

Darwin Lecture 2002 ¹

The Human Individual and Community in the Conservation and Sustainable Use of Biological Resources

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1. Introduction

I feel greatly honoured to be in this resplendent London setting addressing you all, ladies and gentlemen. I sincerely thank you for coming to listen to me. I also thank my host, the Honourable Minister Michael Meacher, and his staff, and the British Embassy in Addis Ababa for being very helpful and hospitable.

I first came to London in September 1966, just over 36 years ago, on my way to Bangor, North Wales, where I "read" quantitative plant ecology for a Ph.D. under a pioneer in the field, Professor Peter Greig-Smith. On my way to the UK, I took 6 weeks travelling by bus, train, river barge, and even a taxi between two countries - Lebanon and Syria, between Beirut and Damascus. I learnt a lot on the way, especially how people adapted to different conditions in their local communities. Of course I learnt even more in Bangor, about how plants adapted to different conditions, also in their local communities. How did I fare on the way, and in the U.K., especially in Wales? You may ask.

There is a saying in Ethiopia which goes:

"Nobody is a fool, so long as he is in his own country, by his own river side, in his own village, within his own community."

My answer to the question of how I fared is, therefore, that I felt like a fool. So, I asked questions. I formulated ideas, and reviewed them, and revised them. I even compared plant and human local communities. I still do that. I think that I am always simple-minded when I think of big things. I cannot resist asking simple questions about them. I will, therefore, even in this lecture, raise some questions that may look naive. But believe me, I will raise them only because, to me, they are very serious.

My topic for this lecture has three components: the local community, the individual and biological resources. My topic also includes the interactions among them, and especially with us humans. To most of us, this interaction is based on Genesis, chapter 1, verses 26-30, which makes men masters over all life. Genesis, Chapter 2, verse 15, states that, in the Garden of Eden, man was ordered by God "to cultivate it and guard it." We certainly act as lords of all life. But we have been less and less looking like the gardeners we are meant to be and we are destroying the garden as if we did not care. The forbidden destruction did not stop at eating the apple fruit, or at killing Abel, though serious environmental disruption had in the past been localised in scattered areas, e.g. the salinization of irrigated soils in Mesopotamia. The greatest increase has corresponded with the industrial revolution and the rise of capitalism.

Capitalism has been increasingly privatising biological, and in fact all other, land and water resources. The privatisation has weakened and, for all practical purposes, destroyed the rural local community. The individual has thus to deal more and more directly with the centralising state and less and less with her/his neighbours. The state is so large compared to the local community that the individual's relationships with authority are getting more and more impersonal and based more and more strictly on blind laws rather than on

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understanding and compassion. This law recognises only individual rights and individual responsibilities. Whatever communal residue has remained from the old community days has, therefore, ended up without anyone with any recognised right to, or responsibility for, it. This means that there can be no one to be motivated, or to feel obliged, to care for it. Hence the aphorism: "The Tragedy of the Commons". This tragedy, therefore, emanates from the private, not from the communal.

One school of thought wants to solve this problem by privatising all vestiges of communally owned natural resources. The argument is that the private owners would then look after the natural resources. This is based on two assumptions.

The first is that, if the resources are looked after, then we will all benefit. The problem is that if they are privatised, then we would all have to pay to obtain them. Water is being privatised. There is a serious move by some Swiss banks to start international trade in water. Imagine me a destitute vagrant. How will I pay for the water? By pick pocketing in the train? What good is good water for if it is inaccessible to the thirsty?

The second assumption is that the individual will effectively look after the natural resources. I do not think that this is always true, it is certainly not true for biological resources.

The opposite view is that it is indigenous and local communities that have been effectively using biological resources throughout the human past and thus, where they have been weakened, it is empowering them that will enable us to conserve and sustainable use natural resources. Article 8(j) of the Convention on Biological Diversity recognises this for biological resources¹. I support its position.

Natural resources that are the most intimately intertwined with local community life and development are biological. I am a biologist, an ecologist. I was born to a peasant family. My first memory is of plants, animals and farmers. My knowledge of them has grown with time. I have now been involved in the global debate on the conservation and sustainable use of biological resources since 1991, when I got into the negotiations to formulate the Convention on Biological Diversity and Agenda 21. Later on, I was involved also in the negotiations on the Convention to Combat Desertification, and recently, the Cartagena Protocol on Biosafety. These negotiations very soon made me realise that the bulk of the science and technology for using biological resources while at the same time caring for those resources so that we live in harmony with them, as all life has so far done, comes from our local communities of my childhood and my adult life. The local community, with its capacity for endless existence, an existence as endless as that of the human species, shares timelessness with all life. It is, therefore, fitting that the local community is humanity's best manager of biological resources. The way of using those biological resources that now comes from the present day all-privatising free trade diminishes this endless life. The complete control by the individual of timeless life reduces it to the scale of the individual's life span. No wonder then that the extinction of species is growing geometrically and frighteningly. When other species die out so fast, what reassurance has the human species, all the more so that it is responsible for all the extinction? Could our human species be committing suicide by putting its exclusive focus on the mortal individual rather than on its own continuing timeless life?

By allowing the destruction of our local communities through our privately motivated focus, we would not only condemn other living things to accelerating extinction, no doubt preparing the way for our similar fate, but we would also, in the mean time, make the rural African, Asian, Latin American, poor become totally destitute. And especially my Africa is essentially rural. And in a world of grabbing which has already developed effective grabbers, the rural Southerner, newly pushed out of her/his community, will grab thin air in a rarefied so-called free market. Even that is not certain: look, with water getting scarce, water resources are being privatised; and with air getting polluted, it is likely that clean air, however thin, will be

privatised. It may sound as if I have let go of my fancy; but, say 50 years ago, who would have thought that there would be humans who have to buy bottled water if they want what they drink to be clean? It would not be uncharacteristic of the times if, in another 50 years, canisters of pure air for inhalation were to be common goods at the corner store.

But, you may say, the agroecosystem, which dominates the biosphere, is old, not a creation of capitalism. Is the agroecosystem, and especially its agricultural biodiversity, stable? Has it not been always changing depending on changing fads in agricultural practice?

Yes, but only within natural limits. Farming communities respected those limits. But the individual, both legal and natural, has systematically violated those limits. Let us look at how this has happened. To do so, we first need a quick reminder about ecosystem stability.

2. Ecosystem Stability

There is no ecosystem that does not ever change. A natural ecosystem is only approximately stable. It achieves the homeostasis² required because its functional components respond positively to negative feedbacks caused by change effected from outside. In an agroecosystem, just as in a naturally occurring ecosystem, these functional components include producers, consumers, decomposers and the non-living. The crop plants and their weeds are the producers. Human beings, domestic animals, in many places also some wild animals, birds, insects or some other herbivorous lower animals, especially those in the soil, are the consumers. Soil fungi and bacteria are the decomposers. The humus or decomposed and decomposing organic matter acts as a binder and keeper as well as a releaser and giver of soil nutrients, and as the matrix which binds inorganic particles into the units of soil structure. Humus is non-living, but made from the once living. Soil water as an essential component that must be available to all life, and the bulk of the soil, are non-living. The soil and the rocks under it form the non-living substratum for all ecosystem components to exist on. This substratum, together with the atmosphere and inflowing water, is the source of all new supply of anions and cations for plant nutrition. Together with the humus, these anions and cations buffer the soil to maintain its pH more or less unchanged.³

In agriculture, our interest is the maximisation of biomass production in the crops and/or domestic animals which we use for food or for other purposes. Therefore, it reduces the number of species growing on the land which has become a farm.⁴ In nature, species that grow together often exploit fully or partially different niches of the same ecosystem. This is clearly seen in a forest in the adaptation to differing light intensities by plants of differing heights, as well as differing sizes, shapes and leaf angles. Similar niche specialisations occur in adaptations to various other environmental factors as well, e.g. to soil depth. In an agricultural monoculture, only one niche is used, and all the individuals of the crop or animal species compete absolutely for that same niche while there remain other niches fully or partly unoccupied because species that could use them are not present. Therefore, as pointed out by Heywood and Watson,⁵ though intensive inputs may make agricultural production in a given season high, sustained high productivity over years is not possible with monocultures, i.e. when only one of the green plant niches is occupied. The occupation of a critical minimum of green plant niches is necessary for homeostasis, and the increase in the number of species will even increase production. These authors also point out that the minimum number of complementary species for maximising production is small, but that for homeostasis is large.

This means that even when based on a polyculture, agriculture reduces niche utilisation in the agroecosystem. Therefore, it also correspondingly reduces the positive responses made by the components of the agroecosystem in reaction to the negative signals caused by disturbances of the natural homeostatic processes. For this reason, the agroecosystem fails to adjust as effectively as the ecosystem it has replaced and deterioration sets in. That is

why losses of structure and fertility of the soil occur.⁶ The hydrological cycle then gets disrupted, often resulting in soil salinization,⁷ and even more often in soil erosion.⁸

But, was it not the agricultural revolution, which was carried out by local communities, that brought about ecosystem instability and gave us the fickle agroecosystem? Yes, but the very local communities have also devised ecological techniques of compensating for these deficiencies.

3. Techniques Used by Farming Communities for Compensating for the Loss of Ecosystem Components

It is true that local communities gave us agriculture. But it is also true that they looked after forest patches and, in places, they deliberately spared big forests. They also had trees dotting the countryside. It was not only the crops and the domestic animals that were useful to them. Equally importantly, over the thousands of years of the history of their agriculture, farming communities have learnt various biological and physical methods of coping with the problems of loss of components of agroecosystems, e.g. terracing, fallowing. But perhaps the most significant are those that make the conscious use of crop and animal species and/or varieties to provide positive reactions to the agroecosystem's negative feedbacks. For example, mixed farming,¹⁰ i.e. combining crop and animal production, enables an effective balancing between biological production, consumption and decomposition to make nutrients optimally available at the start of the growing season. It also enables the placing of the decomposing organic matter in the form of manure or compost precisely where it is needed most in the agroecosystem. The use of human waste as compost reduces organic matter and nutrient leakage from the agroecosystem. Deep-rooted crops bring leached nutrients up to the surface soil where they become available to the next generation crop. Legumes fix nitrogen to replace what is denitrified and lost to the atmosphere. Sorghum and similar crop species are deep rooted and, besides bringing up nutrients to the surface, they withstand dry spells which agriculture exacerbates by deforesting the land. Tef slows down its growth to survive waterlogging and resume fast growth when conditions improve, and rice even grows optimally under waterlogged conditions. Not only drying up, but waterlogging also is exacerbated by deforestation. These various techniques of bringing about the positive impacts of agricultural biodiversity on the agroecosystem can be made to occur simultaneously by planting the species in polycultures and/or sequentially by crop rotation in monocultures or in polycultures.

The physical methods developed by farming communities either reduce or prevent soil erosion, reduce loss of water from the soil, drain the soil to reduce excess soil water, or bring water for irrigation. Both irrigation and drainage can influence the physics and/or chemistry of the soil, e.g. by causing salinization.⁷ They have thus caused much loss of good soil and biological resources. But, used in combination with appropriate biological and, as needed, other physical structures, they can be effective.

Combinations of these methods keep the humus content of the soil high and hence also its physical and chemical properties in a state that maintains a high and stable fertility. High humus also helps keep species healthy and thus resistant to diseases and pests.¹¹

The large numbers of crop species and their varieties which are adapted to the varying conditions in the environment make it possible to maintain not only a large agricultural biodiversity, but also other associated non-agricultural biodiversity, including patches of natural ecosystems, free from agricultural impact. The capacity to adapt to differing environmental conditions through the use of a big range of crops and their varieties can be seen from Ethiopia. Table 1 shows how diverse the Ethiopian environment is, and how correspondingly diverse the farming communities have made their agricultural biodiversity. Please note that the list of domesticated crops in Ethiopia is much larger than can be seen from the table.

Table 1 – A Partial List of the Crops of the Cereal-Dominated Agricultural Systems Complex with the most suited main crops produced under different environmental conditions shown in capital letters.

| Altitude m asl | 1500-1900 | 1900-2300 | 2300-2800 | Over 2800 |
|----------------------|---|---|--|-------------------------------------|
| Humid | | | | |
| Cereals | FINGER MILLET MAIZE Sorghum Tef | Finger millet MAIZE SORGHUM | Area Insignificant | |
| Pulses | Lupin Lima bean Haricot bean | LUPIN HARICOT BEAN | | |
| Oil Crops | Niger seed | Niger seed Linseed | | |
| Sub-Humid | | | | |
| Cereals | FINGER MILLET MAIZE Tef | FINGER MILLET MAIZE BARLEY TEF WHEAT | OATS BARLEY WHEAT | OATS BARLEY |
| Pulses | Chick pea COWPEA HARICOT BEAN | CHICK PEA Cow pea HARICOT BEAN FABA BEAN Grass Pea Pea | Chick Pea FABA BEAN GRASS PEA Pea | Faba Bean Pea |
| Oil Crops | Niger Seed Safflower | LINSEED SAFFLOWER NIGER SEED Rape seed | Linseed RAPESEED | Rapeseed |
| Dry Sub-Humid | | | | |
| Cereals | SORGHUM TEF Wheat Maize | Sorghum TEF WHEAT Maize | BARLEY OATS SORGHUM TEF WHEAT | BARLEY Wheat Tef |
| Pulses | Chick pea COWPEA HARICOT BEAN Groundnuts | FIELD PEA LENTIL CHICK PEA GRASS PEA Groundnut | FABA BEAN Field Pea Lentil Chick Pea GRASS PEA | FABA BEAN Field Pea Grass Pea |
| Oil Crops | Sesame Niger seed | LINSEED RAPESEED Safflower Niger Seed Sesame | Linseed Niger seed Rapeseed | Linseed Rape seed |
| Semi-Arid | | | | |
| Cereals | Finger millet SORGHUM TEF Maize | Finger millet SORGHUM TEF Wheat BARELY | BARLEY Sorghum TEF Wheat | BARLEY Wheat Tef |
| Pulses | COWPEA HARICOT BEAN Groundnuts | Chick Pea Groundnut LENTIL GRASS PEA | FABA BEAN Lentil Chick Pea GRASS PEA | FABA BEAN Lentil Grass Pea |
| Oil Crops | SESAME | Linseed SESAME Rapeseed | LINSEED Rapeseed | LINSEED Rapeseed |

And what has individual ownership, and hence also individual responsibility, for the agroecosystem achieved?

4. Industrial Agriculture: Creating the Ecosystem Market

Industrial agriculture started after the First World War. In 1940, Sir Albert Howard, a British agricultural scientist, described its origins thus: "Since the Great War the factories then engaged in the fixation of atmospheric nitrogen for the manufacture of the vast quantities of explosives needed to defend and to destroy armies well entrenched, have had to find a new market. This was provided by the large area of land impoverished by the over-cropping of the war period. A demand was created by the low price at which the mass-produced unit of nitrogen could be put on the market and by the reliability of the product. Phosphates and potash fell in line... The testing of artificial manures [i.e., chemical fertilisers] and new varieties has necessitated innumerable field experiments, the published results of which are bewildering in their volume, their diversity and often in the conclusions to be drawn from them. By a judicious selection of this materials, it is possible to prove or disprove anything or everything".¹²

Industrial agriculture tries to produce a homogenous environment irrespective of the distinctiveness of the pre-existing ecosystem. Therefore, it uses irrigation extensively even when not needed. It thus creates a captive market for pumping and irrigation equipment. It also creates contracts for building dams and irrigation and drainage canals. In this way, it stimulates capitalist enterprise and it geographically extends the age-old problems associated with irrigation. It divorces animal production from crop production. It plants single variety monocultures as a continuum over very extensive areas. Ecosystem disruption thus becomes inevitable. One indicator of such a disruption is the regular and quick collapse of single varieties owing to emerging vulnerabilities to diseases and pests.¹³ This keeps breeders specially trained to weed out diversity and produce uniform monocultures employed. It also gives chemical companies that produce and supply pesticides and herbicides a captive market. Both the breeders and suppliers of agrochemicals are now increasingly the same North-based transnational corporations.¹⁴ This is understandable since combining both sectors enables the breeding of varieties that can be relied upon to need the agrochemicals and thus captures two markets together.

To enable the corporations to dictate how farmers use the seed and the agrochemicals, they patent both. The aggressive push of the patented package results in extensive monocultures and erodes biodiversity. By so doing, it marginalises the farming communities, who are the time-proven breeders¹⁵ of diversity. It is they that have given humanity the various crops and the thousands of varieties of each crop. They have also given humanity the ecological methods of using diversity to forestall diseases and pests. Thus marginalised, these farming communities lose confidence in their customarily acquired systems of effective conservation and sustainable use of biodiversity and become dependent on the vulnerable monocultures of the private breeders. They then become helpless when confronted by the diseases and pests they used to prevent effectively. Nutrients are leached deep into the soil, and washed away. This pollutes ground water, springs and streams. More importantly, increasing amounts of nutrients have to be externally supplied at regular intervals to enable crop production to continue. This gives chemical companies that produce and supply fertilisers a captive market. Soil structure deteriorates and compaction becomes a serious problem. This gives agricultural machinery companies a captive market. The natural components of the ecosystem are thus replaced by tradable artificial components that are bought and sold in the market. The proven and customarily acquired ecological methods of restoring and maintaining soil quality and fertility fail to work. In Ethiopia, our smallholder farmers state: "The land is corrupted: it has acquired the taste for bribery. We have to bribe it with chemical fertiliser in order to produce anything." This is the way that globalisation from the rich corporate North is entering into community agriculture in the poor South. What is there in it for the poor in the South?

5. The South and the Ecosystem Market

Assuming that these purchased replacement agroecosystems can achieve the same level of homeostasis as the natural ones, there would be an objection to them: why pay cash when you can take the same free from nature by merely using your labour?¹⁶ And when rural labour is so plentiful? And with virtually no alternative employment? When it is noted that the suppliers of these replacement agroecosystem components are from industrialised countries, it is clear that, irrespective of labour consideration, the Southern farmer is getting into dangerous dependency. This dependency would be frightening. Suppose a Saddam Hussein, or a Mullah Omar springs up in a Southern country and the United States and Europe impose a trade sanction? "Death to the enemy, never mind the peasant?"

TABLE 2 – THE CAPTIVE MARKETS OF ECOSYSTEM COMPONENTS

1. Irrigation creates a captive market for:
 - i) pumping and irrigation equipment
 - ii) dams, irrigation and drainage canals and causes salinization and other forms of soil degradation.
2. Divorcing animal production from crop production creates a captive market for chemical fertilisers, and disrupts ecosystems, especially polluting water.
3. Monocultures over extensive areas create captive markets for:
 - i) pesticides and fungicides that kill also non-target animals, fungi and micro-organisms
 - ii) services of breeders to replace lost varieties thus destroying agricultural biodiversity
4. Patents on seed and agrochemicals tighten control and force obedience and subservience on users of varieties and inputs
5. Soil structure deteriorates creating a captive market for agricultural machinery.

In fact, the replacement agroecosystem that these purchased replacement ecosystem components constitute is not homeostatic. Unlike the natural components, these replacement agroecosystem components do not respond to feedbacks effectively. Therefore, the more they replace the natural components, the less homeostatic the agroecosystem becomes.¹⁷ In this way, they steadily destroy the natural agroecosystem components and make themselves indispensable, perpetuating locally insensitive corporate control from afar.

The suppliers of these replacement components want to increase their profit and they often come up with highly simplistic quick fixes to the market-making fundamental agroecosystem flaws they have created. The most recent quick-fix, genetic engineering, is being championed not as a means of increasing homeostasis and yields in stabilising agroecosystems, but as a means of producing crops that will grow in degenerating agroecosystems.¹⁸ The logical end result of degeneration is destruction. If transgenic crops can grow in an environment under destruction, it were bad enough since it would lull us into accepting degeneration until it is too late to reverse it. As it is, so far, genetically engineered crops have been used only to put more disruptive factors into the agroecosystem: poison to invertebrate animals in the case of Bt transgenic crops,¹⁹ and universal poison to other plants in the case of herbicide tolerant transgenic crops²⁰. The claim that genetic engineering will feed the South is irresponsible. It is not lack of good seed that is starving the South; it is global structural defects. Scrapping the Agreement on Agriculture of the WTO, which entrenches existing Northern subsidies and prohibits new subsidies so that the South would never use them, however, would bring money to the Southern farmer, and feed at least the South. In any case, to my knowledge, there has not been one transgenic crop variety that has been statistically compared to the best non-transgenic variety for yield in any place. The claim for GM crops raising yields in the South is, therefore, a mere hype.

Without giving the issue much conscious thought, the South is being lured into the agroecosystem market by the industrialised countries. The forces of lure that cause a lapse in clear thinking about the issue are several.

One lure is that of turning the South into a Europe by mere imitation. The thinking on development in both Europe and the South is usually linear. It assumes that, if we in the South are to develop, we must do what Europe has done. This makes us lose sight of the fact that Europe has been, and is, making many mistakes which we can avoid. The industrialised countries are realising their past mistakes in managing their agroecosystems and, as a reaction, they have now developed an "organic products" market to stimulate corrective action. Their organic products supply a fast growing niche market. Understandably, in order to protect this niche market, the products have to satisfy some requirements. But some of these criteria may have little to do with agroecosystem homeostasis. For example, they completely prohibit the use of chemical fertiliser. If an area is already deficient in a nutrient, say potassium, it would make sense if a measured amount of potash, only additional to that known to be in insufficient amount in the soil, were applied to kick-start a higher level of production. From then on, this increased production can be maintained by homeostatic feedbacks provided, of course, that the waste from the use of the biomass produced is returned to the agroecosystem. The criteria to qualify a product as organic should, therefore, become more robust to enable the effective restoration of homeostasis to the abused agroecosystem, not to create another captive market.

A second lure is technical and financial aid which is effectively used by Europe and North America to make the South adopt the new ways which they choose for it.²¹ This lure is reinforced by the demand or assumed demand of the markets of the industrialised countries for a specified homogenous agricultural produce. Often, in fact, the market is fickle and it disappears after the prescribed change in agriculture has taken place in the South. For example, DDT and other pesticides were in the past pushed on the South by the industrialised countries. Now, their continued application by the South is used by those same industrialised countries as a reason for rejecting Southern products.²¹ This is a neat way of pre-empting competition. The prevaricating attitudes of industrialised countries towards eliminating subsidies as desired by the preambular paragraphs of the Agreement on Agriculture of the WTO is consistent with this view that they scheme among themselves to pre-empt emerging competition from developing countries. One may argue that the sad story is a result of a genuine mistake, not a stratagem. If so, then, when will the North accept liability for the mistakes that it pushes on others? I think that without an international liability and redress regimes, pronouncements on the precautionary principle will remain mere lip service and the poor and the environment will continue to bear the costs of the misadventures of the rich.

The third and perhaps the most potent lure is the appeal to the Southern young of the European and American agricultural education systems. Both when we teach in the South and when we send our young to the industrialised countries, we use European and/or American curricula and teaching materials. The young Southerners are thus taught that the agroecosystem components have to be bought and sold, and they put them all in the market when that is not necessary simply in the belief that they are modernising their country.

| TABLE 3 – LURES THAT ATTRACT THE SOUTH INTO CAPTIVITY AS A MARKET | |
|--|---|
| 1. | Turning the South into a Europe by mere imitation |
| 2. | Financial aid inducing the South to accept these traps as progress |
| 3. | Indoctrination through Northern education |

It is time that the industrialised countries decide to wake up and regulate the destructive marketing of replacement components of the agroecosystem. In the South, this marketing is still not complete in spite of the wishes of its elite. Thus the Southern governments and public can and should reign in our elite whom we have so far aided and abetted to be thus

systematically misguided by imitating Europe and North America. We have to push them to help re-establish homeostasis to the Southern agroecosystems: Nature is very quick at healing itself if it is given a chance! But my hopes are low that the rich greedy man will give it that chance.

6. Of Greed and South-North Resource Flow

This hype is motivated by greed that fuels a South to North resource pump. Why do I talk of greed? I have come across information from the late 1980s and early 1990s that shows that there is a net South-North pump for resources flow. Though I have no more recent figures, it seems common knowledge that the gap between the rich and the poor, and North and South, is growing, and that, therefore, the resource pump is improving in efficiency.

Khor²² recognises this outflow from the South to go North through a number of channels - see Table 4:

| TABLE 4 – THE SOUTH-NORTH RESOURCE PUMP: Resource flows from South to North, in billions of US dollars |
|---|
| -unfair terms of trade amounting to about U.S. \$200 billion in 1990; |
| -debt servicing amounting to about U.S. \$158 billion in 1992; |
| -transportation cost of trade amounting to U.S.\$27 billion in 1987; |
| -outflow of profits on foreign investment amounting to U.S.\$10-11 billion (say 10.5 billion) in 1992; |
| -payments on royalties and licence fees amounting to U.S.\$30-50 billion (say 40 billion) in the early 1980's; |
| -investment lost through "brain drain" amounting to U.S.\$3.7 billion accruing to the U.S.A. alone in 1970; |
| -capital flight amounting to U.S.\$180 billion from 13 developing countries alone in 1988; and |
| -loss through changes in foreign exchange, and many other losses, which remain unquantified. |

If we err on the side of caution and thus accept to underestimate, we can assume that the figures of earlier years were the same in 1992, that "brain drain" occurred only to the U.S.A, that capital flight occurred only from 13 Southern countries, and that we can ignore all other losses. This would then add up to U.S. \$619.2 billion South-North outflow in 1992. In the same year of 1992, Agenda 21 estimated that the South would need an annual development aid from the North of U.S.\$125 billion, which is less than ¼ of the South-North flow. But the North has still refused to make that available. In fact the so-called foreign aid, which is meant to cushion us a little against the impact of the pump so that we, in the South, do not despair and become unruly, has been steadily decreasing since 1992. The 1995 evaluation of the implementation of Agenda 21, which took place in New York, showed that instead of the 1992 promise of 0.7% of GDP of industrialised countries, it had come down to 0.35% of GDP. The Johannesburg evaluation next August will tell us worse.

And the most adversely affected part of the world is Africa. Why? Because, as any text-book on economic geography can show, Africa is the best endowed in natural resources, and every industrialised or even aspiring industrialised country dips its resource pump into it. I presume most of you have heard of diamonds and Sierra Leone and the Congo Democratic Republic, for example? And of Belgium's admission that they had a hand in murdering the Democratic Republic of Congo's first post-independence leader, Patrice Lumumba, because they were afraid their own resource pump would be made ineffective? These items of news have been much in the mass media recently, including on the BBC.

Why all this? It is because industrial values have focused on the individual with his limited life and thus also his interests limited to the self. The industrial society came up with the corporation, which extends individual identity into the indefinite future. Unfortunately, the

corporation has only individual ethos, and it has thus become only more effectively capable of sustained manifestation of individual interests than even the individual himself, albeit limited to a non-existent self. No wonder then that 450 years ago²³, you in England said, "Corporations have neither bodies to be punished nor souls to be damned."

For these reasons, how uplifting it is to hear Mr Tony Blair talking lately so sympathetically of the plight of the local community-based South, especially of Africa, and promising to help? I sincerely thank Mr Blair. I wish, thought, that in his attempts in Africa and elsewhere in the South, he would focus on our local communities rather than on the soulless branches of Northern corporations in our Southern countries. I also wish that we could deny Mr Blair the chance to change his mind by incorporating him straight away into the Global Governance Corporation before he visits Washington often enough to be influenced. Then, we in the South would benefit. And you, in the North, would have at least one corporation with a soul!

Assuming, then, that we would have many Mr Blair's that are long lasting and thus the North's good will, what do we want done about strengthening our local communities for the conservation and sustainable use of biological resources for all humanity, and about restraining the individual greed, usually of the soulless corporate kind? Our desires are based on Article 8(j) of the Convention on Biological Diversity.

7. Protecting the Local Community from Individual Greed

While negotiating for the Convention on Biological Diversity, I became aware of the North's design on biological resources. As is usually the case, this design was worked out and spearheaded by the leading country, the USA. The thrust went thus: biodiversity from the South to come North free. Why not, is it not merely a community resource? not belonging to any one? To be captured in the North through genetic engineering irrespective of whatever risks there may emerge. And thus resist the development of an international law on biosafety. Then to be baptised Northern, with a patent as legal proof of Northern birth. Then, as Northern, to be sold at high cost to the South. Why not? Is it not an industrial product, an invention? Making it an invention improves the South-North resource pump by levying royalties annually instead of selling only once for the selfish peasant farmers to propagate and resow.

This design frightens us in the South. Patenting retains the crops planted in the South under the control of the bodiless and soulless corporations based in the North. The Northerners, the real persons with hearts and souls and a life span of usually less than four scores, can then foster their souls by stating appealing high principles of equity and human rights and by giving us aid food when we starve and the soulless corporations make yet more money out of the tragedy.

Therefore, in 1993, I wrote down what I discovered were the inherited rights of communities, rights that they always had and still enjoy when not illegitimately prevented, rights that pre-date the patent system by tens of thousands of years. We teamed up with the Third World Network of Malaysia to develop these ideas further. Together with Mr. Gurdial Singh Nijar of Malaysia and Dr. Vandana Shiva of India, we discussed and structured these ideas into element of a community rights law. Mr. Gurdial Singh Nijar refined them into a model law that found its way into all the Southern continents. Then, together with my colleagues in Ethiopia, we teamed up with other experts from Africa under the auspices of the Organisation of African Unity to develop the "African Model Law for the Protection of the Rights of Local Communities, Farmers and Breeders, and for the Regulation of Access to Biological Resources." This was endorsed by the Organisation of African Unity Summit in Ouagadougou in 1998. It is now being domesticated by African countries. The central ideas of relevance to us here are two. The first is that community rights are those recognised by the communities themselves, and governments have to protect those rights thus recognised. We believe that this is right, because the local communities pre-date our post-

colonial states; or even your post-medieval states. The second central idea is that living things, their processes, their parts or components shall not be patented. I believe that my audience understands me. But I understand that the European Commission has issued a directive on biotechnology which authorises the patenting of living things. I think that, therefore, I should comment further on this matter²⁴.

The system of patenting was developed for machines. It is being forced onto living things. Most of the problems of patenting life arise from this fact. I will thus raise some questions on patenting life, questions that arise because of this fact. I will also give very brief answers to the questions.

Imagine that I invent a new kind of carburettor that economises on fuel.

Question - If I patent my carburettor, is the rest of the car into which it is fitted also patented?

Answer - No.

Question - When I patent an organism because I claim to have invented a gene, do I patent also the whole organism?

Answer - Nominally, no. In practice, yes. This is because the carburettor is sold individually, but the gene is always in the organism. I am thus prevented access to the whole organism in the name of protecting that patented gene.

Question - Conversely can I patent a whole organism because I claim to have been inventive in the context one of its genes, or one of its traits?

Answer - Nominally, no. But I effectively keep out users of the other genes. Therefore, in practice, yes.

Question - If I have invented a carburettor would I not be able to scale it up or to scale it down to make it fit a lorry or a motorcycle?

Answer - Yes.

Question - When I do this would I not know beforehand what the effect would be on the lorry or on the motorcycle?

Answer - Yes, though some fitting trials, as with a garment being tailored, will be needed. Making it fit is always possible.

Question - When I introduce a gene into one organism or another, do I find that its impact in both cases is as predicted?

Answer - Often, not.

Question - When not, can I change the scale (or whatever dimension) of either the gene or the organism, to make it match my prediction?

Answer - No.

Therefore, breeding and genetic engineering reorganise something existing; they do not create anything *de novo*. Considering achievements in reorganising as if they were inventions is a distortion of meaning, with the aim of distorting reality. This distortion is made for a specific purpose, for controlling living things in the same way as one can control machines one has invented. Those who patent living things will claim that they are not distorting anything but that they are merely asking for a recognition of their own creativity that has gone into making the living thing what it actually is.

If the nucleic acid sequence that corresponds to a trait were invented, that it did not exist in nature in any species, such a claim could be understood. But, in fact, we know that a trait is the result of an interaction among many genes or nucleic acid sequences. That is why we can never tell for sure what a newly introduced gene will do in the organism. We only introduce it and find out the effect. This fact alone would have made any patent claim untenable. But, as they say in my country, "He who wants to eat a vulture names it a Guinea fowl! "

Article 27.1 of TRIPs states that both the product and the process of a technology shall be patented.

What is a product and what is a process in a living organism? It seems to me that the way of introducing a gene into an organism is a process. If I want to make a carburettor, I use a combination of human hands, tools and machines. This is analogous to introducing the gene into an organism which did not have it before. Then the transgenic (genetically engineered) organism and the carburettor would both be products. My aim in inventing the product called carburettor is to carry out another process: that of burning fuel efficiently. Similarly, my aim of producing the product called a transgenic wheat cell to produce a transgenic wheat plant is to have the process of, say, producing a measles vaccine in wheat. Now, the life process takes over from the transgenic cell to make a transgenic individual and from that individual it produces many more transgenic individuals through reproduction. This extra process has no mechanical counterpart or analogue. It is not caused by my introduction of the foreign gene. It is something in all life, something I have not influenced by my genetic engineering. This process substitutes in each generation the hand, the tool and the machine needed to make each carburettor. If the introduction of a gene is an invention, each ensuing generation of that gene would have to become "self inventing" and create the next generation without resorting to the natural processes of chromosome doubling and cell division. Please note that cell division, far from being invented by the genetic engineer, invented the genetic engineer himself. If life were a god, the genetic engineer claiming a patent would be committing blasphemy. Cell division is non-patentable even according to Article 27.3(b) of TRIPs and the reproduction process, so essential to genetic engineering "products", thus wipes out every claim to "invention", and thus also every patent, on living things, their parts or components, be they considered as they are, or in combination with other living things, their parts or components.

If the genetic engineer were to insist that the right to expropriate the biosphere and claim the cell division and reproduction processes that give us genetically modified organisms out of tinkered single cells as his inventions, he should be held responsible for whatever happens. In which case, he would be held responsible for:

- **the "loss of quality" that happens with each generation producing individuals without the gene he has introduced;**
- **the change that would occur in non-target individual organisms which cross with his "invention" through the usual process of sexual reproduction;**
- **any unforeseen and un-forewarned behaviour of the transgenic variety; and**
- **any negative impact on humans or the environment;**

thus becoming absolutely liable in case of any damage or manifestation of any trait or behaviour not specified beforehand.

But, no corporation, not even any Northern country, considers as appropriate the liability of Northern corporations exporting transgenic organisms to the South. When we were negotiating the Cartagena Protocol on Biosafety, we proposed provisions on liability and redress. No Northern delegation would even react to our proposal. There was total silence. We had to resort to total silence on our part on the transboundary movement of genetically modified organisms before we convinced them that they had to talk. The issue is still pending in spite of the fact that we now have a protocol. And yet damage through genetic engineering is highly likely. We would, otherwise, have had no Biosafety Protocol. In spite of the adoption of the Protocol, however, genetic pollution from transgenic crops is still on the rise. You may have heard that in October it was reported that maize in Mexico, in its centre of diversity, has been found contaminated with unintended genes from transgenic maize. Nobody is talking of redress by the United States, the home of the culprit transgenic maize. On the contrary, the corporation responsible has been claiming that this only enriches maize genetic diversity! One might as well say that getting infected improves one's pedigree! Obviously Europe and America are losing their souls through soulless corporations. Why

else did Europe, not only refuse to consider liability and redress in genetic engineering, but also last summer in Durban, South Africa, together with the United States of America, refused to apologise to Africa for the massive suffering inflicted during the era of slavery? Did Europe not apologise to the Jews for the holocaust; and, even through the Pope, did it not apologise to Arabs for harm done during the Crusades? Do you remember the mass media coverage of the issues?

Let me tell you how I read this. Jews control many corporations; and these individual but soulless institutions fight for Jewish interests. Arabs control oil. Oil moves corporations. Corporations respond to Arab pressure, and these corporations thus fight for Arab interests. But genetic pollution would affect not only us Africans, but also Jews, Arabs and even Europeans and Americans.

We Africans have only our local communities, busy conserving and sustainably using their own biological resources. They foolishly go on respecting their customary norms of giving all humans access to all genetic resources. "Fools, rob them", seems to be the corporate spirit of the North. That is why it is so refreshing to hear Mr. Blair speaking.

Am I saying that Europeans and Americans are evil, that, contrary to the global image portrayed by the European Churches, the Devil is white, and that all that is white is evil and all that is black is meek and shall thus inherit the Earth? Looking at the history of the last 500 years of trade, conquest, slavery, colonialism, neo-colonialism, globalising arrogance, all led by Europe and its Diaspora in the Americas and Oceania, one gets tempted to hold this view; and many blacks use this evil history to hold this evil view.

I do not hold this view. But I pity us, I pity the human species for being prone to such self-degradation through wilful self-destruction. I hold none of you here as personally responsible for our past and present condition. Even less do I hold our local communities responsible for not withstanding, for not pushing back and for not punishing the European Diaspora that wandered back to its native land, Africa. We Africans sent Europeans away to begin with. They were our great uncles and aunts, and you are our grand cousins and nieces. The African ethos welcomes all humans. I do not blame you, I blame institutions for the past excess.

8. Institutions and the Individual

The majority of present day European and North American institutions were established during the colonial or even slavery eras. In the relatively short post-colonial period, actual competition among industrialised countries, and even anticipated competition with developing countries assumed to be industrialising fast, has kept them more or less preoccupied with themselves and thus inward-looking and defensive. They still run on colonial inertia. I know it when I see it. I encounter it at Heathrow Airport. Fortunately, once out of Heathrow, I can and do avoid such institutions. To the extent that they have consciously applied modernising force to modify the direction of this inertia, it has largely been to enable them to compete more effectively, to act more voraciously. Whatever change has tried to accommodate the impoverished South has been restricted to aid departments.

On the whole, therefore, institutional support from the North is fraught with the risk of generating Southern institutions that serve Northern purposes, and often the outdated colonial purposes at that. Such Southern institutions act as cancerous growths in the body. Southern leaders and functionaries have thus their societal values replaced by Northern values through the Northern educational institutions and systems cancerous in the South. In any case, they are directly and/or indirectly indebted to Northern leaders and functionaries for their position and personal wealth. A Northern disapproval can mean a coup or a debilitating sanction.

The modern Southern, and, as time goes on, also the Northern institutions thus get out of phase with current values both in the South and in the North. The Southern public, and increasingly also the Northern public, thus get progressively disenchanted with Northern institutions and with their Southern imitations, also called in the South 'modern' institutions. Traditional Southern institutions then begin to be seen in a new and more favourable light.

Southern institutions are both traditional and modern, with formal recognition and power residing in the latter. The modern institutions are inappropriate because they are, at best, not created in response to the felt needs of the population, and are mostly Northern implants with cancerous effects.

The traditional institutions function on inertia from the pre-colonial past. The aggressive colonial, and more recent cancerous, institutions which wield power nationally, often force the traditional institutions to be defensive and inward looking. The traditional institutions are, therefore, not very daring in experiments at adapting themselves to these fast-changing times.

For these reasons, the South's institutions are even more inappropriate for the conditions, aspirations, and needs for change in their societies than are those of the North in theirs.

9. What Future?

The fear of what the Soviet alternative offered is no more. The Northern capitalist institutions can thus, and do, implement their missions of grabbing embodied in their inertia without restraint. The predatory behaviour of Northern institutions and the cancerous behaviour of Southern institutions are being inflicted aggressively on the hapless public, both in the South and in the North. This is being streamlined by the Northern institutions co-opting the cancerous Southern institutions into formalised partnerships through international law. This is resulting in new institutions which are predatory in favour of the corporate North, e.g. the World Trade Organisation.

The predictable consequence is that the interests of the Northern public are converging more and more with those of the Southern public. So is the disenchantment with the existing institutions and with the current process of globalisation. Consistent with the fact that it is Europe that has the longest historical links with the South, such disenchantment in the North is most felt in Europe. The telecommunications component of globalisation is helping this process of North-South public interaction.

If we want a future of less tension and war between South and North, and between the 'haves' and the 'have-nots' in both the South and the North, therefore, we must bypass the inertia of Northern institutions and foster direct South-North linkages at the peoples level. This will prepare the world for reforming its own institutions, for new and appropriate institutions.

We must also develop ideas that unite South and North in fairness and social justice at the individual, the community and the society levels. We need such ideas as the missions of the new institutions we will create.

The alternative is creeping chaos which will first destroy the little that is left in the South but will soon enough engulf the North with its plenty in a massive conflagration that will leave it more scorched. The South would survive better owing to its stronger local communities. Staying put with national institutions out of synchrony with the values of their public is not going to be possible for long in this age of globalisation of information. We often forget that globalisation is a two-edged sword.

But, would that not be a challenge to the global *status quo* and thus be actively prevented? Should I not be frightened expressing these ideas? Frightened of what might happen to me personally and to my kind, the poor and the rustic peoples of the South?

I will first tell you 2 very short stories my father told me at different times when I was 7 or 8 years old.

First story: Two friends were travelling. No cars then. Night came. They tethered their horses, got near a bush, and lay down on the ground to sleep. One of them was a coward. The other one also feared danger, but he also realistically evaluated it, and that is why he was "normal". Before falling asleep, the friends agreed that, if either of them was awakened by any sound of danger, he was to wake up the other. Then they fell asleep. At night, the "normal" man woke up. And he said, "I think I hear some movement." The coward then whispered, "Shh! Don't worry. It is a hyena. It is only eating my leg. We are safe". The "normal" man jumped up and chased away the hyena and helped his now one-legged friend back homewards.

Second story: The same scene until lying down on the ground by the bush, and agreeing to wake up each other in case of danger. The coward placed a very thick cudgel beside him for protection. He was startled by a nightmare in which he saw a hyena chewing his leg. He automatically went for his cudgel, and gave the carnivorous hyena a big whack. But no hyena; it was on his own leg that the cudgel landed. He howled. His friend woke up to look after a one-legged friend and help him homewards.

What is the moral of these stories? The moral is that, yes, I get frightened. But I also know that if I lie low for fear, I will only be buried. I would be lucky to be eaten; being eaten would imply being noticed. Therefore, I value my fear: it motivates me into action. But, if my action is not well considered to maximise effectiveness, I would only knock off the leg I stand on. I know that so long as I do not break the law, I am safe whether the globalising powers that be like me or not. And the *status quo* always has the stated ideology of fairness. It needs it to mollify its own population. Therefore, it takes unfair action only if it were needed to oil its resource flow pump. Therefore, I safely fight unfairness under the ideological terms of the home of institutionalised and silent unfairness. Violence is a loud instrument. And noise may wake up the unaware fair public. So, violence is unlikely. So, I am safe. I am not implying that the unfair institutions are always silent. They are usually so. But hear, for example, the barking about countering terrestrial terrorism with star-wars dream armaments. This is loud, but it is merely a cudgel that aims at the skies and beyond. And, in spite of its loud bangs, it has a very weak knee. Ordinary fear of the ordinary person harnessing the ordinary power of consideration of the ordinary person, can wound that knee. Therefore, let us forget the arrogance of the mighty and the terror of the coward and act rationally and nationally to change our morbid institutions.

I challenge you all to act to change your institutions. I know that institutional routine has tied down most of us, in the North and in the South, and we cannot easily see the problem of institutional inertia. Let us wake up and push those who are too pre-occupied with routine to think beyond it. We owe it to our future generations to do that. Those of you who are willing to apply the necessary pressure to change the institutional inertia are our brothers and sisters; let us continue together. Those who realise this institutional inertia and are happy with it and gloat over our condition e.g. skinheads and the right wing governments, rub in on us at the present the evils of slavery and colonialism their ancestors perpetrated in the past. We want the present to be one of catharsis, of forging a new common future. Those who knowingly refuse our partnership into the future and thus actively aid and abet attempts to repeat the past, which lives on in their institutions, are our declared enemies. They may think they are powerful, but we take this as an over reaction of the extreme coward, with a bare knee conveniently placed for us to aim at. Truth and justice are on our side. Irrespective of anybody's perceived might I am safe since I will always have my own

country. Since I will always be by my own riverside. Since I will always be in my own village. Since I will always be within my own community. May you all also so be. Then we can banish all fear and unfairness.

May I also appeal to my hosts, the Department of Environment, who have given me this great honour, to also give due honour to the ever living rural local communities by supporting them financially and technically, but most of all, by helping them push aside global structures that refuse them room to care for our biosphere as only they know best how to. The only time globalisation with all its now intimidating superstructures will have a human face is when it fosters the internally motivated development of the local community wherein it is in human nature to snuggle for comfort.

Thank you all. I will remember you all back in my country, back by my riverside, back in my village, back within my community.

Thank you.

Endnotes

1. Laplant, Benoit and Martin K. Luckert, 1993, "The wastepaper dilemma: can newsprint recycling legislation kill two birds with one stone?" in W.L. Adamwicz, W. White and W.E. Phillips (editors), **Forestry and the Environment: Economic Perspectives**, C.A.B. International: Wallingford, UK, p. 97-116, has summarised the economic reasons why private ownership and thus market forces alone cannot ensure forest conservation.
2. The word "homeostasis" refers to the maintenance of stability by using internal functional components to counteract external disturbances.
3. Any introductory textbook on ecology will give sufficient information to understand an ecosystem. A brief but sufficient analytic description is found in the proceedings of a workshop: Linthurst, R.A, P. Bourdeau and R.G. Tardiff, 1995, (ed.) **Methods to Assess the Effects of Chemicals on Ecosystems**, John Wiley & Sons Ltd: Baffins Lane, Chichester, U.K., pp. 13-34. Though views on the degree to which an ecosystem can be seen as a loose assemblage of organisms with complementary requirements, (e.g. McIntosh, R.P., "Ecology since 1900", in B.J. Taylor and T.J. White, (ed.) 1976. **Issues and Ideas in America**, University of Oklahoma Press: Norman, Oklahoma, pp. 353-372;) or as a superorganism with the component species as its clearly determinable parts, (e.g. Clements F.E., 1905. **Research Methods in Ecology**. University Publishing Co.: Lincoln, Nebraska), the ecosystem as a unit maintained at more or less the same condition, even if changing over the long term, through homeostasis achieved by the interactions among all the components, is accepted as ecological fact.
4. Heywood, V. H., and R. T. Watson, 1995, **Global Biodiversity Assessment** Published for UNEP by Cambridge University Press: Cambridge, p. 443.
5. **Ibid**, pp. 402-405, and p. 448.
6. **Ibid**, pp. 326-452 give additional information on how this soil deterioration occurs.
7. Salinization as a consequence of irrigation, especially when water drainage is not properly carried out, is a well-documented phenomenon. Therefore, even though it may at first sound counter-intuitive to associate excess salts with excess water, it is lack of proper drainage that causes simultaneous waterlogging and salinization, and land lost to both is usually lumped together. Brown, L.R., and C. Flavin, 1997. **Vital Signs, 1997**, World Watch Institute: Washington, p. 42, state that 2 million hectares of irrigated land are lost annually to waterlogging and salinization. Pretty, J.N., 1995. **Regenerating Agriculture**,

- Earthscan Publications Ltd.: London, pp. 126-127, gives the lower estimate of 1.5 million hectares per year. But either figure is equally frightening.
8. World Resources Institute, United Nations Environment Programme, United Nations Development Programme and The World Bank, 1998. **1998-99 World Resources – A Guide to the Global Environment**, Oxford University Press: Oxford, p. 157, state that soil is being eroded globally at a rate of 16 to 300 times than it is being formed. This shows that we are eating up nature's investment and investing in death for future generations.
 9. On 24 September 1995, the participants of the "Revelation and the Environment, AD 95-1995" symposium visited the ruins of the ancient city of Ephesus. I was one of them. While in the ruins of the city, dug out by archaeologists, we were told that it was soil eroded from the surrounding hills that had sedimented out and buried the city. The hills were now mostly rock.
 10. Howard, A., undated. **An Agricultural Testament**, The Other India Press: (Reprinted. First published in London in 1940), pp. 1 and 32-38 describes the system. Note that there is no mixed farming in industrial agriculture. It is, however, extensively used by farming communities of the South, including Africa.
 11. Unless it is owing to my lack of access to the complete literature, modern papers and books on soil science do not deal with the health implications of soil organic matter (humus). But it may also be because modern authors are so engrossed with ecosystem replacement agrochemicals for dealing with crop diseases and pests that they do not focus on natural cures. But authors that published before agrochemicals were as widely used as now wrote on the issue. Howard, A., **ibid**, pp. 143-174, shows the importance of high humus content and a balanced agroecosystem as important in keeping crops physiologically fit and thus not succumbing to diseases and pests. He argues that the use of agrochemicals for fighting diseases and pests is of limited efficacy since the diseases and pests adapt to the chemicals. More recently but still before agrochemicals became so ubiquitous, Russel, E.W., 1961. **Soil Conditions and Plant Growth**, Longman, Green and Co. Ltd.: London, has repeated the same basic theme, with more precise information, pp. 210-221 on how a balanced soil microflora helps, and pp. 523-534 on how soil organic matter helps by keeping plants healthy and resistant to pests and diseases.
 12. Howard, A., undated. **Op. Cit.**, pp. 188-189.
 13. Fowler, C., & P. Mooney, 1990. **Shattering: Food, Politics, and the Loss of Genetic Diversity**, The University of Arizona Press: Tucson, Arizona, p. 135, report that between 1947 and 1977, new barley varieties in the U.K. were losing their resistance about every 3 years.
 14. Fowler, C., and P. Mooney, 1990. **The Threatened Gene: Food, Politics and the Loss of Genetic Diversity**. The Lutterworth Press: Cambridge, pp. 115-139.
 15. The specially trained plant breeders who produce the homogenous varieties for industrial agriculture have been denying that farming communities are breeders and saying that they merely select what nature provides. This is indeed true, but not only of farming communities, but also of plant scientists. That is why to conjure up a distinction the industrial agriculture breeders call the varieties produced by farming communities "land races", denoting that it is the land and not the farming community that produced the variety. Albeit grudgingly, even industrial agriculture plant breeders are now recognising farming communities also as breeders, e.g. Duvick, D.N., "Plant breeding and biotechnology for meeting future food needs," in: Islam, N., (ed.), 1995. **Population and Food in the Early Twenty-First Century: Meeting Future Food Demand of an Increasing Population**, International Food Policy Research Institute: Washington, D.C., pp. 221-222, recognises both as breeders and distinguishes their contributions as "professional plant breeding" and "plant breeding by farmers".

16. Pretty, J.N., 1995. **Op. Cit.**, pp. 94-130 describes methods used by various farming communities from many parts of the world to maintain agroecosystem homeostasis. There are many other studies from all over the South.
17. Pretty, J.N., 1995. **Op. Cit.**, pp. 26-93, Conway, G.R. and Pretty, J.N., 1991. **Unwelcome Harvest**, Earthscan Publications Ltd.: London, pp. 17-369, Heywood, V.H., and R.T. Watson, 1995. **Op. Cit.**, pp. 326-452, Shiva, V., 1991. **The Violence of the Green Revolution**, Third World Network: Penang, Malaysia, pp. 103-150, among many others, have described the specifics of how this loss of homeostasis occurs.
18. The United Nations Development Programme, 2001, **Human Development Report 2001**, Oxford University Press: New York, p. 35, states, "Biotechnology offers the only or the best 'tool of choice' for marginal ecological zones ... home to more than half of the world's poorest people ..." In the next paragraph, the UNDP states, "There is a long way to go before biotechnology's potential is mobilised." In so saying, the UNDP admits that biotechnology as 'the only tool' has not been tested in marginal areas to prove itself as the best tool, or even as any tool. Therefore, it is only a dream to state that it is "The only tool". Each of us can dream, of course, including those manning the UNDP. But dreams cannot become food. I know that there has not been even one successful, transgenic crop developed for the marginal areas by the poor. Assuming that biotechnology could indeed produce adequate food in marginal areas, how are "the world's poorest people", who are mostly not even monetised, nor even literate in their own languages let alone in English, going to deal with the intricate negotiations with patent holders, who will most probably be all foreign and from the North, meant to deal with the negotiations required to use patents, and how are they to pay the royalties? In spite of a discussion on IPRs (see pp. 102-109) the UNDP is silent on the issue. This certainly turns its dream into a nightmare!
19. The genetically engineered Bt varieties have all had a gene from a bacterium (*Bacillus thuringiensis*) introduced into them: This gene produces a general poison which indiscriminately kills at least insects, including pollinators, bees etc. See, for example, National Research Council, 1989. **Field Testing Genetically Modified Organisms**, National Academy Press: Washington, p. 63, and James, C., 2000. **Global Status of Commercialised Transgenic Crops**. ISAA: Ithaca, NY.
20. National Research Council, **Op. Cit.**, p. 62; James, C., 2000. **Op. Cit.**
21. It is understandable that official Northern publications, even UN, IMF and World Bank, who should know this best, do not write much about it except in broad terms, for instance, on the debt of developing countries, e.g. UNDP, 2001. **Human Development Report 2001**, Oxford University Press Inc., New York, pp. 191-194. Many individuals have, however, written on these issues. An easily readable account of how developed countries, especially through the international lending institutions, exact conditionalities, including structural adjustment, has been written by: Hancock, G., 1989 **Lords of Poverty**, Mandarin Paperbacks: London, pp. 37-75. The private sector also exacts obedience to its conditionalities, including within its own home base, and pressurises governments effectively to do what it wants. This has been described by many authors, e.g. Korten, D.C., 1995. **When Corporations Rule the World**, Earthscan Publications Limited: London.
22. Khor, Martin, 1994. South-North resource flows and their implication for sustainable development. *Resurgence*, No. 46.: pp 4-25.
23. Simpson, John, 1992. **The Concise Oxford Dictionary of Proverbs**, 2nd.Edition, Oxford University Press: Oxford, p. 50.
24. A fuller treatment can be found in Tewolde Berhan Gebre Egziabher, 2001. **The Inappropriateness of the Patent System for Life Forms and Processes**, Third World Network: Penang, Malaysia, 26 pp.