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BIODIVERSITY: A MATTER OF EXTINCTION : The challenge of protecting the South's biological heritage

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Key Facts

- ✍ Since the beginning of the century about three-quarters of the world's crop plant varieties have been lost, and around 50,000 varieties disappear every year.
 - ✍ The world's population obtains about 90% of its calories from 20 crop species.
 - ✍ Tropical forests and woodlands contain at least 50% of all known plant and animal species.
 - ✍ Some 40% of the world's market economy is based on biological products and processes.
 - ✍ At least 7,000 medical compounds in Western pharmacies from aspirin to birth control pills are drawn from plants, mostly from Third World countries.
 - ✍ If Transnational Corporations (TNCs) paid developing countries and indigenous people royalties on the plant varieties and local knowledge the TNCs have used, royalties would amount to \$5.4 billion a year.
 - ✍ The release of genetically modified plants and micro-organisms threatens to become a serious environmental hazard if agreement is not reached on safety rules.
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Introduction

A peasant farmer in Mozambique scythes sticks of cassava which have survived drought. A mother of four children in Uzbekistan pops down a birth control pill. A blinded five-year-old in Sarajevo is given morphine. A cosmetic counter in a New York department store exudes fragrance. Whether they be life-savers or glam-makers, they all derive from the planet's rich biological diversity.

But the profusion of plants, animals and micro-organisms is disappearing at an alarming rate, threatening future food supplies and the making of new drugs. The UN Food and Agriculture Organisation warns that since the beginning of the century about 75% of the world's crop plant varieties have become extinct, and around 50,000 disappear every year.

And worse may be to come, as the rich countries exploit what is essentially a Southern resource; over 90% of plant species are located in Africa, Asia and Latin America. What amounts to a multibillion dollar market has been cornered by large corporations, mostly from the North, bent on patenting everything from traditional pest-resistant seeds to human cells. International patent law remains open to interpretation, but it is usually the local farmers and others in the South who fail to get protection.

The challenge for conservation is critical as commercial mono-crop agriculture spreads and habitats are lost due to anything from expanding cities to jungle tourist sites. Genebanks and protected areas are being set up, but much more is needed.

The 1992 Biodiversity Convention raises the possibility of protecting much of the world's biodiversity resources. But agreement has not been reached on including tropical forests or controlling the release of genetically modified organisms. Moreover, the new World Trade Organisation, which grew out of GATT, looks likely to undermine conservation priorities that have already been agreed.

1. BIODIVERSITY UNDER THREAT

Alarm grows over Earth's lost riches

The profusion of plants, animals and micro-organisms that make up the planet's rich biological diversity is disappearing at an alarming rate, threatening future food supplies and the making of new life-saving drugs.

According to the UN Food and Agriculture Organisation (FAO), since the beginning of the century about 75% of the world's crop plant varieties have become extinct, and around 50,000 varieties disappear every year. And 25% of animals which contribute about 30% to the total global value of food and agriculture with some 4,000 breeds worldwide are in danger of becoming extinct, warns the FAO.

Plant biodiversity is primarily a Southern resource. Over 90% of plant species are located in Africa, Asia and Latin America. The world's rich industrial nations are poor in biodiversity, and are dependent on exploiting the South's genetic riches.

Such exploitation is mainly carried out by the world's leading transnational corporations in drug and agriculture-related products. These giants have cornered the multibillion dollar biodiversity market, taking out patents on anything from products and processes derived from indigenous peoples' traditional knowledge to even their human cells.

The threat to all species has never been greater, believes Elizabeth Dowdeswell, Executive Director of the United Nations Environment Programme (UNEP). "There are indications that humanity is now on the verge of a new wave of massive extinctions" (1).

Variety is the basis of life

The range of species (and variation of individuals within species) of plants, animals and micro-organisms is astounding. About one and a half million species are known to mankind, yet many more are still to be identified.

Biodiversity is essential to the world's ability to maintain its current level of food supplies; and according to the FAO, a 60% increase in food output is necessary in the next 25 years. Crops need to be made more productive - able to yield more, to resist pests and disease, to tolerate difficult environments such as drought and heat, and to cope with climate changes. Such characteristics might be found in the range of varieties of plants, both cultivated and wild.

The research and development of new crops is carried out both by farmers, who select plants on their farms for useful characteristics, and by scientists who identify particular genes and insert them into plants or animals in what is called biotechnology or genetic engineering. Without a large pool of varieties, and the different genes which cause variations, this work cannot be done.

Biodiversity also provides the key ingredients for medicines. Around 80% of the world's population is at least partly dependent upon traditional medicine and medicinal plants to treat their ills (2). According to a meeting of Southern exporters in Tanzania in 1990, at least 7,000 medical compounds in Western pharmacies - from aspirin to birth control pills - are drawn from plants. The rosy periwinkle, for example, "a plant vital to childhood leukaemia treatment,

originated in, and has long been used by healers in Madagascar" (3). A Chinese herb, *Artemisia annua*, is a promising new weapon in the fight against malaria.

The Mediterranean, China, India, Myanmar, Southeast Asia, South-Central Asia, West Asia, Ethiopia, Middle America and South America are some of the chief centres of plant biodiversity. Tropical forests and coral reefs are usually very rich in biodiversity.

Much of the world's biodiversity is found in the territories of indigenous farming peoples who have traditionally taken care to use their land, soil, water and genetic resources sustainably. In the case of crop plants, "they maintained the many diverse varieties they used; this is still the case in many areas", points out Henk Hobbelink of Genetic Resources Action International (GRAIN). "Farmers often had very complex and sophisticated ways of producing food, involving multiple strategies which in many cases were very sustainable" (4).

Modern agriculture and bio-loss

For as long as humans have been herding and cultivating, they have sought to enrich their yield by selecting and improving locally occurring varieties of many species and adopting plants and animals from other regions. But today the demand to increase food production has led to dependence on a dangerously small number of crops. The world's population obtains about 90% of its calories from 20 crop species. Four of them – rice, maize, wheat and potato – account for 50% of total calorie intake.

Within these few crops, the number of varieties used is also shrinking. This is because the technology of large-scale commercial farming, such as mechanical harvesting and heavy use of chemical pesticides and fertilisers, demands that large areas are monocropped – planted with the same variety of the same crop. The introduction of high-yielding rice, wheat and maize has replaced thousands of local varieties of these crops by a few genetically uniform varieties.

Though the modern hybrid varieties have been successfully bred for particular desirable characteristics, such as high yield, or a short growing season, they may lack resistance to pests and diseases – and are highly vulnerable, precisely because of their lack of genetic variation. The Irish potato famine in the 19th century occurred because the few potato varieties planted in Ireland were vulnerable to the same blight. More recently, a fungal blight on maize in the United States and a virus on rice in Asia in the 1970s caused dramatic losses because of over-reliance on a few varieties.

The FAO was one of the chief supporters of the Green Revolution in the 1960s, but it now stresses that "intensified food production can be achieved by the sustainable use of a broader range of genetic material".

Traditional farming often makes direct use of biodiversity and is therefore not as vulnerable. A farmer who plants many different crops, or many varieties of one crop, reduces the vulnerability to disease and knows that some plants will survive whatever the weather conditions or pest attacks. Peruvian potato farmers, for example, may grow many different varieties in order to spread their risk. Such farmers continually experiment and improve their varieties, crossing traditional and new cultivars (cultivated varieties) as well as wild relatives, to produce stronger and more resilient crops.

Scientists, for their part, hunt through "libraries" of plant material and cross-breed, or introduce new genes into existing varieties (creating "transgenic" varieties, using biotechnology) to create

new varieties. If the wild relatives and old cultivars disappeared, all their useful characteristics would disappear with them.

Why biodiversity is fast disappearing

"The current decline in biodiversity is largely the result of human activity and represents a serious threat", says the Agenda 21 plan of action, agreed at the Earth Summit in 1992. The decline could be highest in the West Asia/North Africa region, one of the richest in biodiversity and also a region with one of the world's highest population growth rates (5).

The human activity causing the loss of biodiversity is many-sided. The spread of modern agriculture is a major culprit, for though it has led to gains in terms of higher output, it also means that local varieties have been discarded - along with the local farmers' knowledge of their particular characteristics and uses. Today about 60% of the land under rice, wheat and maize in developing countries is planted with high-yielding variety seed.

"The replacement of one crop with another, or a farmers' variety with a semi-dwarf variety, for example, can mean that the discarded genetic material is eaten. A hundred generations of farmer-bred material can disappear in a morning pot of porridge" (6).

The conversion of more and more land to intensive agriculture leads to loss of habitats; other causes of loss include pollution, the disappearance of tropical forest, the spread of urban areas, warfare, large dam construction, road building, and even tourism. The loss of traditional ways of life also contributes as it leads to the loss of knowledge of local plants and their medical and other uses.

The loss of animal breeds, says the FAO, is "mostly due to the highly specialised nature of modern livestock production...much of the genetic base of indigenous breeds is being eroded by 'grading up' with exotics". If only 5% of the breeds are being lost every year, it says, "the average loss could be about one breed a week" (7).

Over the last 40 years, overfishing and the use of intensive modern technology has had a devastating effect on fish biodiversity. Commercial fleets have driven some fish species close to extinction, destroying coral reefs and seagrass beds. (See Panos Media Briefing No 15, 1995).

Behind the visible causes of biodiversity loss lie more fundamental causes, "many of which are located in the workings of the economic system at the local, national, international and global level" (8). Economic systems- and policy-makers looking to short-term gains - do not usually give biodiversity its true value. Wild plants could be worth millions of dollars as the breeding material for new crops, yet in the wild they appear to be of low value. So a field may be built on for housing and the value of biodiversity in that field not considered.

Internationally, many developing countries are under severe economic pressure to turn fields and forests into monocropped estates of crops, mainly for export. When higher export earnings are possible, the value of the biodiversity being lost may be forgotten. Conservation brings no immediate rewards. Biodiversity, and the habitats and cultures in which it exists, does not have a value in the market.

The challenge is to give biodiversity a market value, or agree some kind of compensation mechanism, so that people and governments have an interest in conserving it, and can enjoy a just share of its benefits. The total contribution of wild genetic resources to the US economy has

been estimated at \$66 billion (9). Little, if any, of this goes back to the peoples who have been safeguarding and sustainably using those wild resources for centuries.

2. TRANSNATIONALS MONOPOLISE BIO-PROFITS

The bio money-spinner

Marketing the commercial products of biodiversity- scientifically-bred seeds, medicines and cosmetics - is a transnational business. New technology that can screen plants for specific genes and genetic engineering can speed up the process of identifying new materials and developing new products, thus potentially making the business extremely profitable, particularly if extended to medicinal plants. In 1990 the annual world market value of medicinal plants alone was estimated at \$43 billion (10).

This multimillion dollar business is increasingly concentrated in the hands of a small number of companies, who wield enormous power. According to a Greenpeace report, six chemical companies dominate research and development in plant genetic engineering - Monsanto, Enimont, Du Pont, Sandoz, Zeneca and Ciba Geigy. Together with Shell, WR Grace and Cargill - the world's largest international grain and oilseed trader - these companies also dominate the international seed business.

Intellectual Property Rights

The profits these companies make from selling a medicine or seed variety they have developed are only guaranteed if they have exclusive rights over the biological ingredients (including genes), the biotechnological process, and even the plants and their descendants.

The concept of such rights - Intellectual Property Rights (IPRs) - is generally recognised in international law. This is based on the argument that unless the fruits of research and innovation are protected, the innovation will not take place. Profits are needed to cover the high costs of researching, developing and testing new substances and plant varieties.

IPRs are protected by national laws, which vary from country to country, and reinforced by international agreements. Protection is increasing and the subject is highly controversial due to a number of factors: the expansion of global markets, new technology, and the recent adoption by the World Trade Organisation (previously known as GATT) of rules regarding TRIPS - Trade-Related Intellectual Property Rights. All these factors potentially increase the scale and power of TNCs.

Breeding and protecting profits

IPRs are protected through patent and Plant Breeders' Rights (PBR) legislation. PBRs are property rights granted to crop breeders (mostly Northern companies) to give them exclusive rights over plant varieties they develop. Rules governing PBRs were laid down in the 1978 International Convention for the Protection of New Varieties of Plants (UPOV). The UPOV system was reformed in 1991 giving a boost to breeders' rights but at the possible expense of farmers' rights, a change that "reflects to a large extent the wishes of the large research and development-based companies working in modern biotechnology" (11). Neither version of the UPOV is at all concerned with the conservation of biodiversity.

Under the provisions of UPOV 1991, farmers' rights to save seed from one harvest to plant for the next one are threatened. "The rights to replant protected cultivars are removed unless individual governments reinstate them...governments are expected to continue to respect the breeders' interests as far as possible" (12).

The increasing scope of patents

Another set of protective laws is patents. These also tend to favour Northern companies - firstly because the cost and difficulty of applying for patent protection is generally beyond the resources of an individual farmer, and secondly because to qualify for a patent (as with PBR) a variety has to be uniform and unvarying, which is seldom the case with farmer-developed varieties.

Patent law varies from country to country but the tendency of agreements like WTO-TRIPS is towards standardisation. The system of patents was originally developed to encourage the development of new industrial processes and products. But the interpretation of patent law does not seem to have kept up with technological developments and there is no universal agreement on what can be patented and what cannot. The US, for example, was the first to allow patenting of plants, which is still not allowed in Indian law.

Recent patents appear to give transnationals the right to monopolise whole types of crop, such as transgenic cottons. In 1992, for example, Agracetus Inc (a subsidiary of WR Grace) received a European patent on all transgenic soyabean varieties.

IPR protection: for and against

Supporters of the system of protecting IPRs in biological materials argue that the world's emerging biotechnology industry "provides many of the tools needed for environmentally sustainable growth". This is the view of Gus Speth, former director of the World Resources Institute: it is not only corporate interests but also some major NGOs which are in favour of the system. "Patent protection will serve to stimulate the development of competing and diverse genetic solutions", believes John Duesing of Ciba Geigy (13).

Opponents argue on the contrary that such protection will encourage even further spread of modern agriculture with its genetic uniformity, and the consequent loss of biodiversity materials and skills. One of India's leading environmentalists, Vandana Shiva, argues that the commercial drive to maximise profits "is the primary cause of species extinction" and can never be compatible with the aim of conservation. Biotechnologies are technologies for breeding uniformity in plants and animals, Shiva argues.

Other grounds for unease with the increasing monopolisation of biology-based products by TNCs are that it is incompatible with justice, development and economic health.

Seeds that have been developed and improved by farmers over generations have been used by TNCs to make further developments. But whereas there was no question of farmers taking out patents on their improvements, the TNCs have sought to patent their seeds as original inventions.

Similarly, seeds of neem trees from farmers' fields in India are being used by WR Grace and PJ Margo Co to produce neem-based bio-pesticides. WR Grace has taken out US patents on the pesticides. The two firms estimate that the global market for the pesticide could reach \$50 million per annum by the year 2000. Local farmers are unlikely to see any benefit in royalties from a tree they have cultivated and improved for centuries (14).

WR Grace say that their patent does not apply in India and will not prevent Indian farmers from continuing their traditional uses of neem. However, this does not allay the fears of many Southern farmers that in the future they will have to pay the companies high prices for patented seeds or products which they, the farmers, have helped to develop down the centuries. Their worry is that powerful TNCs will jeopardise their independence and eventually push them off their land.

The scale of TNCs' operations in itself carries risks. The Agracetus soyabean patent is "tantamount to an exclusive monopoly of the world's \$27 billion soyabean crop...a clear threat to world food security", says the Canada-based NGO, Rural Advancement Foundation International (RAFI) which is challenging patents of this kind. Agracetus is "working towards legal monopoly and exclusive control of all genetically engineered varieties of soyabeans, cotton and rice", alleges RAFI. "If Agracetus achieves this, the impact...will be huge, since all biotechnology researchers working on these crops will be required to get permission from and pay royalties to Agracetus and WR Grace" (15).

There is widespread opposition to the very concept of patenting genes ("patenting life"). "Patenting genes makes biology stand on its head", says Vandana Shiva. "Complex organisms - which have evolved over millennia in nature and through the contributions of Third World peasants, tribals and healers - are reduced to their parts, and treated as mere inputs in genetic engineering.... In the area of life forms, the granting of industrial patents is full of risks and controversies" (16).

WTO versus biodiversity?

The Uruguay Round of GATT includes a section on Trade-Related Intellectual Property Rights (TRIPS). Many farmers and NGOs fear that its whole purpose is to strengthen the power of TNCs at the expense of people in the South. It does not distinguish between industrial and biological innovation, and does not recognise the value of genetic raw material for biological innovation. It requires countries to legislate for the protection of plant varieties, either by joining one of the existing UPOV conventions, or by passing their own legislation. Most companies would favour universal adoption of existing types of protection - Northern ones because it is in their interest, Southern ones sometimes because they are under pressure to do so from their Northern business partners. But many farmers and NGOs all round the world are opposing such a move.

India is one country where feelings are running high. India has not so far allowed patents to be taken out on plants. The Indian Patents Act of 1970 makes clear that inventions relating to agricultural and horticultural processes are not patentable, and parliament recently rejected an amendment to it on the grounds that apart from the unacceptable economic cost, it would end farmers' traditional ability to innovate and adapt their own varieties, wiping out centuries of biodiversity material and skill.

In July 1993, farmers in India's southern state of Karnataka burnt down an administrative building belonging to Cargill because they were fearful that the TRIPS provision could make it illegal for them to replant seeds that their ancestors have used for centuries without paying royalties to patent holders. "The installation of a patents regime in genes, plants and farm inputs, when none exists, is to gain control of a nation covertly," said a farmer.

And governments still have the right, under the TRIPS agreement, to develop their own plant protection legislation. This is a vitally important opportunity for them to try to devise new laws which will give the required protection to commercial varieties but at the same time protect biodiversity and the interests of farmers and indigenous people.

Access to genetic resources

Indigenous peoples' knowledge of genetic resources has clearly contributed enormously to the people and companies of the North. A RAFI report prepared for the United Nations Development Programme found that if agriculture in the North paid developing countries and indigenous people royalties on the plant varieties and local knowledge it has used, then the royalties would amount to \$5.4 billion a year. But until now, researchers have not been required to pay anything.

The Biodiversity Convention, however, intends to put an end to researchers' free access to biodiversity. It proposes a system of agreements between researchers and the governments of the areas in which the biodiversity is found, by which the government controls and the researchers pay for their hunt for new biological materials (or "bioprospecting").

One access agreement, widely hailed as a model for the future, is the \$1.1 million, two-year deal drawn up in 1991 between Costa Rica and Merck, one of the world's largest pharmaceutical companies. Under the deal, a non-profit Costa Rican NGO, INBio, agreed to provide Merck with 10,000 biosamples from the country's nature parks, which the company will scan for potential new medical substances. If any profitable new drugs are developed from this arrangement, Merck will pay Costa Rica an undisclosed percentage of the royalties. Some observers suggest that if 10 successful drugs are developed, Costa Rica could earn more in royalties than it does from its coffee or banana exports.

But the deal has also been criticised. For example, some members of the Crucible Group, an international cross-section of agricultural experts, industry representatives and NGOs, dismiss the INBio agreement as "cheap labour" and a "rip-off of the South's biological treasure" (17). Apart from the question of whether the financial arrangements are fair, there are other difficult questions: for instance, the agreement seems to give Costa Rica the right to profit from plant materials which may equally well be found in other neighbouring countries; it is not clear that benefit will go to the indigenous peoples who live in the area covered by the agreement; and it does nothing towards limiting the monopoly position of Merck as regards marketing any drugs which may be developed from the agreement.

Biopiracy robs developing countries

Although the 1992 Biodiversity Convention established countries' right to control and profit from access to their genetic resources, "biopiracy" is rife. RAFI recently documented 55 current instances of such piracy - where companies (sometimes via academic research departments, whom they sponsor) are scrambling to grasp new genetic materials, without any attempt to compensate or seek permission from the holders of the materials - whose own traditional knowledge may be exploited to speed up the research.

"Recent examples from Gabon, Thailand, Ecuador and Peru illustrate biopiracy activities on a grand scale," says RAFI. In one of these cases, the University of Wisconsin has received two US patents for a berry that grows in Gabon, which will be used to make a sweetener. Although corporate interest is said to be strong, Gabon's contribution will go uncompensated.

In the South Pacific, pressure is growing to mount a legal battle against moves by researchers in the West to patent blood products from native peoples. Reports say two NGOs are advising the governments of the Solomon Islands and Papua New Guinea on how to draw up a test case. They are seeking a ruling from the International Court of Justice on whether the US government and researchers can claim patent rights to cell lines from blood taken from local tribal people.

Earlier this year at a conference in the region, opponents of bio-prospecting called for a moratorium on bio-prospecting in the Pacific. It also called for a treaty to declare the Pacific to be a "life-forms patent"-free zone. Others are looking to the Biodiversity Convention for protection. But is it enough?

3. THE BIODIVERSITY CONVENTION: WHAT ACHIEVEMENTS?

"The most important initiative"

The 1992 Convention on Biological Diversity has been called "the most important initiative ever taken to set the world on a course towards environmentally sustainable development" (18). Fine words. But to be effective, the Convention needs to be translated into action.

Its three key objectives are to ensure:

- ✍ the conservation of biological diversity
- ✍ the sustainable use of this diversity
- ✍ the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.

While the Convention has made some progress, many aspects of its implementation are still to be worked out. The Second Conference of the Parties (COP) in Indonesia this November should be an important step in addressing some key issues, although several important questions were not put on the formal agenda. The meeting does, however, provide governments with a unique opportunity to inject urgency into vital issues which affect the world's future.

From concern to Convention

Concern about declining biodiversity came to a head in the late 1980s; awareness was growing that the protection of biodiversity provided under existing conventions was inadequate, and failed to address the global crisis. Environmental groups in the North, concerned about conservation, and groups in the South, demanding equity, were campaigning for action. In mid-1990 an expert group concluded that a global treaty on biological diversity was urgently needed.

In 1991 an Intergovernmental Negotiating Committee began formal negotiations on a Convention on Biological Diversity (CBD), and in May 1992, agreed the "Final Act", which contains the Convention's text. This was signed at the Earth Summit a month later by 156 countries. Only the United States (Republican) government said it would not sign, a decision that was blasted in Rio by US (Democratic) Senator Al Gore, who became Vice-President later that year. The US signed up in 1993 but has yet to ratify.

The Convention entered into force on 29 December 1993 after being ratified by 30 countries. Never has any international Convention on a development and environmental issue come into force so rapidly. The CBD Secretariat claimed "this is indicative of the political will of the international community to spare no effort to implement without delay the commitments assumed under the terms of the Convention" (19).

In late 1994, the first COP was held to deal with issues that arose out the Convention. But it considered mostly administrative and procedural rather than substantive issues.

The framework for conservation

The Convention is the first time that biodiversity had been comprehensively addressed and recognised as the concern and responsibility of the international community. It opens the possibility for developing countries to benefit directly from the biodiversity within their borders. However, it is a "framework Convention" - an agreed and legally binding set of principles and broad goals, but not a detailed set of rules for realising those goals.

The Convention requires each signatory country to prepare a national plan for the conservation and sustainable use of biological resources, and "establish systems of protected areas, manage biological resources, rehabilitate degraded ecosystems...protect threatened species", and to integrate the national plans into their overall policies.

One of the most important new elements in the Convention is the acceptance that biological resources, like mineral resources such as copper and tin, are the property of the state in which they are found, rather than a common heritage of humanity, freely available to all. "States have sovereign rights over their own biological resources", it says. Countries now have more incentive to conserve their genetic resources.

Although they agreed to "facilitate access" to their genetic resources, governments of developing countries can now control, and charge for, the access of outside interests, such as TNCs, to resources that lie within their borders. The Convention envisages a system of contracts between resource-rich countries and the (mostly Northern) "bioprospectors" who wish to find and use new biological material but will from now on have to pay for it. A country can negotiate rent or royalties if a plant originating in its territory is used in the development of a commercial crop variety. But this is a new field, and there are few guidelines.

For some countries it could mean a sizeable increase in foreign earnings. RAFI has compiled a list of more than 100 instances where genetic resources and/or local knowledge in the South have made - or are making - a contribution to agriculture, food processing, or pharmaceutical development in the North. Farmer-derived Ethiopian barley, for example, is said to be worth \$150 million in the United States each year. Pau D'Arco, a medicinal plant from Latin America, which has long been used to combat malaria and cancers, has a market value in the North of \$200 million a year.

The Convention also contains the recognition that "the fundamental requirement" for the conservation of biological diversity is the in situ (on-site) conservation of ecosystems and natural habitats. It also notes that "it is vital to anticipate, prevent and attack the causes of significant reduction or loss of biological diversity at source". (This is potentially a radical challenge, but its implications are not in fact spelled out in the Convention.)

The Convention recognises the role of indigenous communities in conserving and understanding biodiversity, and their right to share in profits made from their knowledge and from material found in their areas. An effective national conservation plan should be based on the participation of all interested parties - including both indigenous communities and companies.

Although over 120 countries have now ratified the Convention, few national plans have been finalised. However, many governments are now moving more rapidly to prepare and implement their plans. But some thorny issues remain to be worked out at the international level if the Convention is to become an instrument for shaping a sustainable future, and not just empty words.

The need for more action

One fundamental unresolved area is the relationship between the Biodiversity Convention and the World Trade Organisation (WTO) which has replaced the GATT, following the Uruguay Round of trade negotiations. The Uruguay Round agreement appears to clash with the objectives of the Convention. In a situation of conflicting rules or priorities, it is likely that the WTO rules would prevail over the Biodiversity Convention rules - not least because the WTO rules can be reinforced by trade sanctions, whereas the Convention's cannot.

The Committee on Trade and Environment set up during the Uruguay Round negotiations has a two-year mandate to evaluate areas of conflict between trade and environmental concerns. Some NGOs (such as Friends of the Earth UK) have serious doubts about the environmental credentials and lack of transparency of this Committee and are calling for the establishment of an intergovernmental panel with clear powers and a commitment to promoting environmentally and socially sound development.

A general criticism of the Convention, made by the Crucible Group, is that "the unique role of agricultural biodiversity is not well understood" (20).

In order to strengthen the Convention's impact on agriculture, a "protocol for Biodiversity for Food and Agriculture" has been proposed. The FAO is promoting a major gathering (in June 1996) that will consider a global plan of action on plant genetic resources. This could provide the basis of a protocol.

Tropical forests excluded

Tropical forests cover about 13% of the Earth's surface and contain at least 50% of all known plant and animal species, but according to the FAO they are being destroyed at a rate of at least 15.4 million hectares a year. Yet tropical forests are excluded from the Convention.

Some countries want only a loose relationship between forests and the Biodiversity Convention. The Malaysian government especially is fiercely protective of its right to use the country's forests as it wishes, and not to be told how to manage them - a stance that has brought it into conflict with the country's environmental NGOs as well as with the international community.

A group of 29 NGOs, attending the first COP, said the Convention has the potential to address the loss of forests and forest biodiversity "by taking a holistic approach to the underlying cause of forest loss" (21). The NGOs point out that the Convention makes specific references to issues such as the sustainable use of biological resources, and that the forests contain many of those resources. The Convention therefore provides an "important framework to guide governments on the conservation and sustainable use of forests", argue the NGOs.

In their national plans, governments could extend the principles of the Convention to cover tropical forests.

Bio-pollution set to spread

The release of genetically modified plants and micro-organisms could become a new and serious environmental hazard. "A new form of biological pollution threatens the environment", says Greenpeace (22).

A number of concerned scientists have called for a temporary ban on the commercialisation of genetically modified organisms (GMOs) to allow adequate time to develop better scientific understanding of their behaviour in the environment and their impact on other organisms, and to develop systems for better monitoring and control of safety risks. GMOs, once released, cannot be recalled.

Some of the risks have been identified by Greenpeace:

- ✍ The modified crops may become pests in farms or in the wild because of their improved ability to survive.
- ✍ The crops may act as a channel for new foreign genes to move into wild plants.
- ✍ Crops engineered to produce toxic substances such as drugs and pesticides may be dangerous for other organisms.
- ✍ Crops engineered to tolerate harmful pesticides may increase the use of these pesticides, further polluting water and poisoning wild plant species.

Most Northern countries have legislation controlling the release of GMOs but the vast majority of developing countries have no such legislation. Greenpeace reports that "unregulated GMO field tests or development activities" are known to have occurred in 13 developing countries - Belize, Burkina Faso, Cote d'Ivoire, Dominican Republic, Guatemala, Mali, Nigeria, Pakistan, Peru, Puerto Rico, South Africa, Syria and Zaire (23).

Because of the risks involved, some scientists and NGOs are calling on governments party to the Biodiversity Convention to agree a protocol for "biosafety". This was discussed at the November 1994 COP but industrialised countries lacked enthusiasm. The main opponent, the United States, has not yet ratified the Convention but has exercised its influence to block a decision.

Funds - the predictable shortfall

There is some confusion about funding. The need for funding from industrialised to developing countries has been accepted as important if the aims of the Biodiversity Convention are to be fulfilled, and if national plans are to be implemented successfully. But it is not clear how this should happen. According to the Convention, funds to enable developing countries to meet their obligations should be additional to existing development assistance - but at the same time it endorses the refusal of industrialised countries to accept open-ended, automatic financial commitments.

Funding at present comes mainly through the World Bank's Global Environment Fund. The COP will periodically determine the amount of financial resources needed. The critical question, however, is whether industrialised countries will provide them.

4. THE CHALLENGE OF CONSERVATION

Genebanks check species loss

Many plant genetic resources are in situ (on-site) in the wild or on the farm. Others are kept ex situ (off-site) outside their natural habitat, in a genebank, for example. Both have a role to play in the conservation of biodiversity.

Collections of plant material gathered from all over the world are held in genebanks. Significant among these are 12 genebanks in international agricultural centres funded by the Consultative Group on International Agricultural Research (CGIAR). These 12 centres together hold over half a million samples, accounting for some 35% of all the unique samples stored in the world. They include over 100,000 samples at the International Centre for Agricultural Research in the Dry Areas in Syria, 80,000 rice samples at the International Rice Research Institute in the Philippines, and 35,000 samples at the International Maize and Wheat Improvement Centre in Mexico.

In late 1994 an agreement was reached by which the 12 CGIAR genebanks come under the auspices of the FAO, which will hold the collections in trust for the benefit of the international community and not allow any exclusive use. Geoffrey Hawtin, director of the International Plant Genetic Resources Institute in Rome, said that the agreement "resolves the status of the collections held in the centres' genebanks; it will mean they continue to be freely available for breeding and use" (24).

But even if genebanks continually build up their holdings by collecting new plants, they are not a complete solution to saving biodiversity:

- ✍ It is difficult to ensure proper storage _ lots of banks lose a lot of their material.
- ✍ Poor cataloguing _ scientists often do not know what the banks contain or where material came from.
- ✍ Genebanks may suffer war or natural disasters, or loss of government support, or bad management.

There is so much we don't know about the species in the world that scientists are never likely to capture and store all of them.

Protection in the wild

The Biodiversity Convention recognises the greater importance of conservation in situ. Some countries have protected areas for plants and animals. These may be wild areas such as forests, which are out-of-bounds, or areas where human activity is strictly limited. But policing such areas can be difficult.

Biodiversity can also be protected if fields, forests, fisheries and wetlands are used in sustainable ways that do not pollute, degrade or upset the ecology. Many farmers are doing this. Across Africa, Asia and Latin America, farmers are maintaining the diversity of their plants, conducting field trials, testing new seeds and developing their own improved varieties sometimes without links with any outside agency, sometimes linked up to the formal sector.

These farmers have both the technical competence and knowledge needed to conserve plant genetic resources and often something to teach government agricultural staff. "From cassava cultivators in the Dominican Republic to potato growers in the Andes and rice farmers in the Philippines, formal sector researchers are now looking for and finding genuine inventiveness", says the Crucible Group (25).

Independent of foreign "experts", the Mende farmers of Sierra Leone conduct field trials, test new seeds in different soils, and compare results. West Africa's Azande farmers increase both the number and complexity of their crop experiments following poor harvests. Rural societies throughout the developing world are maintaining agricultural biodiversity because they know it is essential to their survival.

The importance of this indigenous work has been increasingly recognised following the Earth Summit in 1992. In many communities it is women farmers who are prominent in the research. Sudanese farmer-breeders are usually women. Kayapo women in the Brazilian Amazon not only breed new crop varieties but preserve representative samples in hillside genebanks. Tanimuka and Yukuma women in the Colombian Amazon have bred and preserved numerous clones of peach palm (26).

The Ethiopian lesson

Ethiopian farmers, many of them women, play a central role in the conservation and sustainable use of genetic resources. Ethiopia, a rich centre of food-crop diversity, also has an exemplary plant genetic resources strategy. The "Seeds for Survival" programme links on-farm conservation and crop improvement by rural communities with government back-up.

The Plant Genetic Resources Centre in Ethiopia which assists the programme has benefited from the "knowledge and skills of farming families...especially in the collection and identification of useful plant material," says ex-director Dr Melaku Worede (27). The programme assists farmers in their tasks of selecting the best seeds to plant. "The farmers make their selections based on their judgement and long-established skills," says Dr Worede.

In many small-scale Ethiopian farms, cultivated crops intercross with their wild relatives which are growing in the same field or nearby, resulting in plants with new characteristics. After the 1984/5 famine in Tigray, survivors decided to revive seed selection skills to prevent future famines. They identified the best traditional seeds and organised community seed banks.

"The Ethiopian approach to on-farm conservation merits consideration by other countries", believes the Crucible Group (28). It is when farmers are tempted, perhaps by government agencies, with the promise of higher yields if they plant uniform varieties, that plant diversity on their farms can decline and conservation skills fall into disuse.

Farmers' rights to rewards

Farmers are more likely to maintain their traditional methods of using and conserving biodiversity if they are financially rewarded. IPR protection for farmers - Farmers' Rights - was first espoused at an FAO meeting in 1985, as a counter-proposition to Plant Breeders' Rights. The concept of Farmers' Rights appears in the Earth Summit document, Agenda 21; and was reiterated in the lead-up to the Biodiversity Convention.

Farmers' Rights have been defined as "rights arising from past, present and future contributions of farmers in conserving, improving and making available plant genetic resources". The concept recognises that farmers make important contributions to the conservation and sustainable use of genetic resources and should be rewarded accordingly.

Supporters of Farmers' Rights contend that it is "immoral to allow Plant Breeders' Rights over commercial crop varieties unless the international community also accepts Farmers' Rights over the crop varieties they have bred for their own fields" (29).

Ways of protecting farmers' knowledge so that they can profit from their inventions are only now being explored. This is a new area for national and international legislation and needs to be clarified in the Biodiversity Convention.

Rewarding indigenous knowledge

Indigenous peoples should be recognised and rewarded for their knowledge of plants and other organisms and their uses - both because they have acted as guardians of biodiversity for generations and because their knowledge is often used by Northern researchers, whose companies profit. Environmentalists argue that indigenous peoples should also profit, for reasons of justice and also for practical reasons. Financial incentives would encourage local and indigenous people to continue to conserve and sustainably use the biodiversity resources in their environments.

In India, farmers are demanding international legal recognition of collective intellectual property rights to biological diversity and people's agricultural and medicinal knowledge of plant properties. This would reward communities for their traditional knowledge and help to conserve genetic diversity.

Whether such demands are met or not, the next 12 months are critical for the conservation of biological diversity. The Biodiversity Convention is in place but the decline of biodiversity goes on. The challenge facing governments is to act without delay to put the Convention's ideas into practice in their own country, while the international community should give every support to that process.

Glossary

COP: Conference of the Parties to the Convention on Biological Diversity

Genebank: a store of genetically diverse biological material; seeds may be kept in refrigerated storage, or grown in special fields

Ex situ: off-site. Genetic resources conserved outside their natural habitat, for example, in a genebank

In situ: on-site. Genetic resources conserved in the wild or on the farm

GATT: General Agreement on Trade and Tariffs. Superseded by WTO (World Trade Organisation)

GMOs: Genetically modified organisms

IPR: Intellectual Property Rights; intended to secure ownership over all those things which emanate from the exercise of the human brain

Patent: a legal right which gives the holder exclusive rights to an invention for up to 20 years

PBRs: Plant Breeders' Rights; property rights granted to crop breeders to give them exclusive rights over plant varieties they develop

TRIPS: Trade-Related Intellectual Property Rights

UPOV: International Convention for the Protection of New Varieties of Plants.

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