

Biodiversity Conservation: A Review of Some Socio-economic and Ecological Issues

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Two British authors (Hambler and Speight 1995^k) have recently advanced the provocative thesis that science should replace 'tradition' in wildlife conservation. The implication in this is that science somehow is able to provide an objective account of what biodiversity is and how it should best be managed. Against this view, a consensus among social scientists would probably be that 'biodiversity' is a social or cultural construct, as evidenced by its relatively recent emergence as a topic for international negotiation, and the relative ease with which specific versions of the concept can be associated with identifiable economic or political interests. There is no doubt that this can be done, and that it is very important in understanding the conflicts around, and obstacles to biodiversity conservation that these links between identifiable, more-or-less persistent constellations of interests and different ways of conceptualising biodiversity and priorities in its conservation are explored and analysed. At the same time, this should not involve any concession to the currently fashionable view in some social science disciplines that the socially constructed character of a concept implies that its referent is, likewise 'socially constructed'. Of course, the concept of social construction itself stands in need of analysis, but my main point here is to insist on the possibility and the necessity of an approach which recognises both human social and cultural practices and their non-human conditions, means and contexts as real, interdependent and interacting causal orders. Though concepts of biodiversity are, indeed, socially constructed, they make reference to immensely complex realities which exist independently of our thinking about them, have effects on us, and are affected by us in ways which are sometimes recognised,

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sometimes not, sometimes intended, wanted, or foreseen, sometimes not. To approach the question of biodiversity conservation is to require an unaccustomed collaboration between the disciplines of the 'natural' and 'social' sciences, but to do so in ways which will call for a partial 'deconstruction' of those traditionally defined disciplinary matrices and of their boundaries.

In what follows, I will try to unravel a little of the complexity in the rival definitions of what biodiversity is. I will then offer some suggestions about how and why the conservation of biodiversity has, within the last decade, come to be established as a major issue for international negotiation. Finally, I will try to use some of these suggestions to explore the strategic implications and inner tensions of current international biodiversity conservation, most especially through an analysis of the terms of the global biodiversity treaty.

Conventionally, biodiversity is held to refer to three broad levels of biological organisation: genes, species, and ecosystems. So, is conservation about maintaining diversity in global gene-pools, about maintaining existing numbers of species, or about the protection of threatened habitats? Even at this elementary level, the difficulties can be seen. There is no uncontroversial way of classifying ecosystems, and the criteria for distinguishing the species-level in taxonomy differ as between different groups of organisms. Measuring biodiversity in terms of the number of species in a given ecosystem will produce different evaluations from doing so in terms of the number and complexity of ecological interactions between populations, or in terms of diversity of higher-level taxonomic groupings represented. Also, since species differ considerably in the amount of intraspecific variation within and across their various sub-populations, there is no direct correspondence between biodiversity measured in terms of gene-pools and in terms of species. In addition to these conceptual and methodological issues, there is the more directly practical problem that in global terms only a small fraction of living forms have been identified and scientifically described - let alone studied in terms of their life-histories and ecological interactions. So far only some 1.4 million species have been scientifically named, but estimates of the full complement of the earth's species vary from 5 to 100 million. The great majority of these species live in the tropical moist forests - perhaps 90% of the world's species in some 7% of the land-surface. But the evidence suggests that biological knowledge is also at its least complete in these forests - at present, probably less than 5% of species known to science. Some of the most species-prolific groups such as micro-organisms, fungi, and many orders of insects and other invertebrates remain largely unknown. Many of these species of the tropical forests exist in small, highly localised populations, and so are especially vulnerable to extinction through perturbation or destruction of habitats.

Concepts of biodiversity may also be distinguished along another axis - the relationship between life-forms and human action. Here it is conventional to distinguish 'wild' from 'domesticated' biodiversity. Again, however there are some difficulties. Most of the earth's surface has been directly or indirectly affected by human activity in hunting and gathering, forestry, horticulture, pastoralism, agriculture and settlement over many thousands of years. So, over this period, the

environments in which 'wild' species have continued to evolve have been ones in which human activities and their effects will have contributed to the selective pressures at work. On the other side of the distinction, it is important to keep in mind that all domesticated species of animals and plants are derived from wild originals, and that for many species of crop plants, continued exchanges of domesticated with wild genetic materials is important for preserving and developing such characteristics as disease resistance and adaptability to local environments. In discussions of biodiversity among domesticated organisms, the emphasis tends to be on intra-specific variability in a relatively small number of species which are economically important, or required for human subsistence.

The current phase of global concern over biodiversity loss began in the mid 1980s. Of course, there is a long history of sporadic and often quite localised alarm about habitat destruction and the extinction of species. In the UK for example, there was a massive increase in membership of wildlife conservation organisations such as the Wildlife Trusts and Royal Society for the Protection of Birds from the 1960s onwards - coinciding with equally massive grant-aided agricultural intensification in the British countryside. One of the classic texts of contemporary environmentalism - Rachel Carson's Silent Spring appeared as early as 1962, whilst scientific concern focussed at species loss on the global scale was being expressed in the 1970s ('Scientists talk of the Need for Conservation...' Science 184:646-7 1974; N. Myers 1974 The Sinking Ark Oxford etc. Pergamon). However, the high international media profile, the presence of the issue high on the agenda of the diplomatic efforts of nation states and transnational institutions, and the development of a specialist terminology (including the term 'biodiversity' itself) is more recent. This more recent set of discourses and practices around the concept of biodiversity should, I will be suggesting, be understood as an ambiguous and unstable convergence of problems, priorities, aims and strategies articulated by a diverse array of national, transnational and regional social and economic interests.

This 'convergence', assembled by the mid to late 1980s, brought together a number of quite heterogeneous interests and topics of concern. One such source was academic biology itself. Field biologists and ecologists were well placed to perceive the scale of species-loss through habitat destruction, pesticide use, building development, environmental pollution and other forces which were left untouched by most forms of legislation which then addressed only such activities as collecting or hunting rare or endangered species. These scientific 'whistle blowers' confirmed, gave legitimacy to, and extended the already significant levels of public concern about extinctions and habitat loss, especially in the industrialised capitalist countries of the west. They provided well-grounded estimates of biodiversity loss at rates varying from 50 to 100 species per day, with the consequences of tropical deforestation being highlighted as of the most urgent concern. Academic biologists, as well as being well-placed to appreciate the problem of biodiversity loss, and to give voice to socially authoritative concern about it, also could be said to have a special interest in the issue: biodiversity is, after all, the subject matter of their discipline - their professional *raison d'être*. However, field biologists were not alone in their concern about habitat destruction and extinction of species. The efforts of scientists in globalising this concern were complemented by the emergence of international social movement organisations such as WWF, FOE and Greenpeace which continued the work of local and national conservation groups at international

and global levels. These organisations included in their staffing and policy development considerable input from what might be called 'dissident', but what I would prefer to call 'socially responsible' scientists. By a combination of providing high quality visual material for an international media audience, eye-catching forms of direct action, and the mobilisation of local forms of protest action, consumer boycotts and the like, these and related organisations have succeeded in constituting a mass international popular base for wildlife conservation. Popularisation has generally been assumed to depend on highlighting the plight of specific organisms - mainly large mammals, birds of prey, and, in a few instances reptiles and 'popular' groups of insects such as butterflies. However there has been a growing tendency to represent the threats to these selected species in terms of habitat destruction which also threatens the many other species with which they coexist. With the highly significant exception of the rainforest campaigns, there has been very little attempt to include the effects of habitat destruction on human populations in the picture. Rather, the tendency has been to represent wild species and their habitats as subject to threats from a culturally and socioeconomically undifferentiated 'man'

This strand within the conservation movement has tended to rely on the didactic effect of visual images themselves, but it has been able to do this only because of the prior existence of ~~pre-existing~~ cultural and ethical codes and educated moral sentiments in receptive audiences. Where the appeal for active conservation has been verbally articulate, it has tended to rely on two broad sets of cultural predisposition. One of these is a moral framework generally called 'ecocentrism'. Ontologically, humans are seen as part of nature, interdependent with it, and not set apart from or over it. Morally, other life-forms, and even non-living nature is understood to be inherently valuable. No special value priority is assigned to humans, or, at least, not simply in virtue of species-membership. In its fully articulated form, adherence to this 'deep ecological' perspective is quite rare, but many of its associated sentiments and attitudes are now very widespread among the 'attentive' publics of green social movements and parties in the industrialised capitalist countries and urban populations in parts of the 'third world'. People influenced by these ideas will tend to be predisposed to view human activity in relation to nature as potentially destructive of an assumed 'natural balance'.

The second widespread set of cultural presuppositions to which the wildlife conservation movement appeals has sometimes (unhelpfully, in my opinion) been called 'postmaterialism'.⁴ The background to this cultural set is a recognition of diversity among human needs, from physical and organic needs for food, shelter, clothing and security from attack, through emotional and identity needs to 'self realisation' needs, such as the need for artistic expression and intellectual development. These needs, once distinguished, can be arranged in a hierarchical order, those at the physical/biological end being considered more basic, and so deserving of a higher priority than the 'higher', non-material needs. These latter come into play as significant motivators of human conduct only when the more basic, material needs have been met. If this framework is applied to a social context, it suggests that public political agenda are likely to be dominated by 'bread and butter' issues until basic needs are broadly met, with 'postmaterial' issues, associated with meeting 'higher' needs, arriving later on the political scene. The framework also suggests that 'postmaterial' issues will tend to be raised by relatively affluent, 'self-realising' social groups in a population

⁴ (Inglehart)

and I would say more of this is the result of my talk

There are, of course, many points at which one could challenge this framework. However, I think it does capture something of the sources of appeal of wildlife conservationism. Where this does not appeal to a belief in the intrinsic value of non-human life forms, it appeals to the widely and deeply felt sense of loss to human aesthetic appreciation of their world implicit in biodiversity loss. The title Silent Spring captures this sense of aesthetic loss perfectly. Here I should stress that I do not wish to overemphasise the distance between these two cultural formations. Academic environmental philosophy makes a great deal of the contrast between ecocentric and anthropocentric approaches, but I think it can be shown that there is a convergence between the two once it is recognised that nature serves human purposes of many different kinds, and that amongst these are needs for aesthetic and what Marx once called 'spiritual nourishment'.

However, notwithstanding the popular resonance of this form of conservationism, and its effectiveness in some important areas, it is only one among several independent forces that have together forged the contemporary global biodiversity agenda. A second, powerful source has been the changing political economy of the chemical, agricultural and pharmaceutical industries, overdetermined by key breakthroughs in biotechnology. The salient features of these changes in the last twenty to thirty years are:

Increased concentration and centralisation of capital, so that key industrial sectors are dominated by a small number of very large firms, which, in addition, tend also to hold commanding positions in a number of adjacent sectors (eg agrochemicals, animal feed, and food processing);

The increased domination of world markets by these transnational companies, in the context 'liberalised' international trading regimes, whose terms favour increased levels of international capital flow, and the penetration of national economies by the transnational companies.

The escalating commercial application of genetic manipulation technologies in such fields as the 'improvement' of domesticated animals and crop plant varieties, pharmaceuticals, waste disposal, and so on

There are ^{several} ~~at least three~~ important respects in which these recent changes underpin the global biodiversity agenda. The first is that the products of the new biotechniques are the prospective basis for future capital accumulation on a global scale, and, given the economic scale of these industries in the context of their 'home' national economies, they consequently have a high priority in the economic policies of the 'northern' powers. Since genetic manipulation techniques are not difficult to acquire, the emphasis in maintaining the competitive advantages firms gain from product-innovation is on intellectual property rights and commercial secrecy. In Europe and the USA companies with biotechnology interests have exerted pressure on existing patent law to extend it to include genetically engineered organisms, and also specific genes and genetic characters. So far, this pressure has been more successful in the USA than in Europe, and recent US diplomatic efforts have been seen to reflect the interests of the biotechnology industries more directly than those of European governments. The 1991 International Convention for the Protection of New Varieties of Plants extended existing Plant Breeders Rights in the direction of patents. As far as biotechnology research is concerned, in the field of crop plant 'improvement'

individual family businesses specialising in selecting and selling seed have been subject to large scale takeovers by the transnationals from the 1970s onwards (see, for example, R. Vellve 1993). At the same time, Western governments have restructured the relationship between private and public sector research. The prestigious Plant Breeding Institute at Cambridge, UK was sold to Unilever in 1987, and there has been a widespread shift in the direction of research with commercial applications to be taken away from public sector institutions in favour of the R&D facilities of the big companies.

This latter shift in the location and control of research has two important implications for our analysis. The first is that the research-agenda can be more closely tied to the commercial strategy of the firm. In agriculture, for example, this means that a technique with general applicability - the splitting and artificial recombination of units of DNA - can be utilised in the design of crop varieties with built-in compatibility with pesticides marketed by the same firm. More generally, the research effort to convert a technique into a marketable commodity involves a set of presuppositions about the general form of the farming system and its ecological and financial conditions of existence. These assumptions can be controlled to fit the marketing strategy of the firm in the form of intellectual constraints on researchers which public sector research would not tolerate. Secondly, the results of private sector research are subject to the requirements of commercial secrecy which directly contravene scientific norms of open communication of knowledge.

These developments necessitate a transnational politics of biodiversity for the widely acknowledged reason that the new biotechnology capacity is primarily located in the industrial, northern-based transnationals, while the centres of biodiversity which they require for their biological 'raw materials' are concentrated in the poorer countries of the south, and especially in the tropics. In a post-colonial period when direct coercion is now harder to legitimate (but by no means absent - viz. The Gulf War), the appropriation of third world natural resources by the more economically powerful states has taken more indirect economic, financial and diplomatic forms. This has been the situation with mineral ores, forestry products, cash crops and so on, but the conditions required for the commercial exploitation of biodiversity by the new biotechnology-based companies present some specific ^{financial} obstacles. For pharmaceuticals and other industries seeking to exploit 'wild' biodiversity extensive *in situ* research effort is required in 'prospecting' for potentially useful organisms. Only relatively uncommonly have the necessary infrastructures been established for this, and where they have (as in the instructive case of Costa Rica - see D.H. Janzen in O.T. Sandland et al. (Eds.) 1992) this is because the 'host' government has a developed policy for capitalising on its biodiversity. A second distinctive feature is that discovery of exploitable resources in this new context does not imply wholesale physical removal or extraction. All that is required are small samples whose phenotypical characters can be tested and genetic structure analysed. A third distinctive feature is the relationship between the new forms of transnational prospecting and preexisting local knowledges, and, in the case of agricultural and horticultural varieties, preexisting communal practices of innovation. Experience has revealed a far higher rate of discovery of pharmaceutically exploitable properties from plants already in medical use by indigenous people than from examination of randomly gathered plant samples (J. Hanlon 'Repelling the Bio-pirates' Red Pepper April 1995:9).

So, for those transnational companies whose future depends on the exploitation of 'third world' biodiversity, there are strategic priorities which require

interventions directly, or on their behalf, beyond the jurisdictions of their 'home' states. Large areas of species-rich habitat need to be preserved from destructive development as a result of other forms of capital investment, requiring influence over the overall development strategy of some 'third world' governments. Access to those habitats has to be obtainable, (and preferably exclusive access) for prospecting. The right to remove germplasm for research and development has to be secured, and, finally, exclusive rights to commercial exploitation of the resulting 'products' have to be established and internationally recognised.

From the standpoint of the 'third world' countries whose biodiversity is the object of concern, this is a new situation which demands a major revision in previous thinking on these issues. In particular, genetic resources in these countries had previously been considered a 'heritage of mankind' (see International Undertaking on Plant Genetic Resources, FAO - discussion in D. Cooper 'Genes for Sustainable Development' in V. Shiva (ed.) 1991 Biodiversity: Social and Ecological Perspectives London & New Jersey, Zed Books), and western scientists had previously been allowed access for research purposes on the assumption that scientific knowledge, too, was 'a common property of mankind' (see A. Brøgger 'Ethical Concerns Regarding Gene Technology' in Sandland et al. 1992 Conservation of Biodiversity for Sustainable Development Oslo: Scandinavian University Press). Now, both germplasm and scientific knowledge of its properties are increasingly appropriated by capital as productive resources. Since this capital is almost always foreign-owned, and the legal forms of intellectual property assign property rights in the 'products' of biotechnology almost exclusively to these same companies, the pressure to assert national sovereignty over the elements of biodiversity as a lever to gain bargaining power over each of the objectives of the transnationals is irresistible. This underlies the shift to an explicit recognition of national sovereignty with associated responsibilities in the preamble to the Convention on Biological Diversity ('States have sovereign rights over their own biological resources' - see discussion in ch. 7 of M. Grubb et al. 1993 The Earth Summit Agreements: A Guide and Assessment. London: Earthscan). However, the key actors in this bargaining process are national governments, and not all interested parties have equal access to setting the terms. I will return to a more detailed discussion of the implications of this a little later.

For now, it will be necessary to return to considering the various processes which underly the emergence of biodiversity as a high-profile topic of inter-governmental concern. I have so far mentioned the issue of extinction of species and habitat destruction as a matter of concern to the relevant scientific community and a wider public concerned for aesthetic and ethical reasons. Next, I have introduced the changing political economy of chemical, agribusiness and pharmaceuticals, overdetermined by the new biotechnologies. A third significant source of concern about biodiversity is also connected with the political economy of agribusiness, though not so centrally with DNA technology.

This problem is a consequence of the 'success' of the 'northern'-based agribusiness interests in transforming farming systems to high-input, high yielding intensive methods both in their 'home' countries and throughout the 'third world'. Whilst this has enabled the small number of massive firms which now dominate world markets in this sector to impose profitable forms of economic dependency in newly market-oriented producers, it has also had the necessary consequence of reducing biodiversity in several significant respects. First, it has drastically reduced

For example,

the number of crop plant species in cultivation. (A study of Provençal food production, reported by R. Vellvé (1993) revealed that of some 250 plant species which figured in local diets in the 19th. C., only some 60 species are now cultivated, with the bulk of cultivation being devoted to only 30 species. Second, it has drastically reduced the number of varieties of each species in cultivation. (The same study reports that 71% of French apple production is accounted for by the imported 'golden delicious' variety. Third, biodiversity has been reduced by the decreased degrees of genetic differentiation between what are marketed as different varieties.

For example

This third aspect of declining diversity in agriculture and horticulture is a direct consequence of the laboratory-based methods of crop 'improvement' employed by the big companies. Because of commercial secrecy, evidence about their 'stock' is limited, but what evidence there is suggests that they use a highly uniform germplasm developed from well-proven high performance varieties, and generate new varieties by minor modification of this 'elite' stock (Vellvé, 1993). This genetic 'tunnel' effect is in the short term commercially viable, since 'improvement' is targetted at increased yield, without reference to such characteristics as disease-resistance, hardiness and adaptation to local environments which have governed the multi-purpose selective practices of traditional agriculturalists. The commercial logic of this is that mechanised land-management, irrigation and pesticide application can standardise growing conditions - simultaneously, of course, binding farmers to agribusiness interests.

Finally, biodiversity is threatened and undermined in yet another respect by the spread of the newer intensive systems. Not only is there a reduction in the biodiversity of the crop plants (and domestic animal breeds) in use, but the sheer physical spread of these systems, and the changes in agricultural ecology they entail, reduces the area of land under less intensive and subsistence uses, primarily oriented to meeting local needs. These land-use systems are not only richer in crop species and varieties, but they also harbour populations of 'wild' species which are rapidly eliminated from the intensive monocultures. Pressure on less intensive systems imposed by the spread of intensive cash cropping is commonly associated with rapid degradation of fragile and marginal ecosystems. Also, both directly and indirectly, key centres of 'wild' biodiversity, such as the tropical moist forests themselves, are threatened by the encroachment of intensive, commercially oriented systems

So far as the agribusiness sector is concerned, the loss of traditional varieties, so called 'landraces' is coming to be seen as a potential risk for several reasons. One is the vulnerability of highly genetically uniform crop species to pandemics as a result of evolution of new pathogens. Another source of concern is uncertainty about future climate change, and its potential impact on the world food system. Newly redistributed growing conditions may well require crop characteristics not available from the uniform genetic materials currently used in the plant breeding laboratories. This has given rise to the quest to seek out and store in 'gene banks' samples of traditional varieties. Again, there is an international politics of this process. Most of the gene banks are retained in the 'north', and there are issues concerning the rights of farming communities who developed these varieties over many years, as well as access to the stored germplasm.

The fact that the physical spread of the intensive systems is at the expense of less intensive, subsistence and 'wild' biotopes has other implications. One is that such biotopes are often of great importance in regulating water regimes. Upland deforestation can cause havoc for lowland agriculture by increasing the incidence of

* The Ecologist

drastic flooding and loss of topsoil. Local climates, too, are significantly affected by large scale destruction of natural and semi-natural biotopes. Other problems of spray-drift, pesticide run-off into water courses, and food contamination are well-known. But as well as these effects which harm both human and non human populations by way of their ecological conditions of existence, there are more directly socio economic consequences. The new farming systems are accessible only to farmers with sufficient capital, or access to sufficient credit to purchase inputs, and with control over a sufficient land-area for mechanised cultivation and harvesting to be viable. Poorer and smaller farmers, casual and wage workers are forced into more intensive use of marginal land or migration off the land altogether. Localised practices of food production and distribution are disrupted, and dietary practices are transformed by the penetration of global markets.

To some extent, the agribusiness sector is quite insulated from many of these consequences. Only if they generate social movements with serious political influence on governments are there negative implications for the transnationals. However, intensive agriculture has ecological consequences which undermine its own conditions, as when it leads to erosion because of insufficient organic content, or when its spread undermines the ecological functions of adjacent natural or semi-natural biotopes. In these respects, intensive agriculture is one among a wide range of dynamic processes which produce ecological degradation - urbanisation, construction of roads and other infrastructure, power generation, logging, industrial pollution, and so on. These processes are included by the American writer, James O'Connor⁷ under the concept of a 'second contradiction' of capitalism. Capitalist economic relations are characterised by an inherent contradiction between forces and relations of production, which is the basis of capital/labour conflict - the 'first' contradiction. But the development of the forces of production under capitalist relations also undermines the conditions of production, so generating environmental crises which can only be resolved extra-economically through a conflict-ridden process of socialisation of the conditions of production. In other words, capitalist development entails ecological damage which becomes problematic for the further accumulation of capital itself. Only public intervention, often at the instigation of environmental social movements, can restructure the provision or preservation of the necessary ecological conditions for further capital accumulation. This theoretical approach does, of course, require much more empirical testing and further elaboration, but I think it gives some useful insights into the processes of biodiversity loss and the global political processes which have arisen in response to it. I will return to this theme a little later.

So far I have suggested that there is not just one problem of biodiversity loss. This concept can be understood in many different ways, and these differences may be linked to heterogeneous sources of concern about global environmental change. Field biologists and wildlife conservationists have intellectual, aesthetic and ethical concerns about habitat destruction and extinctions. The industries with developing interests in the new biotechnologies require preservation of especially 'third world' reservoirs of wild and cultivated biodiversity for prospecting and commercial exploitation. Third world governments are keen to use their biodiversity as bargaining counters to offset against the debt burden, and to gain technology-transfer and inward investment. Agribusiness has a further set of concerns which arise as a consequence of its own success in dangerously reducing cultivated and wild biodiversity. All of these interests and sources of concern are sufficiently powerful

* See various contributions to the U.S. based journal, Capitalism, Nature, Socialism

actors either directly or indirectly on the international arena to ensure that their priorities are reflected in the construction of the biodiversity agenda

However, not only are there reasons for thinking that no stable or workable agreement could be forged between these interests, but also there are significant interests which are largely ignored or underrepresented in such agreements as have so far been reached. The analysis so far identifies a number of such interests. First, there are indigenous peoples whose cultural traditions involve both material subsistence and symbolic interconnections with specific biotopes. These people are directly threatened by habitat destruction - deforestation, drainage of wetlands, coastal and marine pollution and over exploitation of game species and fish-stocks. But it is increasingly recognised that the cultures of these peoples are invaluable repositories of knowledge about useful properties of living organisms, and of practical experience of sustainable use. Second, there are 'traditional' horticulturalists and agriculturalists, producing for subsistence or for local markets. These people, too, are threatened by the spread of export-oriented intensive regimes, but, again, they are also increasingly recognised as possessors of important knowledge of methods of sustainable cultivation in immensely diverse local conditions. It is also now persuasively argued that many so called 'traditional' cultivators are systematic crop improvers, using *in situ* methods which parallel the laboratory R&D carried out by the transnationals. C Fowler ('Biotechnology, Patents and the Third World' in O.T. Sandland (ed.) 1992) brings together evidence from Asia, Africa and Latin America of farmers recognising and classifying many different crop varieties, encouraging 'introgression' of wild relatives of crop species, hybridisation, testing, recording data and selecting traits (see especially P. Richards 1986 Coping with Hunger: Hazard and Experiment in an African Rice-farming System. London: Allen and Unwin.). Yet none of this activity by 'traditional' farming communities is legally protected as 'intellectual property'. There are, too, numerous other social interests at stake, though these are sometimes difficult to identify in a clear way. The urban poor in many 'third world' countries suffer problems of lack of shelter, food and fresh water, and sanitation. These problems are compounded by the rural processes reviewed above, which intensify rural/urban migration, and change the basis of food production and distribution in ways which adversely affect the least well-off.

Finally, I will turn to a brief consideration of the ways in which these interests and processes have so far been conceptualised in the international negotiations concerned with biodiversity. In the debates surrounding the Convention on Biological Diversity, a broad division was clear. On the one hand governments of 'developed' countries were concerned to further the interests of their biotechnology industries. This took the form of insistence on the recognition of 'intellectual property rights' in the 'products' of biotechnology, and on the need for 'developing' countries to both conserve and allow access to their genetic resources. At the same time, the perspective of the 'developing' countries was acknowledged to the point of recognising national sovereignty over biological diversity. The crude outlines of the proposed bargain were that 'developing' countries would conserve biological diversity and allow access to it on condition that they would be involved in biotechnological research, would share the benefits of commercial exploitation of that research, that they would be recipients of transfer of the new biotechnologies, and that 'developed' countries would contribute financial resources to enable developing countries to meet their obligations under the convention

There are some references to the interests of indigenous peoples and farmers in the convention. Article 8 enjoins contracting parties to 'respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application', and to 'encourage the equitable sharing of the benefits'. This section embodies a recognition of 'farmers rights' as this concept emerged from debates in the FAO during the 1980s: 'The concept of Farmers' Rights is a means of claiming that plant genetic resources are not just raw material divorced from human creativity, and as a way of pressing forward the demand that if plant breeders' rights are to be observed and rewarded, then farmers' rights must be treated similarly.' (see C.Fowler 1992, op. cit., p.276).

Numerous commentators have pointed out, however, that there is little sign of such symbolic recognition of farmers' rights being backed up with substantive benefits to indigenous peoples or local farming communities in 'developing' countries. David Cooper (1991, op.cit.) offers a series of practical proposals, such as giving legal standing to local innovations and knowledge, strengthening locally based research, development and training, and reintroducing or strengthening local common property institutions where these have proved effective in the past. C. Fowler (1992, op.cit.), despite arguing strongly in favour of the need to protect farmers' rights, concedes that it is unrealistic to expect wholesale reform of the patent system. He advocates other forms of protection of these rights, and the establishment of a mandatory 'gene fund' which would reward innovation, and finance conservation

These are well-argued positions, but in the light of the above analysis they raise some difficult questions. One such question concerns the political, symbolic and economic relationships between the nation states and their governments, which are the parties to the Convention, and the various social groupings for whom they claim to speak and act. The US government representatives, who refused to sign the convention at Rio did so quite explicitly on the basis of a supposed identity of the national interest with that of the biotechnology industries. (Divisions within the US negotiating team would be worthy of further analysis).

So far as the governments of 'developing' countries are concerned, there is a similar presumption that they speak for the totality of social interests within their jurisdiction, often, quite explicitly and eloquently, on the development needs of the poor. However, if we look at the terms of the bargain offered in the Convention, the conditions imposed by the 'developing' countries express the requirements of a broadly conventional model of development in terms of 'catching up' with the technological developments of the north and consequent economic growth. But it is precisely this form of development that has generated the crisis of biodiversity loss and the wider problems of ecological degradation and socio-economic dislocation. To speak, as Article 19 of the Convention does, of 'priority access on fair and equitable basis by Contracting Parties, especially developing countries, to the results and benefits arising from biotechnologies based upon genetic resources provided by those Contracting Parties', begs the question of what counts as a 'benefit' and to whom it is a benefit. It also conceals the fact that the 'Contracting Parties' are national governments, whilst the de facto providers of the genetic resources in question are, as we have seen, indigenous peoples and local farming communities

Whilst technology transfer and associated conventional western-style economic development may well serve the short term interests of some 'developing-

country' governments and the social and economic elites which they commonly represent, there is no reason to suppose that developed-country assistance to move further in the same direction will be any less disastrous for the urban and rural poor and the indigenous peoples, not to mention biodiversity itself, than it has been to date. In the absence of radical new models of development, the proposed global biodiversity 'bargain' is, as Vandana Shiva put it, 'schizophrenic'. On the one hand, it threatens to stoke up conventional development pressures on the environment, as well as adding new threats, such as the introduction of genetically engineered organisms. On the other, it proposes to set up 'no go' areas of set-aside, to preserve the potential resource-base of the biotechnology industries. Quite apart from ~~to the~~ contradictory pressures this approach is bound to set up between different state-institutions and areas of policy making, it takes no account of the large sections of the rural populations of many 'developing' countries who depend wholly or partly on natural and semi-natural habitats for a range of material and cultural needs. McNeely, for example, reports a protest movement in 1990 of Bolivian Indians at the way US plans for the conservation of their part of the Amazonian forest would deny their traditional rights of resource use in the forest. And, of course, set-aside is no solution to the problem of biodiversity loss in agricultural, forestry and horticultural systems. One possible reading of the mention of the need to respect and preserve the knowledge and practices of local communities and indigenous peoples in this context would be that they would be sequestered from the general processes of 'development' as social and cultural 'set asides'!!

Finally, the well-intended focus on the integrity and common property management systems of local communities has to be considered further. Is it the case here, as in other uses of the term 'community' in political discourse, that it conceals divisions of interest and forms of power relations within 'communities' which could be exacerbated by certain strategies for strengthening them?

All of this does, of course, pose a host of questions about the possibilities, in the present world-situation, for the emergence of new transnational alliances around defence of the interests of the rural and urban poor, the promotion of alternative models of development, and the establishment of forms of interaction with non-human nature which enable mutual flourishing of human and non-human nature. The widespread pragmatic concessions to a narrowly economic approach to the conservation of biodiversity (see Janzen, 1992, op.cit.), whilst understandable, may turn out to be deeply counter-productive, not only from the standpoint of biodiversity conservation, but also from the standpoint of the great majority of the world's population, for whom biodiversity is the source of life, as distinct from the source of profit.