products (*e.g.* wood products) are often cost-effective – and generally under-utilised – they should be promoted. However, it will still often be necessary to use non-market-based instruments (*e.g.* regulatory initiatives such as banning trade in endangered species) in the policy mix.

There is also a need to work at the international level to implement biodiversity management policies, for example in development co-operation or in policies to protect migratory species and aquatic resources. Moreover, biodiversity-related resources have non-use values to people everywhere that need to be reflected in local use decisions – without compromising local economic development. ■

How to encourage good biodiversity use?

Incentive measures are the basis of a market approach to biodiversity management. Such measures help reconcile differences between the value of biodiversity-related resources to individuals and the value of biodiversity to society as a whole. They increase the cost of activities that damage ecosystems important for biodiversity and reward biodiversity conservation and enhancement/restoration. Farmers who receive a government payment for maintaining biological diversity on their land, for example, will be more willing to use farm practices that sustain biodiversity values.

The idea of using incentives to achieve particular biodiversity objectives often requires a method for gauging the value of biodiversity. Unfortunately, reaching consensus on such method(s) is not always easy. Economic valuation can sometimes offer a solution if monetary measures of the impacts involved can be obtained or implied – such as the cost of travel, and related expenses, for visiting natural areas. However, it is more difficult to quantify the more aesthetic or cultural values involved, for example, in non-use of biodiversity, such as declaring a mountainside an ecological conservation area. For those non-use values, techniques to get people to "reveal" biodiversity's value to them are needed.

Although some debate continues about how far economic valuation techniques can be used to value non-marketed environmental resources such as landscapes, the acceptability and use of these techniques continue to grow. This is due mainly to theoretical advances in the methodologies underlying these techniques. ■

How to create markets for biodiversity?

Markets are created by removing barriers to trade, including the establishment and assignment of well-defined and stable property and/or user rights. Market creation is based on the premise that holders of these rights will maximise the value of their resources over time, thereby optimising biodiversity use, conservation, and restoration. Market creation therefore involves a broader approach than the simple use of market incentives.

Governments have two important roles to play in supporting markets for biodiversity-related resources. First, they need to establish the right framework conditions for private and public operators to supply biodiversity-related resources efficiently to users. They also need to apply the right policy instruments to ensure that public biodiversity-related goods and services are provided in the most efficient and effective manner.

Three issues need special attention. First, the absence of appropriate information can inhibit the development and implementation of market approaches to biodiversity conservation, use, and restoration. Information can be provided through such mechanisms as labelling, certification and technical capacity-building. Scientific knowledge is also important, so governments need to develop policies that establish the right conditions for new knowledge to emerge related to biodiversity conservation. Indicators to monitor biodiversity change will also be important, along with the active and early engagement of stakeholders in developing and implementing biodiversity management policies. Local community networks that identify and support local biodiversity objectives can make important contributions in this regard. Also, markets need to be periodically monitored to ensure they actually result in net benefits for society as a whole.

A number of specific markets have already developed around biodiversity-related activities. Examples include: organic agriculture; sustainable forestry; non-timber forest products; genetic resources; and eco-tourism. Two highly successful examples where the instruments themselves created the market are trading in access to fishing rights and transferable development rights to land. The emergence of private parks in many regions of the world also demonstrates that there is scope for capturing public values in private markets. For those parks, the private value of their uniqueness is high enough to support public biodiversity objectives. However, since the public value of the parks will typically be greater than the private values, economic incentives that capture some of these additional public values would improve the efficiency and effectiveness of biodiversity management. ■

Why is biosafety important?

Products of modern biotechnology might also affect biodiversity, and thus raise environmental safety issues. Genetically engineered crops (also known as transgenic crops) are no longer an idea of the future, but have well and truly arrived. Crops such as maize, soybean, rapeseed and cotton are being approved for commercial use in an increasing number of countries. The OECD has been active on such issues since the mid-1980s.

From 1996 to 2004, there was more than a 47-fold increase in the area grown with transgenic crops worldwide, reaching 81.0 million hectares. In 2004, there were 14 countries that grew 50,000 hectares or more: the US grew 59% of the world total, followed by Argentina (20%), Canada (6%), Brazil (6%), China (5%), Paraguay (2%), India (1%), and South Africa (1%). In addition, Uruguay, Australia, Romania, Mexico, Spain and the Philippines each had smaller scale cultivation of less than 1% of the total. Most of this cultivation was devoted to soybean (60%), maize (23%), cotton (11%), and rapeseed (6%). So far, most commercialisation has focused on these crops, and the genetic engineering has involved two traits: insect resistance and herbicide tolerance (Clive James, International Service for the Acquisition of Agri biotech [ISAAA], 2004).

The trend for an increase in the transgenic crop area seems set to continue, given the large range of genetically engineered crops in research and development

In all OECD countries, a notification or registration has to be made to obtain approval for the commercial use of a genetically engineered crop – whether for planting and growing or for use in human or animal foods. Such approval is always based on a safety assessment by national authorities, which in turn is based on scientific information regarding the crop, its specific trait, and the receiving environment. It is important for governments to ensure that good quality safety information is publicly available and, where possible, to adopt international approaches to risk and safety assessment that ensure the efficiency of the risk assessment process. ■

How to ensure biosafety?

One of the primary goals of the OECD's work on biosafety in the past decade has been to promote harmonisation among member countries of notifications and registrations of biotechnology products. Such harmonisation aims to ensure that the information used in risk/safety assessments, as well as the methods used to collect such information, are as similar as possible.

Box:

OECD WORK SUPPORTS INTERNATIONAL COMMITMENTS ON BIODIVERSITY AND BIOSAFETY

OECD work on biodiversity and biotechnology helps countries to work together to develop effective and economically efficient measures to comply with their international commitments in these areas.

Many of the priorities of OECD countries related to the economics of biodiversity and biosafety are expressed within the Convention on Biological Diversity (CBD) and its Biosafety Protocol. For this reason, much of the work of the OECD in both areas is channelled toward the CBD Secretariat, and a strong co-operative relationship between the two Organisations has evolved.

The result has been that many OECD outputs, such as those regarding incentive measures, have also found their way into decisions generated by the Conference of Parties to the CBD itself.

This can lead to countries recognising or even accepting information from one another's safety assessments, and it generates significant benefits. It increases mutual understanding among member countries of each other's risk assessments; it avoids duplication of effort; it saves on scarce resources; and it increases the efficiency of the risk/safety assessment process. This in turn improves safety, while reducing unnecessary barriers to trade.

For harmonisation to be possible among member countries, it is important that they have similar approaches to risk/safety assessment. Earlier OECD work on risk assessment demonstrated that such assessment should be based on the characteristics of the organism, the introduced trait, the environment into which the organism is introduced, the interaction between these, and the intended application. This work has formed the basis for environmental risk/safety assessment that is now globally accepted.

The similarity of approach was reinforced by the fact that most genetically engineered organisms are developed from organisms such as crop plants whose biology is well understood. This allows the risk assessor to draw on previous knowledge and experience with the introduction of plants and micro-organisms into the environment. The process takes account of a wide range of attributes including, for example, knowledge and experience with the plant, including its flowering/reproductive characteristics, ecological requirements, and past breeding experiences.

It is not just that national authorities use the same concepts and principles in risk assessment. OECD countries also share a remarkably high degree of similarity in the questions and issues addressed in risk/safety assessments as outlined in national laws, regulations, and guidance documents. Of course, national authorities also request some regulatory information which is specific to the local environment. But nevertheless, much of the information used in risk/safety assessment that relates to the biology of crop plants and micro-organisms is similar or virtually the same in all assessments involving the same organism.

So a major focus of the OECD's work on harmonisation is to compile the biological information common to the risk/safety assessment of a number of transgenic products, focusing on two specific categories: the biology of the host species or crop; and traits used in genetic modifications. The aim is to encourage information-sharing and prevent duplication of effort among countries by avoiding the need to address the same common issues in each application involving the same organism or trait.

The resulting Consensus Documents on biology and traits are not intended to be a substitute for a risk/safety assessment, because they address only the generic part of the information that member countries believe is relevant to risk/safety assessment. They are intended to be a "snapshot" of current information, for use during the regulatory assessment of products of biotechnology. Nevertheless, they make an important contribution to environmental risk/safety assessment and help prevent duplication of effort among countries.

An additional challenge is to transfer the knowledge obtained by countries with experience in risk/safety assessment to all those who need it, including non-OECD countries. This enables those involved in risk assessment

of transgenic products to easily obtain information developed from previous experiences. The OECD has established information exchange mechanisms and databases to support this process. One such mechanism, BioTrack Online, has been one of the best sources of information on regulatory developments in OECD countries, as well as field trials and approvals of commercial products. The OECD's Product Database (*www.oecd.org/biotrack/productdatabase*) contains information on the safety of genetically engineered crops in commercial use, as well as links to the Web sites of national authorities.

BioTrack Online is publicly available on the Internet, and in recent years has been linked with the Biosafety Clearing House (BCH) which is part of the Cartagena Biosafety Protocol to the UN Convention on Biological Diversity. The Cartagena Protocol is intended to lay the foundation for a global system for assessing and managing the impact of living modified organisms on biodiversity.

How to identify genetically engineered crops?

Confusion can arise when national authorities share information on the same genetically engineered crop if different names or descriptions are used for the same type of maize or cotton. To avoid this problem, the OECD has developed a system of "unique identifiers" for transgenic plants. A unique nine-digit letter and number code is given to each new transgenic plant that is approved for commercial use and becomes its "name" worldwide. So, for instance, a maize developed by Monsanto to be resistant to insect pests has a unique identifier of MON-ØØ810-6, while DD-Ø1951A-7 denotes a cotton developed by DuPont.

The guidance provides for the developers of a new transgenic product to generate the identifier. Once approved, national authorities can forward the unique identifier for inclusion in the OECD's database.

OECD countries are already using the system. The EU recently adopted it as its system for generating unique identifiers and it has been recognised as a mechanism for unique identification to be used within the context of the Cartagena Protocol. The OECD has been forwarding unique identifiers to the Biosafety Clearing House (*http://bch.biodiv.org/*) which is a key element of the Protocol's activities.

The system works well for genetically engineered crops and the OECD is now considering how the identifier tool can be extended beyond crops to micro-organisms and animals. Thanks to unique identifiers, all stakeholders, including the public, will be able to access solid and reliable information when making their judgements about safety.

For more information

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The OECD's biodiversity Web site is at: *www.oecd.org/env/biodiversity/*

BioTrack Online: *www.oecd.org/biotrack/*.

Biosafety Clearing House (CBD): *bch.biodiv.org/*.

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For further reading

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