The Parts of Life

Agricultural Biodiversity, Indigenous Knowledge, and the Role of the Third System

By Pat Roy Mooney

Editorial Note

This is the third part of a trilogy on genetic resources and biodiversity, which the Dag Hammarskjöld Foundation has published in the course of the past 14 years. It brings up to date the remarkable story of the contribution of the 'Third System'—civil society and its organisations—to the struggle for control over the genetic wealth on which food security and human survival depend.

It could well be argued that this contribution by Third System organisations—or Civil Society Organisations (CSOs), as the author prefers to call them—is one of the best examples in today's world of how a life-decisive issue, over a period of two decades, has been 'discovered', brought out of the specialist domain into public and international fora for discussion and democratic decision-making by the Third System, and gradually been accorded its full political, social and economic importance. The issue, as we shall see in the following pages, has been and still is the cause of bitter political struggles, complicated intergovernmental negotiations, galloping numbers of industrial mergers and huge investments and profits, while small farmers—key actors in the fight for global survival—and their knowledge, are still mostly neglected.

For the Dag Hammarskjöld Foundation it all started in 1983 with the publication of *The Law of the Seed: Another Development and Plant Genetic Resources* in *Development Dialogue* (1983:1–2). The group of people with whom we have worked closely since then—Pat Roy Mooney, Hope Shand and Cary Fowler, later joined by several others—had, however, begun their work on plant genetic resources long before and trace the 'founding' of their 'movement' back to November 1977.

We at the Dag Hammarskjöld Foundation first took note of the issue of plant genetic resources when we came across Pat Roy Mooney's book *Seeds of the Earth* (1979). It drew our attention to the serious threat to the diversity of nature, and particularly the species on which we depend for our food security. The concentration on small selections of seed varieties energetically sponsored by Western research and industry, to the detriment of the broad diversity kept alive by small farmers around the world, was one of several disturbing factors. There was also a striking imbalance in the control of ownership and 'rights' over plant genetic resources between the South, from which over 90 per cent of these resources originated, and the North, which bred them, patented them and sold them on the world market for good profits under monopoly-like conditions.

Clearly, the emerging situation was not consonant with what was stated in the 1975 Dag Hammarskjöld Report, *What Now: Another Development* (*Development Dialogue* 1975:1–2)—still the Foundation's major policy document—about the strengthening of the South's capacity for self-reliant development. More particularly, the Report had emphasised that the South should exercise 'the right of national economic sovereignty over resources and production' and should seek to bring to an end 'the drain of resources from the Third World to the industrialised countries' by, *inter alia*, reviewing 'contracts, leases and concessions entered into with transnational cor-

porations under conditions of inequality' and 'regulations of conditions governing trade in technology including the revision of the present patent system'. This quote seems as relevant today as it was in 1975, while the political and economic power structures, unfortunately, seem to have changed considerably in favour of the North.

The central argument put forward by Pat Roy Mooney in *The Law of the Seed*, and one deserving serious concern, is the simple fact that seeds are the first link in the food chain and that it is totally unacceptable for these to be subject to exclusive control, monopoly patenting and genetically uniform breeding which limits diversity. 'There can be no true land reform—no true agrarian justice of any kind—and certainly no national self-reliance', he emphasised, if these fundamental questions are not given proper attention and solved in a just and democratic way.

The Law of the Seed was presented to the world's food politicians under dramatic circumstances. With the printing ink and binding glue still damp, the first 500 copies were delivered to Stockholm airport by our indefatigable printer and highly valued collaborator for over 20 years, Gunnar Stenmark of Motala Grafiska, just in time for them to be taken to Rome for the opening of the FAO General Conference in November 1983. We managed to distribute all the copies during the first few days of the Conference, although we were not allowed to bring copies within the walls of the FAO building. The interest among delegates was remarkable.

In the second part of the trilogy, *The Laws of Life: Another Development and the New Biotechnologies* (*Development Dialogue* 1988:1–2), Pat Roy Mooney was joined as author by three colleagues and friends: Cary Fowler, Eva Lachkovics and Hope Shand. In *The Laws of Life* the aim of the authors was to make intelligible to the interested lay person and development worker the complicated subject matter of the new biotechnologies, a matter which was—and is—of great social and economic importance, but at the time was the almost exclusive preserve of technical specialists. The 350-page volume first gave an overview of the basic technical aspects of biotechnology and then addressed its economic and political dimensions in two comprehensive major sections.

The authors of *The Laws of Life* realised that biotechnology would affect all of us but feared that its most profound impact would be felt in the South. It was therefore important, they emphasised, that 'before we can reach an understanding of the proper role of the new biotechnologies, we should consider what the needs of the world are and what genuine development should be—development *for whom* and *of what, by whom* and *how*,' as the questions were put in *What Now: Another Development* (1975). The choice of technology should be guided by its safety and ability to function under different cultural conditions, it was argued, and conventional technologies should be used before biotechnological solutions are tried. *The Laws of Life* rapidly became a great success and was widely read by members of civil society organisations as well as by representatives of government and industry.

The present special issue of *Development Dialogue, The Parts of Life: Agricultural Biodiversity, Indigenous Knowledge, and the Role of the Third System* is the third volume in the trilogy. It is authored by Pat Roy Mooney with the assistance of the RAFI team. It carries, for technical reasons, the number 1996:1–2 but was actually completed in the middle of November 1997 with the last amendments inserted in early December 1997. We apologise for the delay in the publishing process but are convinced that the publication you now hold in your hands provides much better reading than we would have been able to offer you a year ago.

The Parts of Life begins with an overview of the political developments around the issue of genetic resources during the past 20 years. In the first three sections, it brings us to the turbulent debates at FAO in Rome in the early 1980s, which resulted in the creation of the Commission and the International Undertaking on Plant Genetic Resources under the administration of FAO. It also takes us to the intense discussions of the Keystone International Dialogue Series on Plant Genetic Resources (1988–91), organised by the Keystone Center, a non-profit organisation, based in the Colorado Rocky Mountains in USA. The Dialogue was an ongoing, off-the-record discussion between the key actors in the field—governments, industry, research institutions and CSOs. They met in seminars and workshops in different locations in the world and managed, surprisingly, to find many areas where it was possible to reach agreement or, at least, understanding. The process also uncovered areas where disagreement could be clearly spelled out and were, therefore, susceptible to analysis and critique. In the third section, 'Parts Present', the author updates the reader on the international debate by commenting in detail on the process leading to—and the outcome of—the Fourth International Technical Conference on Plant Genetic Resources held in Leipzig in June 1996, the status of the negotiations in the Conference of the Parties (COP) to the Convention on Biological Diversity (CBD), and the results of the World Food Summit in November 1996.

For those of our readers who are not familiar with these particular arenas of political and economic struggle, the first three sections provide a valuable background to what follows in the volume. For those who have themselves been part of these battles or followed the discussions, it may be preferable to move directly to the middle of the volume. In this connection, it is perhaps important to say that this issue of *Development Dialogue* serves many purposes. It should, first and foremost, be read as a passionate and significant contribution to the present international debate, but it is also an important historical survey written by one of the most dynamic veteran actors in this drama. In addition, it offers a well-documented account which provides a wealth of important references.

'Parts Patrician' and 'First Parts' (sections 4 and 5) deal with a major conflict in the politics of plant genetic resources and agriculture generally. The author first explains the need for reform of the Consultative Group on International Agricultural Research—or 'CG System'—a Northern-dominated body operating through 16 international research centres and exercising considerable control over research at the na-

tional level throughout the South. He contrasts the view of the CG System with the view of those who maintain that the problem of food security—and of human survival—in the future can only be solved by giving local farmers around the world full support and encouragement to pursue their work, methods and technology within their own framework of development. The introduction of the broadly conceived and little diversified green revolution technologies from above in such environments often has been utterly counterproductive, threatening not only food security, based on local and indigenous knowledge, but also health security, environmental security and the 'knowledge security' of rural people. To reiterate the precept of William Blake which Pat Roy Mooney has chosen for this volume: 'He who would do good to another must do so in minute particulars; general good is the plea of the scoundrel, hypocrite and flatterer; for art and science cannot exist but in minutely organised particulars.'

In 'Forgotten Parts' and 'Private Parts' (sections 6 and 7), the author draws attention to the extraction of other genetic resources—medicinal plants and marine and soil diversity—by transnationals and research institutions linked to these, for the purpose of rapidly developing new products for the market. The latter part of section 6 focuses on human diversity and the collecting of human genes, which over the past decade has also become a matter of corporate profit and patent speculation—a truly questionable development. Linked to this is the concentration of capital and power among transnational enterprises in the broad area of food security and biodiversity, which has been going on for the past 10–15 years. In a rapidly accelerating process corporations are buying smaller companies or merging with earlier competitors, thus creating monolithic enterprises and reducing biodiversity. A clear account of the mad power race towards global monopolies is provided in text and graphs.

In 'The Part of the People' (the concluding section), the author discusses the roles of the different actors on the scene and particularly the responsibilities of the Third System—civil society organisations. He concludes that CSOs must take on much greater responsibilities than they have so far, if they wish to offer a reliable alternative to the one-dimensional, top-directed globalisation philosophy that seems to be almost universally accepted. He points to three areas where CSOs could be particularly active. The selection of the leadership of intergovernmental organisations is one of them. Guided by the critical proposals advanced in Brian Urquhart's and Erskine Childers' *A World in Need of Leadership: Tomorrow's United Nations—A Fresh Appraisal* (Dag Hammarskjöld Foundation, 1996), the author directs the attention of CSOs to the processes used when new leaders of UN agencies, programmes and funds are elected. These are generally haphazard and do not usually provide for any wider consultation; nor do they, as yet, involve any representatives of Third System organisations or citizens. Also referring to Charles Weitz' study *Who Speaks for the Hungry? How FAO Elects Its Leader* (Dag Hammarskjöld Foundation, 1997), Mooney concludes that CSOs could definitely make a difference to the process if they decided to act on this matter. Finally, he identifies the 'rights issue' and 'information and communication' as other areas where CSO work could and should be concentrated and

expanded in the future.
Pat Roy Mooney is the Executive Director of the Rural Advancement Foundation International (RAFI), a small civil society organisation with its international office in Winnipeg, Canada, and its US base in Pittsboro, North Carolina. RAFI is dedicated to the conservation and sustainable use of biodiversity and to the socially responsible development of technologies useful to rural societies. It is concerned with the loss of agricultural diversity, the impact of intellectual property on biotechnology and food security, and the governance of international institutions that affect rural communities. With a staff of only six people RAFI has managed to influence profoundly the politics of plant genetic resources at the global level and has given it new bearings and directions.

There are a number of related organisations that should be mentioned together with RAFI as having shared the work in this field. Genetic Resources Action International (GRAIN), based in Barcelona, has played a decisive role and, *inter alia*, been very active in monitoring developments within the European Union and influencing its policies. The Southeast Asian Regional Institute for Community Education (SEARICE) has carried out important work in that region, as has the African Seeds of Survival organisation on its continent; and both have worked at the global level. The contributions of the Latin American Consortium for Agroecology and Development (CLADES), with its head office in Santiago, Chile, and the Indigenous Peoples' Biodiversity Network (IBPN), administered from Ottawa, should also be emphasised in this context.

In order to assist readers in finding their way among all the acronyms, a list of abbreviations has been prepared; a glossary is also provided.

In the present world situation, strong forces are advancing the idea of globalisation as the only solution to almost all problems encountered in our societies, both in the South and in the North. Governments, business and the media all seem to be in thrall to the gospel preachers of neoliberalism, while citizens generally are left without guidance and tend to give up when confronted with the complexities and power of international economic markets.

In the midst of all this stands Pat Roy Mooney arguing strongly and convincingly for something very different. Building on trust in people and people's knowledge, he offers a vision of a society guided by democratic principles, a belief in participation, self-reliance and respect for the environment in all its minute particulars.

Introduction

William Blake and the Quilting Bee

On my part of the Canadian prairies the activity is fading but the memory remains of the quilting bees. Women (local history records that men occasionally joined in) would gather in someone's farm kitchen to set the theme for a quilt (a heavily-padded bed-covering comprised of many individually-stitched patches sewn together). Once the theme was negotiated, the women might either sew together or just agree to meet when their patches were completed for the final sewing.

It's an image I like very much. Each person selected her own materials, made her own design, and was responsible for her own patch. In the end, the pieces came together to form a remarkable whole. There's hardly a museum or art gallery in Canada that doesn't boast of some of these quilts and the best of them have toured internationally—to mingle with their counterparts in Europe or Africa. Was the theme dictated? Did one 'queen bee' lay down the law and the others submit? Undoubtedly this happened, at least occasionally. I prefer to think—and there is reason for it—that decisions regarding theme and the final arrangement of the patches were just one more process of community living and negotiation. Sometimes creative, fulfilling, and democratic—sometimes not. But it was, in the end, a community process and all the remaining tales about the quilting bees are invested with a kind of curmudgeonly comfort that overwhelms even our customary habit of viewing all things rural through a bucolic haze.

If there is one theme in the patchy cacophony you are about to read, it is that the solutions to world problems—be they environmental or political—can only come through a patchwork quilt. Each piece must have its own integrity. In the end, of course, it is sewn together—as surely as the earth is round this is happily unavoidable. But there is no quilt unless each patch is complete.

William Blake, in *Jerusalem*, said it more eloquently: 'He who would do good to another must do so in Minute Particulars; General Good is the plea of the scoundrel, hypocrite and flatterer; For Art and Science cannot exist but in minutely organised Particulars.' For those striving to protect human rights—those of indigenous peoples or farmers—the message is that these rights must have integrity first within these communities before others dare codify them within international laws or conventions. This is not to say that they must not be defended and strengthened in every way possible now—and at every level—but the ultimate understanding and implementation of these rights is built from the 'minutely organised particulars' of each community. For those of us struggling to protect biological diversity and the ecosystem, Blake and the quilt-makers have the same advice. The security of

the environment will only come if each eco-niche is secured by those who know it best. For those fighting for world food security, the real challenge is not to create new technologies (though this can be very useful); it is to build food security from the family to the farm to the community to the nation and on to the world. If somebody's proposed solution does not make sense in each patch and particular, then the 'General Good' will only serve the world's scoundrels and charlatans.

The Parts of Life

This has been a hard issue to write. I began it following the Keystone Dialogue's conclusion in mid-1991. I have worked away at it over the years in bits and patches but sometimes without the integrating integrity that could have been found in a quilting bee. Rather than a reflective step back to analyse past events, it has been written in the midst of wars, in the odd quiet moments between battles. The resulting patches offer more of a pageant than a panoramic overview of the issues surrounding genetic resources. For this, I should apologise. The Dag Hammarskjöld Foundation has thousands of faithful followers and readers and I have probably too often assumed that those struggling through this issue have also read *The Law of the Seed* and *The Laws of Life*. In the opening parts of this volume, I lean heavily on these earlier issues of *Development Dialogue* to bring readers up to date on the ongoing negotiations at the intergovernmental level. In the middle parts, the volume concentrates on the pivotal role played by the international agricultural research system in protecting and utilising agricultural biodiversity—and on the still unacknowledged place of what I call 'First Farmers' in creating and nurturing diversity. In the final parts, the focus is on the two main threats to biodiversity: the Life Industry that would so unwittingly destroy diversity—and ourselves, the civil society organisations (CSOs), who would so wittingly avoid the hard choices necessary to restore diversity and rights. Many parts are missing. There is little in this volume about biotechnology or biological warfare—two urgent concerns that dominated *The Laws of Life*. There is also far too little about the World Trade Organization (WTO) and the terrible downward spiral to globalisation. But these are topics many are writing about. I regret, more, that I have written so little about the astonishing work being done by so many friends at the community level to develop diversity and to support cooperative innovation. Perhaps this oversight is unforgivable.

RAFI began its work 20 years ago. Cary Fowler, Hope Shand and I have tended to count the 'founding' from a meeting we organised in November 1977 in Saskatchewan, Canada. We managed to bring together about 30 CSO researchers and activists from almost as many countries. In the end, we

concluded that the great neglected issue in agriculture was the control of seeds. Over the decades, seeds became genetic resources which in turn became agricultural biodiversity. As you will read, it has, with this issue of *Development Dialogue*, become the parts of life.

Of parts and actors

Every issue of justice played out on the international stage has roles and actors. It may seem frivolous to characterise people and parts in this way but only if we are willing to trivialise Bertolt Brecht or Milan Kundera. To reject some of the actors as unworthy—to wipe them away as though they did not exist—would be to forget the meaning of diversity and to risk becoming its greatest enemy.

Producers and directors

As I flip through the pages now, there is far too much that is personal here and not nearly enough about partners. Since I first visited the Dag Hammarskjöld Foundation in Uppsala in the early 1980's, Sven Hamrell and Olle Nordberg, Wendy Davies (our editor) and the handful of wonderful people who work there with them have been the closest partners and most forgiving friends imaginable. Sven continues to be my intellectual nemesis and *agent provocateur* and one of the most eclectic people on this planet. Sven, in this issue, is—as ever—Alfred Hitchcock on fast-forward—though his appearances at key moments throughout the pageant are far from cameo. He continues to be a major player. In 1994, Olle Nordberg took over the Director's chair with a grace and strength that ensures the Foundation's pivotal place in civil society well into the next century. Next door to the Foundation's studio—in Norway—my old comrade Cary Fowler remains my best friend and Court Jester in this tragi-comedy. I know there is nothing that offends some folk more than that Cary and I have managed to giggle our way through two decades of loss and frustration. There is nothing in life that does not gain from humour. Whoever dies last will laugh last at the other's funeral. Cary and I are no longer walking down the same side of the street—but we are always bumbling along in the same direction.

Stars

Nothing written by anyone in RAFI is the work of a single person. The best information in this volume comes, undoubtedly, from Hope Shand whose research and analysis are simply extraordinary. To a degree that shocks the hell out of Hope and me, Edward Hammond, only in RAFI since 1995, has contributed hugely to RAFI's work and to much of the biopiracy information between these pages. Beverly Cross, who joined Hope and Cary and me in 1982, helped both research and edit important parts of *The Law of the Seed* and *The Laws of Life. The Parts of Life* is as much her third book as it is anyone's in RAFI. In the midst of all this, Jean Christie has kept it all

together, financially solvent, and maintaining the connections with partners on issues ranging from the Human Genome Diversity Project to the World Food Summit.

Co-stars

It is a gross failing of this issue that so little is said of Henk Hobbelink and Renée Vellvé of GRAIN. Anyone who reads *Seedling* or who has followed this issue knows that they and their colleagues in Barcelona have given the debate surrounding genetic resources a standard of thoughtfulness and excellence that the rest of us can only applaud.

Heroes

There are actors here that I have failed to present in the way that they deserve. First among them are four heroes whom I admire more than I can say or have ever told them. They are Melaku Worede of Ethiopia who taught me to respect both science and farmers; Camila Montecinos, who history will record as one of the great thinkers of both agricultural biodiversity and intellectual property; Rene Salazar, who knows more about strategy and the balance between the stratosphere of international politics and the biosphere of farm realities than anyone I know; and Alejandro Argumedo, who carries more in his head and in his heart than any person should have to bear.

Scene-setters (stage left)

Many of our best actors over the years have come from governments and intergovernmental organisations. Some, with especially demanding character parts, may prefer to remain discreetly within their roles! From the intergovernmental side of the stage (usually stage left) I present José Ramon Lopez-Portillo, just retired as Independent Chair of the FAO Council and, previously, Mexico's Ambassador during the most intense debates at FAO; and Mohammed Zehni, also just retired from his cat-bird post in the FAO Secretariat and former Libyan Ambassador to FAO. Dr Zehni, a scientist himself, has been technical advisor for this seeds play and one of the most adroit diplomats ever to venture onto the Circus Maximus set. Both men deserve a special place in the history of genetic resources. So, too, do Erna Bennett, a ferocious Irish revolutionary, who dragged FAO and CGIAR, often kicking and screaming, into the political and practical work of agricultural biodiversity when she worked at FAO from the 1960s until she was exiled in the early 1980s; and José (Pepe) T. Esquinas-Alcazar, the undisputed Don Quixote of germplasm and the most insufferably courageous hero ever to wear a cape on an intergovernmental stage.

From governments whose compass bearings are 'North', Jaap Hardon of The Netherlands, Ulf Svensson of Sweden, and Jan Borring of Norway have always displayed a wonderfully poor sense of direction, non-Nordic passion, and pure diplomatic genius.

Villains (stage right)

I would also like to acknowledge those actors with whom I have disagreed—been fighting against—these past 20 years. It would be nice to believe that those of us who think we are on the side of the angels acted a little more like angels ourselves. I have never noticed that CSOs have cornered the market on decency. In the many battles around the Circus Maximus and in the Biodiversity Convention, I have nothing but personal respect for the way Wayne Denney and Henry Shands—both of the US delegation—have conducted themselves as honourable representatives of their government and as good and decent men. I will never believe that we have not had more in common than that which separates us. Similarly, Tim Roberts and Don Duvick—both retired from villainous transnationals I love to hate—have always offered only the highest level of personal dedication to the issues I pretend to champion. We read from different scripts but I consider them friends.

Missing roles

I have also to mention two old foes no longer with us. Dalmo Giacometti and Wolfgang Seibeck were part of the Keystone performance and we fought tooth and nail for many years. Dalmo never met a seed he didn't want to bring home to his garden in Brasilia and Wolfgang never met a patent he didn't like. They have both died tragically and I miss their warmth, humour and honesty.

Music and score

Among partners, Susie Walsh, is not only my intellectual and moral critic but the artist who brings the most joy and harmony to my life. And then there are those six who make up the chorus, who contribute so happily to the cacophony—Robin, Kate, Sarah, Jeff, Nick and Kelsey. Theirs is a music I could not live without.

I commend all these players, and their parts, to the reader. Their enormous talents will be found—though often hidden—in the script ahead. If the scenes in which they appear are not clear, it is through no fault of theirs.

Winnipeg, Canada, November 1997 *Pat Roy Mooney*

List of Abbreviations

ASSINSELAssociation Internationale des Séléctionneurs pour la Protection des Obtentions Végétales (International Association of Plant Breeders for the Protection of Plant Varieties)
ATCCAmerican Type Culture Collection
CBDConvention on Biological Diversity
CGIARConsultative Group on International Agricultural Research (also called the CG System)
CIATCentro Internacional de Agricultura Tropical (International Centre for Tropical Agriculture)
CIMMYTCentro Internacional de Mejoramiento de Maiz y Trigo (International Maize and Wheat Improvement Center)
CIPCentro Internacional de la Papa (International Potato Centre)
CLADESConsorcio Latinoamericano sobre Agroecologia y Desarrollo (Latin American Consortium on Agroecology and Development)
COPConference of the Parties (to the Convention on Biological Diversity—see Glossary)
CSOCivil Society Organisation
DNAdeoxyribonucleic acid (see Glossary)
ECOSOCUN Economic and Social Council
FAOUN Food and Agriculture Organization
G77The Group of 77 originally comprised 77 developing countries which came together to prepare for the 1964 UNCTAD conference. The membership has increased to some 130 countries.
GATTGeneral Agreement on Tariffs and Trade
GEFGlobal Environmental Facility
GRAINGenetic Resources Action International
HRVHigh-response variety
IARCInternational Agricultural Research Centre
IBPGRInternational Board for Plant Genetic Resources (now IPGRI)
ICARDAInternational Center for Agricultural Research in the Dry Areas
ICLARMInternational Centre for Living Aquatic Resources Management
ICRISATInternational Crops Research Institute for the Semi-Arid Tropics
IDRCInternational Development Research Centre
IFADInternational Fund for Agricultural Development
IITAInternational Institute of Tropical Agriculture
IPGRIInternational Plant Genetic Resources Institute (former IBPGR)
IRRIInternational Rice Research Institute
NAFTANorth American Free Trade Agreement
PANPesticide Action Network
RAFIRural Advancement Foundation International
SEARICESoutheast Asian Regional Institute for Community Education
SIDASwedish International Development Cooperation Agency
UNCEDUnited Nations Conference on Environment and Development
UNCTADUnited Nations Conference on Trade and Development
UNDPUnited Nations Development Programme
UPOVInternational Union for the Protection of New Varieties of Plants
USDAUS Department of Agriculture
WFPWorld Food Programme
WIPOWorld Intellectual Property Organization
WTOWorld Trade Organization

1 The Whole Is No Greater than Its Parts

The Socio-Scientific State of the Genetic Resources Drama

The 'globalisation' of the environment with its myopic focus on sweeping solutions for global warming and greenhouse gases is allowing people and policy-makers to overlook the risk that there may be nothing left in the greenhouse to eat—and that the farmers who have nurtured diversity for millennia are also disappearing. Is the skyward search for holes in the ozone layer leading us to forget the holes in the social fabric around us—and the wholesale takeover of biological resources by industry?

On a brisk Spring day in New York in 1990, a small group gathered in one of the private UN dining rooms within rallying cry of the General Assembly. There was not an ambassador or UN official in the crowd. The only government officer in attendance was one of the two luncheon speakers, a senior US science advisor attached to the Bush administration. Discussing the implications of a White House sponsored conference on climate change a few weeks earlier, the spokesperson got on to the topic of UNCED (the UN Conference on Environment and Development) still more than two years away.

According to the speaker, the Bush administration regarded UNCED as 'unavoidable' even though United Nations fora were 'not the preferred way for Americans to conduct business'. Climate change, the scientist allowed, was the real UNCED agenda. Biological diversity was the raw material needed to help agriculture and industry adapt to climate change. Biotechnology, he concluded, was the tool box needed to put biodiversity to work on industry's behalf. Speaking of industry and diversity, the science expert couldn't help let his remarks drift to the ongoing negotiations (Uruguay Round) of the General Agreement on Tariffs and Trade (GATT) and the likelihood—a 'certainty', he assured me privately—that intellectual property rights over bioresources would be established as a universal trade requirement. The science advisor seemed convinced that GATT, UNCED, biotechnology and biodiversity shared some kind of common economic ecosystem vital to US interests.

To an audience of pharmaceutical and chemical lobbyists the speech marched to the drum of their deepest corporate biorhythms. Certainly, the climate was changing. The simple uncomplicated world of plant genetic resources which I had written about in *The Law of the Seed* in *Development Dialogue* 1983:1–2—even the more ominous world of biotechnology, in *The Laws of Life*—was growing more complicated still. The parts of life seemed to be disassembling. Trade and environment organisations were in

danger of tearing life apart. Two conflicting views of biodiversity were in the wind. Industry saw biodiversity as a tool; urban societies saw it as a toy.

From the jungles of Manhattan, biodiversity seems to stand for all the things we can't use—or at least can't use right now. Biodiversity is panda bears and whales and Bengali tigers. Anything that Walt Disney can make dewy-eyed. For some, if it can't be imprinted on a T-shirt, it's not biodiversity. In the North, biodiversity is also site-specific. Biodiversity is found in rainforests. Preferably, the rainforest should be in the Amazon. If not, Costa Rica or Sabah are second-best. Africa is out. In Africa the world is only interested in elephants and rhinos but they never seem to hang out in rainforests as much as on savannahs—so Africa's rainforests are sort of bias-degradable. The world's concrete jungles have learned a certain appreciation of 'fragile ecosystems'. These, of course, are for the birds. It is becoming common knowledge that Antarctica has a fragile ecosystem—which makes sense because that's where the penguins are. Marshes near big cities are also fragile ecosystems and there is a comfortable conviction developing that these are now being bought by the Nature Conservancy and used, very wisely, by an optimistic group known as Ducks Unlimited. Everything else—wet, dry, or high (especially anything that can be climbed)—is covered by Greenpeace.

There are also certain things that urban legend assures us are clearly not biodiversity. Rice is not. Potatoes are not. Wheat is completely beyond the pale. There is a certain anthropomorphic ambiguity about cows and chickens and pigs but, in general, nothing requiring spoons or chopsticks is biodiversity.

The enemies of biodiversity are also becoming known. These are, in order, commercial land developers, Japanese fishing trawlers, the numerous relations of the Exxon Valdez—the infamous oil tanker that sank off the coast of Alaska—the entire petrochemical industry and anyone who grows food. Luckily, most of these enemies are on water (or travel over water) and since the rainforests are safely on shore, all the world has to do is clean up on farmers and land developers. That's much easier than beating up on Exxon or the US government.

That biodiversity occasionally works for a living is counted as obscene. But only in New York and Berlin and Paris. For the majority of humanity that does not have to watch nature on television but continues to live in rural societies, the distinctions between utility and beauty, between domesticated and 'wild', are much less clear. Cultivated rice needs its weedy relatives whose ancestry goes a long way back. Rice also needs fish to keep down the pest population and rice and fish together benefit from algae and fungi and

insects that formal science has never heard of. Rather than warring factions fighting for scarce nutrients, the diverse forms living in the South's fields and forests and waters are engaged in an energetic exchange. We dare not disconnect them. Policy-makers, be they corporate in New York or political at Biodiversity Conventions, have yet to listen to this exchange and to the rural peoples (especially indigenous peoples) who not only depend upon the dialogue but share in the discourse. The question is not whether we can hear a tree falling in the forest, the question is whether or not we will feel it. Those who will feel it first are the rural poor who depend upon that tree in a hundred ways—who nurture diversity for their own survival.

Global warming and greenhouse gases need urgent attention. But as someone who has lived most of his life around the farms of the Canadian prairies (where a hole in the ozone layer would be a major scenic attraction) the media's 'globalisation' of environmental issues seemed to allow industry to direct the world's attention to the falling sky and away from the practical solutions down on the ground. Leaving the luncheon that day, feeling both cynical and despondent, I was convinced that the struggle ahead—during what was about to be canonised as UNCED's 'Agenda 21'—would be to keep the connection between food security and ecological security and between biodiversity and human diversity.

The parts disassembled

If a tree falls in the forest, it is not likely to die alone. Since *The Laws of Life*, we have learned that genetic erosion is not confined to crops or even forests but also threatens livestock and soils. In the past few years, RAFI has worked with others to monitor the flow from South to North of micro-organisms found in both marine and soil environments. The value of this genetic material can be incredible and its commercial use around the world is already enormous. Beyond micro-organisms, the rate of erosion of livestock breeds—all based upon species originating in the South—makes crop genetic erosion look modest by comparison. By RAFI's estimate, we are losing close to 1 per cent of our rainforests every year, 2 per cent of our crop genetic diversity and 5 per cent of our rare livestock breeds. Ten per cent of our soils have vanished in the past 50 years, and 70 per cent of our coral reefs could be gone in the next 50 years.

In the course of our research on soil organisms, we accidentally uncovered the most alarming tale of all—that human genetic diversity is also at risk and eroding rapidly. When the culture disappears, so does the hope of ecological agriculture and of genuine food security. Human diversity, too, has become a matter of corporate profit and patent speculation. Perhaps 40 per cent of

the world's unique languages will become extinct with the current generation. This translates into 40 per cent of the world's accumulated eco-specific expertise.

An account of these new parts of life—marine diversity, soil diversity and human diversity—is given in 'Forgotten Parts' (section 6).

The part of the people

If a tree falls in the forest, it will probably fall on somebody using it. The starting point for all work and policy is the poor. If environmental or developmental proposals do not fundamentally strengthen the poor in their quest for community self-reliance, they will ultimately be unworkable. For this reason, most debt-for-nature swaps, efforts to establish biosphere reserves, and most of the other sweeping initiatives devised in the wilds of Manhattan rather than on the savannahs of Africa, work against the poor and turn many ecologists into eco-fascists.

Biological diversity offers the poor the means of satisfying nine-tenths or more of all their basic survival needs. Perhaps only half or less of this essential diversity comes from formal cultivation for food or fibre. At least as much, though uncultivated in the traditional sense, is often protected and even nurtured, by the poor. Safeguarded along the banks of rivers or the borders of fields, in family gardens or in forests, this diversity provides medicines, cleaning agents, flavours, fuel and aesthetic value to rural communities. Even in countries with highly sophisticated cropping systems, such as Thailand, as much as one-third of rural nutritional requirements are met by 'uncultivated' species.

Given the opportunity, the rural poor of Africa, Asia and Latin America—who understand that it is in their own best interests to preserve biological diversity—will work closely with scientists and agencies to preserve our common heritage. The task for the rest of us—environmentalists or developmentalists—is to make sure they have that opportunity.

Seeing rural societies as the starting point is not an outright rejection of 'deep ecology'. Humans, after all, are only one of millions of species on this planet. Compared with the way our governments work, dolphins look pretty good. In fact, lemmings look pretty good. But such theories are a lot more compelling for the rich who, rather unequally, assume the right to arbitrate seat assignments on the ark for all the species, than for the poor who seem destined to fight an uphill battle with snail darters for their right to exist. With complete insensitivity to economic realities and basic justice, some

environmentalists rail against the problems created by shifting cultivators rather than recognising that these people are, in fact, 'shifted' cultivators with nowhere else to go. There was a time when the environmental movement took on the cause of pandas and tigers on the basis that—since they were on top of the food chain in their ecosystems—the world's campaign to save the tiger would mean saving the whole ecosystem. It was the old 'trickle-down' theory. As anyone in the South who has seen foreign investment or the World Bank at work can report, trickle-down doesn't work. And the poor are tired of getting trickled down upon. It is time to recognise that rural communities are the species at the top and that strengthening these communities—rather than cutting their bioresources out from under them—is the only way to protect all our futures.

A more detailed study of the role of the people—of farmer-led food security in the context of biodiversity—follows in 'First Parts' (section 5).

The parts that profit

If a tree falls in the forest, it won't land on Novartis (the corporate conjugation of Switzerland's Ciba-Geigy and Sandoz). But Novartis may eventually feel the reverberations. Possibly the reason why the utilitarian side of biodiversity is viewed with such distaste is because it is useful not only to indigenous communities and other small farmers but also to Merck and Monsanto. Suddenly, nature begins to look a little pedestrian. Foregoing a debt-for-nature swap, Merck opted in 1992 for dollars-for-DNA by contracting with INBio, a non-profit organisation in Costa Rica, for access to genetic diversity in national reserves. For a little more than a million dollars Merck is on everyone's lips as the Green Santa Claus of biodiversity.

Malthusian and mechanistic though it may be, there is an element of truth in what the White House advisor said back in 1990. As the world's climate shifts, as the ozone is depleted, as the soils wash into seas and as legions of unrecorded species march into extinction, the importance of the genetic diversity that remains increases exponentially. The difference—as Merck and other corporate folk well know—is that biodiversity is far from a raw material. It is, more often than not, the protected and improved genetic resource of rural innovators. And the 'tool box' includes more than the assemblage of techniques now popularly known as biotechnology. It includes the collective genius and skills of farm communities.

One of the major changes since *The Laws of Life* is that the corporate world has come to recognise, even if begrudgingly, the economic value of both biodiversity and rural knowledge. At the time of *The Law of the Seed*, the big

corporate dispute was whether or not chemical companies were taking over the seed industry. In *The Laws of Life*, that debate was over and the concern was whether or not new biotechnologies had created a life industry. That debate, too, is at an end. In the last two years, pharmaceutical companies engaged in biotech research have merged USD 80 billion in assets to consolidate a new hegemony over living materials. This is the subject of 'Private Parts' (section 7).

The partisans

Genetic diversity is the part of biodiversity that allows each species to adapt to new pressures or opportunities. Biodiversity is the total variability within all living organisms and all the ecological complexes they inhabit. Depending on who you talk to, there are between 5 and 80 million different species on this planet. Only about 1.7 million have been described by institutional science. Within each of these species there can exist many tens of thousands (sometimes hundreds of thousands) of unique genes that allow, for example, soya beans to grow further north; or rice to grow a metre under water; or cows to digest wood chips.

For the non-scientist, it is sometimes easier to think of diversity the way many of us think of dogs. Dogs are one of the 1.7 million described species. Within 'dogdom' there are many hundreds of varieties of dogs from poodles to Great Danes. Even among poodles there is enormous genetic variability.

As it is with pups so it is with potatoes. Innovators in farm communities and institutional innovators in corporate and state laboratories all seek and manipulate the genetic characteristics of a species in order to breed improved plant or animal varieties that meet new conditions. Thus it has been for ten thousand years.

But, the need for bio- and genetic variability is only now being recognised in the socioeconomic context of world food security and national self-sufficiency. Peasant farmers need variability to survive and the rich need it to grow fat—and also, increasingly, to survive as well. Where the fat meets the famished there is going to be trouble—and (often) extinction.

That trouble began in Rome in 1979 at the UN Food and Agricultural Organization's (FAO) biennial conference. Through the early and mid-1980s battles raged over control of genetic resources but by the late 1980s some of the acrimony seemed to clear away as civil society organisations (CSOs), governments and corporations reached for agreements on a few basic needs and priorities—although certainly not on principles and politics.

The disputes were, however, far from over, and the hard-won agreements offered to the UN Conference on Environment and Development in 1992 resulted in little in the way of practical political resolve. The optimism with which the 1990s began went into a gradual, bewildered decline.

The partisans are back again. 1997 feels more like 1988 or even 1983. The connection between genetic diversity and survival is being made and battle-lines are being drawn anew. The account of this history—from 1988 when *The Laws of Life* was published to the late 1990s—is summarised in sections 2 and 3 of this journal.

The strategic role of civil society organisations, particularly in the light of globalisation, is outlined in 'The Part of the People' (section 8). CSOs must move beyond their defensive—sometimes parasitic—posture to address the wider issues of global governance.

Linnaeus—the Biopirate?

It is fashionable, in the harsh, unyielding light of these economic times, to discount the value of genetic resources and to interpret the tales of biopiracy as amplified South–North rivalry and dreams of a genetic Eldorado. In fact, the legend began a little further North and the first bio-battle was North–North even though it involved the South's resources.

It is tempting to argue that the global battle over plant genetic resources began in Uppsala, Sweden in 1778—more than 200 years ago. Certainly, in his time, Carl Linnaeus was the world's leading plant collector. Massively assisted by his 'disciples', Linnaeus combed the deserts of Arabia, the plains of China, the forests of the Amazon and the veldts of South Africa seeking out new and interesting species. Shipload after shipload of plants (and birds and fish and almost everything else) found their way to his Hammarby farm, a healthy hike from the taxonomist's lecture room at the University of Uppsala.

All the most attractive elements of politics and intrigue can be found in the story of Carl Linnaeus. The Swedish East India Company gave passage to Linnaeus's disciples and also hauled back the cargo. Was he an imperialist (as Calestous Juma, Executive Secretary to the Biodiversity Convention has proposed)? If he was, he was not a lucky one. When Linnaeus went to his reward in the late 1770s, there was not enough reward left behind to keep his wife and family in the manner to which his fame had accustomed them. To help the household finances, Linnaeus's widow auctioned off the old man's treasure trove of taxa to the highest bidder. The beneficiary of the family's spring cleaning was a British industrialist and amateur botanist with close ties to Kew Gardens. For a modest sum, the merchant procured the majority of the taxonomist's life's work and commissioned a vessel to haul it back to London.

News that the collected wealth of Sweden's most famous scientist was heading across the North Sea, sent shock waves through Stockholm and, the story goes, King Gustav III, travelling at the time in Italy, commanded that a Swedish navy vessel chase after the British merchant vessel, recapture the national treasure and return it to Sweden. Despite a brave effort and a heroic chase, the British ship, appropriately named *The Disappearance*, outran the Swedish navy and brought the collection safely to shore. To this day, Linnaeus's collection can be found not far down from Trafalgar Square in the hands of the British Linnean Society.

The scene of the great chase over the North Sea became a popular illustration and peeks from the pages of virtually every biography of Linnaeus and his times. The story has all the elements of a great 'Seeds War'—transnational (Swedish East Indies) corporations hiding behind the skirts of professors and pastors to purloin Third World plants for undoubtedly nefarious purposes; Sweden, fighting for the repatriation of someone else's botanical treasures (to Sweden) and even a little sabre-rattling; Kew Gardens, the instigator and beneficiary of the genetic gambit, lurking in the background as the innocent scientific forerunner of today's Consultative Group on International Agricultural Research.

Regrettably, key elements of the story aren't true. No ship chased after *The Disappearance*. Gustav was glad to be out of the country at the time so he wouldn't have to ante up for the collection. The Swedish East India Company appears to have got nothing from the arrangement except the lasting friendship of Linnaeus with the Company's director who was himself an avid gardener. Anyway, Linnaeus's disciples worked their way about the globe as medical doctors or clergy to the sailors. Finally, there is no clear evidence of any commercial benefit to the collection for either Sweden or the United Kingdom—though, obviously, the well-documented collection advanced scientific knowledge and probably pointed the way to commercial opportunities indirectly.

If the Swedes feel hard done by, Jonas Alströmer made amends—and much greater practical profit—by stealing two sacks of potatoes from England and fleeing to Sweden with them. To provide symmetry, the British navy took their turn chasing him, also unsuccessfully, across the North Sea. The story is given credence by no less a body than the US National Research Council who, in 1989, offered the opinion that 'such plant champions are what the plants ... require today'. The Council has got its way. The mythical plant pirates of old have been replaced by the very real biopirates of today.

2 Parts Past

From Seeds to Genes: From the 1970s to the 1990s

Following the creation of the FAO Commission on Plant Genetic Resources—and its first three tumultuous (but successful) meetings—the political environment seemed to be worsening even though some institutional progress was being made. When in the late 1980s the Keystone International Dialogue on Plant Genetic Resources came along, we all grasped it, nervously, in the hope that a different style of negotiation might mean real progress. When it was over, we weren't—any of us—sure whether our euphoria was over our collective achievements—or because we had survived the dialogue decathlon. The Keystone scorecard was an intellectual victory but we were still in the political wilderness, beating our way to the Earth Summit (UNCED) in Rio and trying to bypass GATT in Geneva.

Seed wars in the 1980s

The legend of Linnaeus was on the minds of many when in the late 1970s stories swept through the corridors of the UN Food and Agriculture Organization (FAO) in Rome that some Northern governments and corporations were hoarding the South's germplasm, embargoing its exchange and patenting the best material to sell back to the poor farmers who had created the germplasm in the first place.

A case could be made for starting the clock on the genetic resources debate in 1946, when FAO, meeting in Copenhagen, first discussed the need to conserve seeds. But if FAO is to be at the hub of the seed wars, a still better starting point might be the day in November 1979, when M. S. Swaminathan, the Chair of FAO, warned the Organization's plenary that they had better start taking genetic erosion seriously and look into who was doing what to save our common food heritage.

Whenever the starting point, there is little debate that the seed wars first flared into world prominence at that dull mausoleum off the Circus Maximus which was to have been Mussolini's Colonial Ministry and is now the FAO headquarters.

There is no need to call upon time to distort the issues or events that surrounded the various battlegrounds of the late 1970s and 1980s. Things were pretty distorted even at the time. Battle lines were drawn and the universal litmus test was deemed to be the protagonists' view of transnational chemical corporations pawing at our genes.

Through the sound and the fury, however, some basic points emerged:

- Both the process and structure of decision-making for the global conservation and circulation of plant genetic resources were unclear.
- What New Age (Northern) facilitators call 'the stakeholders'—the farmers, the plant breeders, the corporations, governments and UN agencies involved—were not at all sure of their roles or how they related to one another. Result: suspicion.
- Ownership was a major concern. Rightly or wrongly, the debate over the science and practice of genetic resource conservation was heavily skewed by legislative initiatives surrounding intellectual property rights.
- After a few sloppy years of trying to pretend otherwise, almost everybody agreed that more money and more science were needed to conserve a terribly important resource.

Though FAO may have been the conflagration point, the flames of debate spread quickly and widely. Among industrialised countries, battle was joined as national governments contemplated laws on Plant Breeders' Rights (a form of 'soft' patenting). Major battles were waged from Australia to Canada to Norway and Austria—the last Northern holdouts against plant monopolies. The Southern debate flashed in Nairobi and Addis Ababa and then in Santiago, Harare, Mexico City, New Delhi, Brasilia and Manila.

Some early victories

By the mid-1980s, the South, led by Mexico, could claim some real victories:

- Almost over the dead body of the US Secretary of Agriculture, the South had forced the creation of an FAO Commission on Plant Genetic Resources that would meet biennially to review the political and practical issues related to agricultural biodiversity.
- In the same contentious move, the South had forced through an International Undertaking on Plant Genetic Resources that amounted to a low-level legal accord guiding the flow of germplasm. The Undertaking was interpreted by the North as a blow to intellectual property protection over plant materials.
- FAO had captured from the International Board for Plant Genetic Resources (IBPGRI)* responsibility for the 'network' of gene banks and the information system related to germplasm exchange.
- The United States' hard-line position had won no converts and US efforts to arrange a Northern embargo of the Commission's first meeting fell apart. Even the Americans showed up as 'observers'.

* Then the germplasm institute of the Consultative Group on International Agricultural Research (CGIAR).

By 1988, however, realists had also recognised that FAO was running out of gas. Although FAO had created a Commission and an Undertaking on Plant Genetic Resources and pioneered critical discussions on something called 'Farmers' Rights', the bold move taken by Edouard Saouma, FAO's Director-General, to establish a special international fund was meeting with no definable success and FAO was left performing sleight-of-hand card tricks with its budgets to try to show genuine programme activity. Since 1988, with the tabling of the Brundtland Commission report, the battleground had been shifting to Nairobi where interest was stirring in a UNEP-led Convention on Biological Diversity—and to New York where planning was underway for the largest summit in history—the Rio Earth Summit.

In fact, the debate over plant genetic resources was being driven by three developments. The first was the work of the FAO Commission. The second was the momentum arising from the Brundtland Commission leading towards the Biodiversity Convention. The third influence was the creation of the Keystone International Dialogue on Plant Genetic Resources. Keystone was propelled by FAO and the two were—on the cusp of the 1990s—propelled by the Earth Summit.

The part played by Keystone

Sometime in 1987, frustrated US government officials and senior scientists began talking with equally irritated company executives and lawyers. Although exactly who started it all seems lost to the participants' memory, a number of people found themselves having lunch in Washington one day: among these were Hope Shand of RAFI, a Zimbabwean scientist, and a couple of conflict resolution folk from a place called the Keystone Center in the mountains above Denver. Shortly afterwards, M. S. Swaminathan was invited by the US National Research Council to act as Chair and the Keystone International Dialogue on Plant Genetic Resources trundled into uncertain existence in 1988.

A hundred-odd people joined in one or more of the Dialogue's plenaries and working groups. Keystone was a movable feast, with plenaries in Colorado in 1988, Madras in 1990 and Oslo in 1991, as well as steering committee meetings in St Petersburg, breakfasts in New York, patent encounters in Ottawa and Rome, and other specialist negotiations in Washington and at the Dag Hammarskjöld Centre in Uppsala.

Over three long years, seed-war duellists—patent directors of some of the world's most hated transnationals, members of devil-incarnate CSOs, Latin diplomats and Northern bureaucrats—confronted each other and learnt to

crack self-deprecating jokes in the Oslo sunrise or the Madras dusk, and slowly and painfully to move towards a consensus. The tension never left but the humour was infectious. In St Petersburg, in a mini-van which had run out of petrol, Jaap Hardon of the Dutch Gene Bank and Melaku Worede of the Ethiopian Gene Bank helped Don Duvick of Pioneer Hi-Bred and I recognised that at least as individuals we possessed a common love of diversity, that not all was profit or polemics. With that understanding, it became possible for hard bargainers to tell each other frankly what they thought, what they thought was possible, and what they thought their side would do.

Somewhere as day was about to break over Madras, we gained a certain trust in one another. A crucial piece of text was being finalised and the one left at the computer to 'cut and paste' the final compromise was from industry. Rene Salazar of Southeast Asian Regional Institute for Community Education (SEARICE) and Henk Hobbelink of Genetic Resources Action International (GRAIN), wobbling away from the table, noted the change, shrugged their shoulders and limped to bed unworried. Somewhere in a restaurant in Uppsala, archrivals traded text, read in silence and then agreed that the two opposing drafts were close to identical. They ordered wine and solemnly shredded the papers. Outside of Keystone, either document would have given seed warriors cardiac arrest.

For all the candour, the dialogue process was a long way from being a peace march. There were times when Northern government people and academics seemed to lose their moorings, but industry, CSOs and those from the South always knew who they were and what they were about. We once joked that industry was in the dialogue because it had power, and CSOs were present because we were the counterforce to that power. Neither industry nor CSOs were quite certain why governments were at the table.

The consensus was reached—and is useful—for a number of reasons.

First, because the time for consolidation had arrived. Some might argue that years could have been saved if we had all gathered at the table together in 1981 or even 1979. But the intervening years were needed not only for the issues and the information to come forward but for the understanding that the concerns were real and had some legitimacy to sink in. Northern governments and scientists had to get over their shock and their defensiveness and accept that those with a different political (and practical) interpretation of plant genetic resources had a right to be heard. Southern governments and CSOs also had to work through their own anger and rhetoric towards a

more realistic understanding of the forces that had created the political and practical problem. By 1988, we were just about ready to listen to one another.

Secondly, the Keystone Center offered the seed warriors confidentiality and an acceptable veneer of anonymity. All conversations and working papers were off the record and all participants attended in their individual capacities.

To these points, it has to be added that the mix of participants was also critical: governments, industry, CSOs, UN agencies—politicians and scientists and political activists. At different times during the three years, Northern government representatives helped industry chieftains understand CSOs or Third World diplomats. At other times, CSOs and industry worked together to explain political choices to Northern scientists. Coalitions of completely unexpected 'bedfellows' emerged and re-formed themselves throughout the years to reach consensus on points ranging from community conservation needs to the dangers implicit in intellectual property. Throughout it all, Keystone's facilitators scrambled between working groups distributing advice and aspirins.

The 'whys' and 'whens' of negotiation

The question was (and is) 'why'. Why did the United States government—and even more so, Ciba-Geigy and Pioneer Hi-Bred—come to the table? It took five years, from the publication of *The Law of the Seed* to a phone call from the Keystone Center, for industry and Northern governments to decide to negotiate. Rumours of impending South–North or just North–North talks had been milling about since 1985 and the first session of the FAO Commission on Plant Genetic Resources.

It would have been nice to think that industry was bowing to unbearable pressure. In 1985, RAFI formulated the concept of Farmers' Rights, then (as a counter to Plant Breeders' Rights) introduced it in the FAO Commission. In 1987, we put together a series of regional meetings with CSOs and governments in Addis Ababa, Santiago and Batu Malang (Indonesia) and set the stage, at the Commission's second round, for codes of conduct on both germplasm-collecting and biotechnology. Each of the Commission meetings had proved tough and turbulent. For a while, we wondered if the threat of the codes was forcing the Keystone process.

Then, too, IBPGR was manoeuvring to pull out of FAO and we had announced their plans to the Commission at a time when both IBPGR and FAO wanted secrecy. The Commission had been born out of the battle led by

José Ramon Lopez-Portillo and his Mexican delegation along with Mohamed Zehni, then Libya's ambassador to FAO—and, often, the only geneticist among the diplomats. *The Law of the Seed*, published on the eve of the debate and personally delivered in Rome by Olle Nordberg of the Dag Hammarskjöld Foundation, added fuel to the fire. In the end, the South simply overwhelmed the North.

RAFI had observer status at the back of the Green Room of FAO Headquarters and we rejoiced in it. We were barely an arm's length from the US and IBPGR. As observers in the consensus decision-making process of a UN meeting, we continued to be acknowledged last on the speakers' list just before the Chair summarised each agenda point. This meant that we got in the last word and that everybody was in the room to listen. It was like being judge and jester all at once. If the Chair was from the South, our statement usually figured well in the summing-up. If the Chair hailed from the North, we provided a much-noted counterpoint and often the basis for a Third World challenge to the summary.

As CSOs, we elbowed in between IBPGR and UPOV (Union for the Protection of New Varieties of Plants—the patent people). Since the Americans had chosen to remain outside the Commission and the Undertaking, we delighted in publicly referring to them as our 'fellow observers'—all the more so because they were too proud to use their status to play the informal 'summing-up' role we worked so merrily.

If the biennial battles in 1985 and 1987 were excruciating for IBPGR and the Americans, they were at least uncomfortable for transnational seed companies. The issues were out of hand. UN resolutions might be functionally irrelevant but the bio-battles at the Circus Maximus had become infamous in the agricultural science community and were beginning directly to affect germplasm exchange in the South. Germplasm and seeds were fast becoming 'policy' questions throughout the Third World and seed companies were being subjected to unheard-of scrutiny. Of themselves, UN codes of conduct are also powerless, but a code in Rome can become a fever in corporate boardrooms, and complications and side-effects in the South, including legislation in New Delhi, and regulation in Manila. United Nations initiatives that go unnoticed in the North have a distinct 'trickle-down' effect in the South. If the situation, as viewed from the corporate side, were to worsen, there could be unanticipated and real problems.

In a sense, too, the answer was 'scenery-filling'. The smart money in the corporate world wanted to fill in the background scenery to their R&D strat-

egies. No surprises, please. This meant understanding the trends and the trend-setters in the social and governmental background. Coming to table for off-the-record talks with CSOs and the South would help set the scene for future markets.

Why would CSOs come to table? Probably our reasoning was not as good as the companies'. The best answer was that it would have been a political mistake to stay away. Industry and the North would claim that we were unwilling, unable or too cowardly to meet face to face away from cameras and protocol. This is sometimes true. But, one should not underestimate the element of adventurism and machismo in the CSO camp. A closed-door shoot-out in the Keystone corral high in the Western Rockies was hard to turn down.

How went the biologue?

In Washington, Chicago and Rome, seed warriors found themselves together. Sometimes, on the same side of the issue. When Henry Shands of the US government brought Pioneer Hi-Bred, RAFI and FAO together in Washington in the summer of 1990, the result was a formula that brought the US (eight years late) into the FAO Commission and achieved the wording necessary to recognise the right of any government to withhold germplasm vital to its national interests. A couple of dinners shared by adversaries like Cary Fowler (then of RAFI) and Tim Roberts (then of ICI before it became Zeneca) in Rome in 1989 and 1991 did wonders to reduce misunderstandings around heated meetings of the FAO Commission.

A decade after Mexico launched the battle at FAO, the issues, in 1991, showed modest progress:

- *From heresy to common wisdom.* The poles of intellectual debate had shifted. There was a wide acknowledgement that many of the points made by CSOs in the 1970s and 1980s had legitimacy. Transnational chemical firms did dominate the seed industry and a significant share of their research effort was directed toward market synergies for chemical inputs and seeds. The world's genetic resources were largely stored in industrialised countries and the political handling of collection and storage conditions was almost universally condemned as inept and insensitive. Most of the world's gene banks operated well below optimal standards, and much more money, training and information were sorely needed. In a complete about-face from a decade before, no one any longer denied the need for intergovernmental protection of germplasm.
- *New table settings.* A new consultative atmosphere existed which had the potential substantially to improve practical cooperation and facilitate planning. A key element in this new environment was Keystone's proposal

to form an intergovernmental council that would include all nations on an equal footing as well as grant a unique 'associate member' status to both CSOs and industry. While the proposal had no clear place to go, its spirit permeated FAO deliberations and encouraged a *de facto* environment of consultation.

- *More money.* There existed a strong consensus that the new or revised intergovernmental council could effectively operate a germplasm conservation and development fund of USD 300 million per year. Although modest, this was a massive (proposed) funding increase over current levels. A decade earlier, the United States and Britain had been arguing that no additional funding was necessary.
- *New partners*. Northern—and Southern—governments recognised (under duress) that a genuine community-based innovation system is in operation and acknowledged that rural societies produce inventions that are excluded from the Western model of intellectual property protection. There was reluctant agreement that traditional scientific institutions should seek ways to work with this highly decentralised research system. One manifestation of this new partnership was the creation of the Community Biodiversity Development and Conservation Programme, led by former Keystone protagonists from South and North.

Aside from these rather sweeping generalities, a large number of other changes had taken place. At the community level these changes included:

- *Redefinition of plant genetic resources.* Both the FAO Commission and Keystone recognised that plant genetic resources mean more than an accumulation of germplasm. For genetic material to be a resource, the world community must address what has become known as 'GIFTS' (Germplasm, Information, Funds, Technologies and Systems) which also means that the new institutional body and financial facility must contemplate such issues as germplasm exchange, biotechnology and technology transfer, and intellectual property systems.
- *Recognition of the need for advocacy.* Through its invitations to CSOs, FAO gave a kind of formalisation to the advocacy role played by CSOs with regard to genetic resources. Keystone did the same in its final report by specifically identifying a new category of CSOs 'such as' RAFI and GRAIN at the global level and of SEARICE, CLADES and Seeds of Survival, working on behalf of rural communities at the regional level.

If some of the above areas were, perhaps, predictable, the level of consensus achieved with regard to intellectual property was not. Here, the significant progress was all through Keystone:

- *GATT-TRIPs criticised*. Keystone (in Madras in 1990) asked GATT not to pressurise Third World countries into TRIPs (Trade-Related Intellectual Property agreements) and to recognise the sovereign right of nations to decide these issues for themselves. The group stated categorically: 'No decisions should be taken in GATT concerning the extension of intellectual property rights to plant genetic material' without prior consultations with experts in the countries concerned. At its final plenary in Oslo, Keystone delegates noted that the issue had received little attention by GATT and urged that 'the implications of intellectual property rights for plant genetic resources ... be given adequate discussion and evaluation by the negotiators, with input from national experts and other entities involved with plant genetic resources, before any GATT action is taken'.
- *Detrimental effects cited.* The Keystone Oslo Consensus went still further and acknowledged that patents could work against the interests of farmers and, therefore, against the security of plant genetic diversity. All participants agreed that applying the patent system to plant genetic resources would affect the exchange of germplasm, 'an exchange which is seen as the cornerstone of modern plant breeding and is the basis for the survival of indigenous farming systems'.
- *Reaffirmation of Farmers' Rights.* In keeping with the Madras Report and in direct opposition to the revised UPOV Convention on international plant patents (1991), the Oslo group insisted that the Third World's farmers should not lose their historic right to save seeds without charge or challenge.
- *Corporate gene stocks and Third World stocks.* The exclusion of breeders' lines from the full exchange of germplasm was accepted in Madras. The Oslo group agreed that Third World countries may also hold material of potential commercial value, and of major economic importance to the country, that cannot be exchanged. In such cases, the group stated, 'the world community must yield to the judgement of the holder of the germplasm'.

When the Keystone Dialogue finally rang down its curtain in the endless sunset of an Oslo June, the future looked promising. Having just tottered away from the brink of disaster, Keystone protagonists were relieved and even faintly enthusiastic. A year ahead—almost to the day—was the Rio Earth Summit. Environmental concerns—if not agricultural biodiversity—were in the ascendancy. Now the only perceived obstacles on the road to Rio were GATT (with its new proposals requiring the patenting of life forms) and the ongoing revolution within the life industry.

Table 1 The Keystone Scoreboard

Issue	Before	After	Comment
International cooperation	No transparency, deteriorating cooperation.	Increased openness, growing trust and cooperation.	Much of the progress was intangible. Gains are fragile and need reinforcement with a revised, broadened and legally-binding FAO Undertaking as a protocol to the Biodiversity Convention.
The safety of *ex situ* gene banks and the overall conservation system	North's governments and industry said everything was basically fine and no new initiatives were necessary. South and CSOs said safety was a serious problem and there was an urgent need for new funding.	Recognition that there is a safety problem. There is an urgent need for new systems and long-term support.	
The role of FAO and IBPGR (later IPGRI)	North: FAO should keep out of IBPGR's way. South: IBPGR should be subordinated under FAO.	An intergovernmental body on the basis of one nation one vote (possibly FAO) was proposed to take charge and IBPGR should be a technical arm to this new body.	FAO/IPGRI relations improved enormously and IPGRI agreed to report to the FAO Commission but additional infrastructural work was needed.
National sovereignty over germplasm	North and South: plant genetic resources are the common heritage of humanity and must be fully and freely exchanged.	Common heritage still allows breeders to withhold specialist stocks until final varieties are produced; governments have the right to withhold germplasm that is vital to their economic interests.	FAO's 'agreed interpretations' acknowledge these changes but a whole new and clear Undertaking was needed that could become a protocol of the Biodiversity Convention.
Intellectual property and genetic erosion	North: There's no connection. South: There *is* a connection.	Plant Breeders' Rights could work against the interests of small farmers and, therefore, could accelerate genetic erosion.	Some industry participants in Keystone have since denied this connection once again even though they signed the Keystone report.
Intellectual property rights in general	North: These are beneficial to agricultural development everywhere in the world. South: These are a rip-off of Third World innovations and constitute a system that will force the South to pay royalties for their own genius.	Existing intellectual property systems exclude the poor and could be counterproductive for farmers in the Third World.	These statements had an impact at the Earth Summit and are among the reasons why the texts on intellectual property rights were not as strong as the US wanted.

3 Parts Present

The Leipzig Conference, the Biodiversity Convention, and the Food Summit

It could be argued that the Seed Wars have passed through four phases. The first brief though violent phase ran from the beginning of CSO campaigns on genetic resources in late 1970s to the tumultuous creation of the FAO Commission and Undertaking in 1983. Phase two was the period immediately following the Commission through to the commencement of the Keystone negotiations in 1988. This was followed by the Keystone process and the Rio Earth Summit. Phase three ended—with a deadening thud—in 1992. The fourth phase took us from the Keystone Process to the Leipzig Process as 150 governments prepared for the June 1996 gathering in Germany that was meant to resolve all the outstanding issues left over from the formation of the Commission and the conclusions of Keystone and Rio. In the end, it was a kind of existential Zen experience. We accomplished less than we intended, more than we expected, and still have much to do.

In the early summer of 1990, a meeting took place somewhere outside Washington at the residence of Henry Shands, crop germplasm Czar of the US Department of Agriculture (USDA). Henry Shands was sharing his front porch with Pepe Esquinas—the brilliant, passionate and utterly irascible genius behind FAO's germplasm programme; Don Duvick—arguably one of the world's most philosophical plant breeders (just then retiring from Pioneer Hi-Bred), and myself. The purpose of our meeting was to capitalise on the positive momentum of the Keystone Dialogue to bring the United States into the FAO Commission. One part of our solution was to reconvene the International Technical Conference on Plant Genetic Resources last held in Rome in 1981. In the gathering darkness, we all stressed the *technical* nature of such a conference. The politics were being dealt with through Keystone and the FAO Commission. The Technical Conference would give the genetic resources community a do-able agenda for the future.

Life is what happens when you're making global plans ...

But it didn't evolve as we had planned it. Somehow, during the production process, the script went from *technical* to *political*. What was meant to be a relatively modest scientific encounter became more a process than a meeting. Not that the technical agenda was forgotten or even neglected. By the time the more than 600 delegates rolled into Leipzig in 1996, more than 150 countries had contributed country reports assessing their capacity to conserve and develop their plant genetic resources. More than a dozen intergovernmental regional and sub-regional conferences disgorged no fewer than 2,000 technical and policy recommendations. Out of all this came the first-ever *Report on the State of the World's Plant Genetic Resources* as well as

the first *Global Plan of Action* embracing 20 strategic fields of work. There was also an indicative budget. Conceding that many of the activities, such as training, tend to be open-ended, FAO nevertheless concluded that the original 1991 Keystone proposal of a global annual expenditure in the range of USD 300 million was about right.

To their credit, the FAO documents adroitly sidestepped potentially political debate (as far as anyone can) and stuck to the mandated script. But, between the 1990 dream of a 'consolidating' technical event and the opening of the Leipzig negotiation six years later, UNCED, the Biodiversity Convention and GATT had all come and entrenched themselves in a new, meaner, political environment. As though in harmony with these unexpectedly divisive initiatives, there were new species patents, a controversial new FAO-CGIAR accord (giving policy responsibility for CG gene banks to FAO); and disturbing rumours of a countermove by the World Bank to usurp control of the entire CGIAR system as well as its gene banks.*

In the half-decade between the end of Keystone and the opening of Leipzig, forests—always at the root of most environmentalist causes—had become acutely political. Scientific arguments that the conservation of food plants must also mean concern for the (so-called) 'wild and weedy relatives' of these species, most of which are in forests, were not well received by those dedicated to conserving pristine rainforests. One delegate spied a plot when he observed that the host German delegation was led by a government ministry that included food and forestry in its title! He demanded a name change. Further, *in situ* (including, but not exclusively, on-farm) activities met with cries from a few governments that gene banks were being abandoned. Still other activities to ensure that major gene banks were secure, their collections duplicated, and their regeneration programmes in place, led to cries that the North's (and CGIAR's) dominance in critical collections was about to be further subsidised by poor farmers. Finally, the once highly political prospect of Farmers' Rights came to the fore again—largely because the United States opposed it at Leipzig on the grounds that Farmers' Rights was a new idea. This, even though Farmers' Rights and the US itself had both joined the FAO Commission simultaneously in 1991.

Although the technical preparation for Leipzig proceeded apace, the politi-

* CGIAR, the Consultative Group on International Agricultural Research, is best described as the informal funding consortium for the 16 'Green Revolution' centres scattered around the tropical and sub-tropical world, that have a leadership role in formulating agricultural research policy and strategy throughout the South, often referred to as the CG System.

cal dimensions quickly came to grief. Who 'politicised' the 'technical' conference? Who didn't? The North came into the FAO Commission 'Prepcom' of 1995 saying, essentially, that it was fine to have a technical meeting to create a Global Plan of Action for Plant Genetic Resources—but there would be no money for such a Plan until an assured system of germplasm exchange was adopted. In other words, the South would have to accept a revised International Undertaking that was not just compatible with the Biodiversity Convention—something everybody wanted—but that was also compatible with the access requirements of the North. Only partly in response, the South—dominated by Brazil and Argentina—were arguing that there was no need to have a technical conference if the Plan of Action was not to be funded. Further, Brazil, Indonesia and others with substantial forests were also insisting that the Leipzig Plan and the revised Undertaking confine its work to major food crops. Not to be excluded from the fight, civil society organisations (including RAFI) joined the fray demanding that the Leipzig Plan and the revised International Undertaking both provide for the practical implementation of Farmers' Rights.

During the wobbly, weavy, late-night debates, the old Keystone cronies came to realise the dimensions of their new divisions. A real and genuine scientific plan was about to emerge that would take honest strides toward the global conservation of plant genetic resources. But, that plan could not be fully implemented without money. The money would not come without unacceptable concessions by the South regarding access to germplasm. The South, of course, would not make such concessions (or, at least not without money on the table). And for political reasons, the South would not accept as a scientific necessity that the non-domesticated relatives of cultivated crops be included in any Plan or agreement. The revision of the Undertaking and the Leipzig Plan had to march in lockstep.

Without doubt, the toughest days of the seed wars were not in the early 1980s but in the mid-1990s as old friends and enemies fought to untangle their political agendas.

In order to make Leipzig work, Keystone's alumni had produced a remarkable team. Pepe Esquinas was in charge of the FAO Commission. Not a soul could doubt either his scientific prowess or his passionate dedication to the issues. To shepherd the Leipzig Process, Cary Fowler, a co-founder of RAFI and among the most notorious of CSO seed activists, was brought in by FAO. Fowler had moved from RAFI in 1990 to the Agricultural University of Norway, where he was recruited by FAO several years later. It was pure 'Keystone' that Fowler—so controversial a figure throughout the 1980s—

could take up so delicate a diplomatic post with the warm support of everyone from the United States to Ethiopia. Backing Cary Fowler, FAO also added David Cooper, a young activist and scientist who had briefly been employed by Genetic Resources Action International (GRAIN).

In June of 1995, as the final negotiating phase for the Technical Conference was launched at the FAO Commission, it was hard for many experienced seed warriors not to look around the Red Room on FAO's Building A and shake their heads. On the podium, representing the Secretariat, were former GRAIN and RAFI staff members and the redoubtable Pepe Esquinas. Omnipresent—though not actually in Leipzig—was the newly-elected Independent Chair of FAO, Mexico's José Ramon Lopez-Portillo—the diplomat/devil incarnate. Were the foxes in charge of the chicken coop?

The Red Room held other surprises. Trevor Williams, probably ranking with Cary Fowler and I as the most contentious people in genetic resources at the last Technical Conference, was not to be seen. Director of the International Board for Plant Genetic Resources (IBPGR) for almost its entire life, he had been a casualty of Keystone. In fact, so had IBPGR. Singlehandedly, and almost overnight, Geoff Hawtin—who was also present in the Red Room—had turned the old bunkered and embattled IBPGR into a new, open and creative IPGRI (International Plant Genetic Resources Institute). Even though Hawtin had completed the process that moved IPGRI out of FAO to become a fully fledged Centre in the CG System, he had also turned his Institute into a team player and forged better relations with FAO than had been seen since the 1970s. He—and IPGRI—were also central to the success of the Leipzig Process.

The final member of the Rome-based crew destined to steer the process was at least as unlikely as Fowler. Mohammed Zehni, when I first met him in 1981, had been Chair of the G77 and Libyan ambassador to FAO. He was also a geneticist, an amateur artist and an extraordinarily skilled diplomat. Early on, I'd seen him settle disputes between the Americans and the Mexicans even as his country was tottering on the brink of war with the others. In 1995, Zehni was the man in charge at the podium—boss both to Pepe Esquinas and Cary Fowler—and on the board of IPGRI. If there was ever a team that could get us to Leipzig in one piece, it was this set of people.

Our faith faltered often during the Leipzig Process but it was fundamentally well founded. The 'process' was at a murderous pace. In its final year, as the perils of the Biodiversity Convention and the impact of the WTO (World Trade Organization—the inheritor institution of GATT and the Uruguay

Round agreement) became more clear to governments, the tensions threatened to destroy old friendships and almost wreck negotiations.

When, in June, 1995, the North succeeded in pushing financial mechanisms and Farmers' Rights off the Leipzig agenda, it became unpleasantly clear that the German meeting was not going to finalise any 'deal' over the management of genetic materials. The mood—in the South and among civil society organisations—soured perceptibly.

A final 'Prepcom' was convened, also in FAO's Red Room, in April of 1996—two months before Leipzig. The mood was terrible. The Secretariat's interpretation of the numerous regional and sub-regional meetings had been converted into a surprisingly deft and coherent draft Plan of Action. Not surprisingly, it satisfied no one. It had also arrived so late (the drafting process had been cut short by several months with the decision to bring the document before the FAO Commission) that many delegations—especially those from Africa—didn't see the critical text until they unpacked their bags in Rome. For some, surprise turned into suspicion.

Some saw the document as a whitewash of the existing *ex situ* gene bank system led by CGIAR (see Section 4). Others saw in the draft the Trojan horse of *in situ* (alias Farmers' Rights) strategies that would undermine both the development of national gene banks and the strengthening of wobbly CG gene banks.

The mood was indeed so hostile that industry, chaperoned in the Commission by ASSINSEL—the Plant Breeders' Rights association—approached CSOs proposing a joint statement calling on governments to give basic support to the draft as the basis for negotiation and to commit new and additional funds to genetic resources conservation. In a move that was at least as contentious as the draft itself, industry and CSOs did, indeed, make separate but coordinated statements endorsing the draft and calling for new money to make the final plan operational.

If the unprecedented appeal had an impact, it wasn't obvious. At about midnight of the final day of the Prepcom, government delegates staggered out of FAO with a Plan of Action covered in enough square brackets (meaning unagreed text) to fill a black hole. There were no fewer than 370 chunks of bracketed text, 97 of them imposed by a nervous US delegation and half as many again by nitpicking Canadians. The Latin Americans, too, festooned the document with the unwelcome brackets. The prognosis for a successful Technical Conference looked poor.

A last-ditch effort to salvage the Plan was staged on the eve of the Leipzig Conference when two delegates from each world region bundled into FAO's Ethiopia room to dismantle the square brackets. Miraculously, good will prevailed. The Americans, the Canadians and the Brazilians seemed to come to their senses and much of the mess was cleared away.

Leipzig is what happens when you're making technical plans ...

Somehow, on the short flight between Rome and Leipzig, the mood shifted once more. The US delegation, so accommodating in Rome, remembered its April *angst* when it landed in Germany. The Brazilians, bolstered by pugilistic Argentineans, did likewise. CSOs, shocked and largely on the sidelines in April, came to Leipzig ready to fight hard in defence of Farmers' Rights. US State Department officials irritated friends and neighbours by turning purely housekeeping matters into diplomatic incidents and delayed discussions for much of a day. This dispute was hardly settled before the Americans found themselves the only delegation in the plenary hall attempting to downgrade Farmers' Rights. Although a few other delegations such as New Zealand (otherwise verbally-challenged throughout the conference) were cajoled into grudging support of the US text, constructive work on the Global Plan's substance almost ground to a halt. Days ticked past as an embarrassed and embattled group of USDA and State officials, forbidden to use cell phones by their security people, scampered around the hallways making calls to legal offices in Washington. On at least one occasion, the US delegation in Leipzig declared itself willing to compromise on language only to have to admit hours later that Washington lawyers had quashed the deal.

As the debate over Farmers' Rights raged on, another battle, more predictable, was being fought over funding for the Global Plan. As already discussed, a year before, it had been determined to de-link adoption of the Global Plan from its funding. The theory (highly questionable) was that this would allow governments and scientists to focus on substance divorced from political/financial considerations. The reality was that the South and CSOs, in the absence of a clear schedule for financial negotiations, wanted a commitment from the North that *new and additional* financial support would be forthcoming. Without this commitment, they reasoned, the Global Plan would be a public relations fraud.

European delegations (sympathetic though they generally were) had no mandate to negotiate money. Argentina and Colombia, in particular, took advantage of the situation not so much to improve their position as to imperil the success of the conference itself.

In typical UN style, negotiations came to a head at midnight on the closing Saturday and a tired plenary stayed up until 3.00 a.m. to approve the results of closed-door agreements on both Farmers' Rights and financing. At that hour, few in Leipzig could be sure of which official UN language the texts were written in. The Farmers' Rights text, pronounced a victory by Ethiopia, the Philippines, Malaysia, Venezuela, China and India, had all the unequivocal clarity of any politician's promise. There was, however, recognition that new and additional financial support was needed for the Global Plan of Action.

Not until the wrap-up news conferences of Sunday morning did most delegations realise what they had actually achieved. For the first time in the history of plant genetic resources, the international community had adopted a Global Plan of Action. For the first time, there was broad agreement on what we all needed to do and how we should all go about doing it. There is, though sketchy in places, a blueprint.

Somehow the Technical Conference-turned-Political came out to be both political and technical after all. Somehow, along the way, we all helped each other improve our thinking and our work. There was progress. The Leipzig Process, which continues with the revamping of the International Undertaking and negotiations around germplasm access, offers us all a sound basis for our work in the future. And, fear not, that agenda gives us all lots to fight about. Life (and Leipzig) is what happens when you're making other plans. And, in the years after Keystone, as we negotiated Leipzig, life was indeed making other plans far beyond the realm of plant genetic resources.

Life in adjoining lanes ...

The year 1996 was critical not only for plant genetic resources but for all of agricultural biodiversity, agricultural development, and global food security. Three multilateral processes wound their way through one another throughout the year and made the Leipzig process yet more complicated. First, plans for the FAO World Food Summit, launched in Quebec City in October, 1995, drew attention to sustainable agriculture as well as food security. Simultaneously, the Convention on Biological Diversity (CBD), focusing on agricultural issues, held its third Conference of the Parties (COP III) intended to conflict with the Food Summit—but in Buenos Aires. Thirdly, the CGIAR supported civil society insistence that a full External Review of the CG System be conducted in 1997. CGIAR was also positioning itself to reap the benefits of Leipzig and to take on the mantle of food security at the Rome Summit. Those of us in civil society struggled to be in three places at once for most of the fateful year.

Among the themes of 1996 was the concern to protect national sovereignty over agricultural biodiversity. The negotiating sessions for Leipzig—intermingling in time (but not place) with the PrepComs for the Biodiversity Convention—made clear that some governments felt that the CBD offered greater sovereignty security than FAO. During the Leipzig Conference, it was evident to CSOs and governments that the CBD secretariat felt that all agricultural biodiversity issues should be determined through CBD processes and that FAO (and Leipzig) had only technical responsibilities.

The 'disputed territory' lay in governments' plans to revise the 1983 International Undertaking on Plant Genetic Resources to make it a legally-binding protocol in conformity with the Biodiversity Convention.

Initially touted as one of the inevitable products of the Leipzig process, the Undertaking was clearly in trouble. The CBD Secretariat felt that a refurbished Undertaking should not only conform with its environmental 'constitution' but also be managed by Convention staff.

The 'turf' issue over agricultural biodiversity arose again during COP III in Buenos Aires, where some governments tried to discount unanimous intergovernmental decisions reached in Leipzig and re-open debates in the CBD forum. For civil society, this was difficult logic to follow. Decisions reached by FAO's governing bodies are the result of a consensus achieved among its 176 sovereign member states. Since the CBD has 162 government members, there are 14 states (including the United States) whose sovereign interests are represented within FAO that are unprotected under the Biodiversity Convention.

At the more functional level, the Global Plan of Action adopted in Leipzig for plant genetic resources, was approved by the 150 governments present. Challenging that Plan in Buenos Aires were a handful of countries, arguing that COP III—with 16 fewer countries in attendance than in Leipzig—could ignore the Leipzig decision. Still more significantly, the 194 governments attending the World Food Summit (with 3,705 delegates) endorsed the Leipzig Plan while the Buenos Aires meeting had 60 fewer governments present and less than a seventh of the delegate count.

Where is sovereignty best served? Clearly, a legally-binding protocol on plant genetic resources (ultimately to widen to a protocol on agricultural biodiversity) at FAO, but under the umbrella (or constitution) of the Convention on Biological Diversity, would safeguard the interests of the greatest number of countries as well as ensure that both the political and the scientific sides of the issue are cohesively maintained.

Adding to the concern over sovereignty security is the worry expressed by many CSOs and delegations in Buenos Aires that the CBD is losing momentum. The Argentine session of COP was a lacklustre affair that drew neither the numbers of delegates nor the level of participation of the previous COP II in Jakarta. State representation dropped from 146 countries in Indonesia to 134 in Argentina. Delegate strength plummeted 22 per cent from over 600 at COP II to less than 500 at COP III. While it is premature to predict a crisis, the postponement of COP IV to 1998 will either serve to build intergovernmental interest—or continue the CBD's decline in influence.

If the Food Summit endorsed Leipzig's Global Plan of Action, its own action plan for food security was deeply disappointing for the South and for most of the CSOs who followed the negotiations. True, no reasonable observer of our 'modern times' should have expected great things arising from the herding of today's flock of political clones and clowns. The world's Heads of State were hardly about to tackle world hunger or bring poverty to its knees.

In fact, they said so, well in advance of the Summit. Just as the North forced the FAO Commission to abandon any discussion of financial needs for the Leipzig Plan, it also forced FAO to agree, in advance, that the Summit would assiduously sidestep any new institutional mechanisms or budget implications.

In the end, governments adopted an extremely humble set of seven so-called 'commitments'. Were there a Roget's Thesaurus for political platitudes in the 1990s, Heads of State could have saved negotiators a lot of time and money. If you start off by agreeing that you won't change anything or spend anything, all you are left with is platitudes. The commitments quickly became targets of abuse by those who adopted them. 'We know who the seven dwarfs are', one delegate was reported to say, 'but we can't find a candidate for Snow White.' An OECD delegate added, 'My delegation has been calling the seven commitments the seven mole-hills of Rome.' An Asian diplomat opined, 'We think of them as the seven deadly sins, but the truth is that they really amount to sins of omission.'

The disappointment was not quite universal. Some delegates felt that critics were missing the point, that even holding the Summit was success enough. A Latin American participant insisted that the Summit's wording on trade improved immeasurably during negotiations.

Nevertheless, most of those attending the massive CSO Forum found the

text too weak on action. It had all the right nouns—indigenous peoples, women, family farmers, organic agriculture, non-cultivated food sources—but there were no credible action verbs accompanying the nouns. Tony Quizon of ANGOC, a major Asian farmers' network, insisted that if readers took away the window-dressing they would reveal a non-Plan of Action. In a terse four-minute speech that held his audience spellbound, Fidel Castro pronounced the Summit document 'shameful'. The Plenary Hall erupted in applause and tears.

Given current realities, why did the South or CSOs bother with the Summit at all? In its wake, the Summit process was important. Still more important, the Summit laid in place a handful of potentially useful opportunities for future action.

This potential was not always discernible to the several hundred of us campaigning for a better text. As with Leipzig, the text negotiations were acrimonious. Short weeks before Heads of State were to convene, the draft bore 777 unresolved square brackets (two-thirds of the entire text). Almost all identifiable targets found in earlier versions had vanished. No goals, no dreams, barely a pretence of concern. A pitched battle was waged from late September until late on the night of 30 October when the final square bracket fell away. More than one embittered delegate conceded on leaving the building that night that the only square bracket remaining was around the word 'commitment'.

Right and wrong. Certainly, the final language was deceptive, and destructive of the notion of food self-sufficiency and security. According to the text, the problem was not hunger but poverty, and the solution to poverty was to press on with WTO's agricultural trade liberalisation. Beyond this, the North would generously offer advice: on how to work with the private sector; on trade and investment; on how to slow population growth; on how to achieve 'good governance'; on how to end civil unrest; and on how to provide a stable economic climate for international companies. Most gratuitous of all was the North's advice on how the South should 'just say no' to the North's arms manufacturers. Governments were to abandon food self-sufficiency for 'self-reliance'—a euphemism for 'market dependency'. The South must trust the market and experiment with the untested theory that open-market mechanisms and transnational agribusiness will feed the hungry. It was a text filled with unbearable arrogance.

So, what of the good news? First, through an irritation-filled process that began in Quebec City at FAO's 50th anniversary ceremony in 1995, several

hundred CSOs from around the world managed to achieve the highest level of political consensus I have seen in more than 30 years of international campaigning. The motley swarm crunched together in the abandoned air terminal down the Aventino from FAO had amazing political and strategic cohesion. Finance and format made it hard to express—and some newcomers to such fora found it hard to recognise—but there was not only a widely-shared analysis of the Summit Plan but also a broad understanding that the battleground for food security would have to be fought out with the World Trade Organization. In particular, the GATT chapter reviews on agriculture and intellectual property, everyone acknowledged, would have to be our strategic targets.

Much of the credit for bringing CSOs together goes, perhaps surprisingly, to the Summit's Secretary-General, Kay Killingsworth. It was Killingsworth who encouraged CSOs to become involved in Quebec City and it was she who created the political space and financial opportunities for us to influence the Summit process and meet in Rome at critical points in the debates. Not since the halcyon days of Charles Weitz and the old 'Freedom from Hunger Campaign' has FAO worked so hard and so well to engage civil society. Since Killingsworth herself harks back to that era, it remains to be seen whether the Summit style will be maintained at FAO now that the Heads of State have retired to dinner.

On a second front, the Summit text held within it, not exactly buried treasures, but at least a road map for an ongoing strategy.

When governments know they won't do anything themselves—and/or when they want to surrender power to the corporations—they make a broad appeal for the participation of non-governmental organisations and civil society (by which they mean companies as well as non-profit making organisations). This 'inclusive' language is intended to *exclude* government responsibility or finance. Nevertheless, the Summit text was filled with the call to civil society to work in partnership to fight hunger.

The same text also accepted, though grudgingly, that there should be participatory campaigns to promote 'Food for All'. Further, despite intense fighting over wording, governments agreed that FAO should proceed with the development of 'hunger maps'—the family-to-global mapping of the locations and causes of food insecurity.* Still further, the Plan of Action calls for the study of the concept of the Right to Food through the UN High Commissioner for Human Rights and FAO—with the possibility of reporting back to governments on any measures that might be useful to strengthen the legal

notion of a Right to Food. Finally, the Summit gave lukewarm endorsement to a RAFI proposal to establish a civil society forum on food security. Although we had proposed a 'New Roman Forum' that would bring together all the parties concerned with food security (FAO, IFAD, WFP, CGIAR, UNDP, World Bank, agribusiness, governments and CSOs), meeting every two years ahead of the FAO biennial conference, the Summit's passion to avoid new institutional mechanisms allowed it only to agree that such a forum should take place at the time of the Committee on World Food Security some time during or before 2006.

From these unlikely ingredients a stew may be concocted. National governments are committed to creating Food-for-All committees which will have the heavy involvement of CSOs. These Committees could and should take on the concept of Hunger Maps. As Brazilian CSOs have learned during the last half-century, mapping hunger is a highly political exercise. It means not only identifying where—but why—it exists. It means door-to-door surveys and political debate. It is also the ideal environment for reviewing the Right to Food. Food-for-All committees could take on hunger-mapping in order to explore the legal boundaries of entrenching the Right to Food within the household and from the community to the nation and to the world. As FAO and the Human Rights Commission review the Right to Food as a matter of international law, Food-for-All committees could be working with human rights CSOs to provide the factual information and local elements that could (after years of negotiations) turn the 'concept' of the Right to Food into a legally-enforceable human right.

As the final element, the Summit's reluctant agreement to a civil society forum, many governments privately agreed, could be advanced so that FAO's biennial regional conferences could include such a wide-open forum even in 1998. Then, the FAO Conference of 1999 could include a major forum on Food for All at which CSOs could table their work on Hunger Mapping and the Right to Food. Especially appealing in all of this is that WTO's review of agriculture and intellectual property coincide with FAO's 1999 Conference. A strong and substantive critique of the impact of agricultural trade liberalisation—as provided by Hunger Maps and the Right to Food analysis—would provide vital ammunition to argue for more flexibility in the implementation of GATT policy on the hungry.

* Governments at the Food Summit were so reluctant to credit FAO with the useful political and practical concept of Hunger Maps that they rejected the popular language. The new term is 'FIVMS'—Food Insecurity and Vulnerability Mapping Systems.

Grasping at straws? Possibly. But straws can break a camel's back. And all that is left to us after the World Food Summit are straws such as these ... and the strengthening of practical work for farmer-led food security as envisaged by all of us at Leipzig.

One year after the Food Summit and Leipzig, the political scene is confused. Summit governments have been successful in making 'leadership' on the Plan of Action next to impossible. Nevertheless, FAO has gone forward on the Right to Food and on Hunger Maps. At the same time, it has peddled bumblingly backward on the Food-for-All Campaign and its engagement with CSOs. Its Regional Conferences—which offer such a wonderful opportunity for consensus-building—remain one of the 'food' community's most under-utilised resources. (An effort to describe the roles of 20 countries active in negotiations during 1996 is made in Table 2 in the following two pages.)

On the other hand, governments in the FAO Commission are working furiously to reach a new accord on agricultural germplasm. With two negotiating rounds in 1997—and more coming up in 1998—the Europeans appear to be ready to break with the North Americans and the obstreperous Australians to broker a more progressive deal with the South. Many delegates believe they can imagine a time when a binding intergovernmental agreement will govern germplasm exchange and benefit-sharing. Meanwhile, the Biodiversity Convention wobbles along towards its fourth Conference of the Parties and its last hope of making a real contribution in this field.

Table 2 20 countries that made a difference in the 1996 negotiations (positively or negatively)

Nation	Comment
Angola	Delegation shows consistency as well as scientific and political acumen in all fora. Serious misunderstanding over limitations of *ex situ* gene banks however, has caused unnecessary problems, and undermined an otherwise constructive role within Africa.
Argentina	Well-established maverick role in Latin America continued throughout 1996. Delegation often seemed led by personal vendettas of a former CBD staffer. As a consequence, delegation drew wide hostility within and beyond region, and was seen to be a destructive factor in most fora.
Australia	Seen as a creative consensus-builder prior to last elections, delegation now appears confused and rudderless. During COP III and FAO Commission, Australia was manipulated by Argentina and Brazil, causing unnecessary delays and dissection.
Brazil	Without doubt one of the most intelligent and consistent delegations in all fora, Brazil's strategy nevertheless remains unclear. Delegation appears to believe its weakness in crop biodiversity means it must keep all biodiversity in CBD pot. Brazil's approach to both indigenous knowledge and Farmers' Rights has been diplomatic, deceptive, and destructive.
Canada	After years of uncharacteristic negativism, delegations to all fora showed an impressively constructive and consistent approach that did much to bring the North along. On Indigenous Rights issues however, Canada seems to be following the Brazilian model.
Chile	Despite a critical and constructive role in the Summit process, Chile's performance in the CBD and elsewhere has been lacklustre and disappointing to its friends.
China	The delegation played a pivotal role in achieving progressive compromises in Leipzig, at the Summit, and in the Commission. Combining diplomacy, intelligence and humour, the delegation was at the heart of every important decision and won praise from all sides.
Colombia	Colombia was creative, charming and illogical throughout all fora in 1996. Many Southern delegations felt it was marching to Uncle Sam's drums. In Buenos Aires, however, Colombia's indigenous senators shouldered aside the diplomats and led the important and progressive debate on Article 8J concerning indigenous knowledge.
Ethiopia	Always among the most politically astute and scientifically prepared delegations, Ethiopia played a leadership role in Africa and joined with Malaysia, the Philippines, and China in offering progressive direction for the G77.
Germany	Propelled by the Leipzig Conference to play a mediating role both there and in Commission negotiations, Germany did well and has continued to be a constructive voice in Rome—if rather invisible at the CBD.
Malaysia	The current delegation has both honoured and added to the tradition established by Malaysia during the Rio process, by combining a feisty pro-South style with strategic diplomacy. The delegation works well with Southern partners but is also able to look beyond normal South–North relations both to cajole the South and entice the North.
Netherlands	Dutch delegates played a helpful role in Leipzig and Commission follow-through and have also been constructive, though low-key, in the CBD. A higher profile would be welcome.
Norway	With Sweden locked inside the EU, Norway has moved gracefully to take the lead post in moving issues and brokering consensus in the North. Delegation is consistent in all fora, and displays ingenuity and integrity much respected by other countries. Norway's Summit role was uncharacteristically visible, its arguments slightly convoluted, but still beneficial. In the CBD, Norway is irreplaceable.

Philippines	One of Asia's three diplomatic 'tigers' (with China and Malaysia), the delegation ranked among the most innovative and energetic in all fora and gave the country a consistent policy position from Leipzig to Buenos Aires that the USA must have envied.
South Africa	Still finding its way, the delegation shows competence and potential in both FAO and CBD fora, but needs more experience and time for preparatory work.
Sweden	Muted but never mutated, Sweden continues to fight the good fight within the EU. If it did little on the Right to Food at the Summit, it remained creative and constructive in the CBD and at Leipzig and the Commission.
Tanzania	After a silence of many years, this delegation rose in 1996 to take a lead role among African countries with Ethiopia and to play a significant part in G77 strategies especially in the FAO Commission. Many delegates expect Tanzania's influence to grow in 1997 and hope that it will spread to the CBD and CGIAR as well.
United States	For a delegation that would have to commit collective hara-kiri to win approval, the Americans did better than many expected. The delegation appeared consistently inconsistent, often irascible, and sometimes incompetent, but it was ultimately not a barrier to progress, and many delegations suspect its bark was intentionally worse than its bite on several issues.
Venezuela	Winning wide respect for its adroit leadership of the G77 in some critical fora, Venezuela restored faith in Latin America's place in the G77 when Argentina, Brazil and Colombia were doing great damage.
Zimbabwe	More evangelical than political, the delegation consistently bemused participants and delayed proceedings while still managing to score important points in FAO and at CGIAR fora.

4 Parts Patrician

'Supply-side' Science versus Farmers' Rights

After Development Dialogue *published* The Law of the Seed *in 1983, the Consultative Group for International Agricultural Research (CGIAR) wrote a rebuttal to what it perceived to be an attack on the Green Revolution. The exchange of views was carried in* Development Dialogue *1985:1. But the debate did not stop there. An intense dialogue concerning the science strategies of the CG System, its invisible governance and the flow of benefits arising from CG research has gone on ever since and may now be coming to a head. CGIAR is a powerful scientific network and its influence over agriculture, including biodiversity and the well-being of farmers, is enormous. Whether the nations of the world will have responsibility for CGIAR under a new food security strategy as proposed by the Food Summit, or whether CGIAR will merely be a division of the World Bank, will be determined very soon. For the first time since 1981, the CGIAR will allow a full-scale system-wide external review of its programmes and management.*

The invisible IARChy

In early 1990, at about the same time as the Madras session of the Keystone Dialogue, a number of environmental CSOs penned an open letter to Edouard Saouma, then Director-General of FAO, calling upon him to resign on the grounds that the Green Revolution had contributed to world hunger. Needless to say, the letter left FAO in shock. Although many in the UN agency would have given their eye-teeth to take credit for the spread of high-response seeds around the South, the truth was that FAO had stood on the sidelines watching the Consultative Group for International Agricultural Research (CGIAR) lead the way. When we asked the environmentalists why they hadn't fingered CGIAR rather than the innocuous (if not innocent) FAO, the common response was 'who?'. Almost no one in the environmental movement had ever heard of the CGIAR.

Yet, 70 per cent of the South's annual harvest of wheat and rice and well over 10 per cent of its maize, potatoes and sorghum come from the plant varieties of CGIAR breeders. Just about every living agricultural scientist in the South has participated in one or more short- or long-term CG training programmes. Overall, the largest and best-run crop gene banks in the world have been constructed and provisioned by CG scientists. The CGIAR is, by any reckoning, the most important agricultural agency in the world.

It is also invisible. When the World Bank's Ismail Serageldin took up his post as Vice President for Environmentally Sustainable Development in 1994, he inherited the position of Chair of CGIAR. He told delegates to a CGIAR donors' meeting in New Delhi in May that year that nothing had

astonished him more than to discover that the CG had no legal personality, no rules, no procedures. Indeed, the only time CGIAR appears to meet under a common flag is when donors and scientists crowd together into the Washington auditorium of the IMF building the last week of every October.

But the CGIAR is not merely disembodied, it is also decentralised. One reason for its invisibility is that it is a conglomeration of loosely allied International Agricultural Research Centres (IARCs) spanning the Southern globe from Mexico to the Philippines. In all, 16 Centres—most of them crop-specific, each with its own board of trustees—make up the Consultative Group along with 38 or so donor governments and 11 private foundations and development banks. Collectively, the CG, at about USD 329 million per year, is the size of FAO or IFAD agricultural loans—or of World Food Programme disbursements. But FAO, IFAD and WFP are in Rome; CGIAR is spread across five continents. FAO has about 6,000 staff; CGIAR has 1,800 scientists and close to 10,000 technicians and service workers.

From this disparate base, the Green Revolution was launched. The simple but sophisticated notion that a handful of high-response cereal varieties could be designed to be adaptable across vast and diverse growing conditions has, in a quarter century, turned global agriculture on its ear. Precisely because the IARChy—also known as the CG 'System'—is invisible, RAFI and other CSOs have insisted that its operations should be monitored. Of particular concern are the questions of governance and benefit-sharing. To many CSOs, the CGIAR operates with foreign aid funds primarily for the hidden benefit of Northern agriculture. Its non-structure allows it to work with impunity and invisibility.

Governance and the dominance of the AgreeCulture

'They're very hard to work for', one professional interpreter told me at a meeting of CGIAR donors in New Delhi. 'They all speak English and they talk with that kind of shorthand that people who have the same background and experience always talk. It's very fast and full of references to things that happened before. It makes it hard for us—and still more difficult for the few in the room who need interpretation.'

Whether the CG is in solemn convocation in New Delhi or at its annual International Centres' Week every October in Washington, the culture remains consistent. For those more familiar with the cacophony of a United Nations forum, CGIAR is a refuge of bland tranquillity. Almost everybody cosied up in the dark hardwood chamber of the International Monetary Fund is a 'MWASP'—a Male, White, Anglo, Scientist, Patrician. The only dis-

cordant note in the harmonious assemblage is struck by the two representatives appointed by FAO from each geopolitical region ... off-colour, out-of-context, sitting in corners, and never to be seen again once their brief terms expire.

Let's call this uniform, Western-dominated way of discussing, and deciding, the 'AgreeCulture'. After all, this is what it is: a culture based not just on a common language but even common *alma maters*. The good gentlemen in the auditorium share a common understanding of what the Third World agricultural problems are, and how they should be solved.

The AgreeCulture had its beginnings more than a quarter of a century ago in the Villa Serbelloni at Bellagio on the slopes of the Italian Alps. In April 1969, the Villa, a Rockefeller Foundation watering hole, brought together 24 participants and advisers from the far corners of their known world. All of those present were men. All (excepting a lone FAO adviser) were from the North. Eleven of the 16 participants were from the centre of the AgreeCulture—the four (largely Anglo) countries of the USA, the UK, Australia and Canada. Together, these men—with their Foundation advisers—reshaped international agricultural development and laid the groundwork for the Consultative Group on International Agricultural Research.

The governance style devised in Bellagio has remained comfortably intact for nearly three decades. Consider the CGIAR's highly-touted quality control strategy. The System began its formal career in 1971 committed to conducting rigorous system-wide external reviews every five years. Such reviews were to assure donors of the System's financial discipline and research quality—and to allow it almost unparalleled freedom of policy and practice between reviews. Only two such reviews have actually been conducted: in 1976 and in 1981. The first review panel boasted 11 Northerners—eight of whom were from the AgreeCulture—and three representatives from the South. The second consisted of 13 Northerners—11 from the four AgreeCulture countries—and only five Southerners. Apart from the striking North–South imbalance, an equally important question is how 'external' the CG external review teams really are. At least nine of the 18 members of the 1981 review panel came from within the System. Many were founding members from the early Bellagio meetings. On the eve of its third external review, it seems wise to examine CG governance.

The first level of governance: trustees

Governance in CGIAR must begin in Centres. The 1981 review panel expressed its concern that more would have to be done to ensure the active participation of the South in CG governance. Interestingly, the reviewers

also reported that more than half (53 per cent) of all IARC board trustees were from the South.

Considering that the real 'stakeholder' in the CG's research was the South, the panel obviously felt that this was still weak policy participation. Yet, when CSOs were first invited to formal discussions with CGIAR a full decade later, the proportion of Southern board members had dipped below 50 per cent. By 1996 it had dropped to 44 per cent. Meanwhile, the share of board seats held by the AgreeCulture countries has ranged reliably between 25 and 28 per cent.

Were there an intentional strategy to increase the participation of the South in CG governance, it might be expected to manifest itself in the nominations made by CGIAR to the individual IARC Boards in recent years. While only a handful of seats change bottoms every year, this is a clear opportunity for the CG System, as a whole, to show leadership.

As the 1981 Review Panel recognised, a simple majority on IARC Boards does not equal real influence in CG decision-making. Since trustees convene, at best, once or twice a year, the real governance of the IARCs is undertaken by its various committee chairs. For this reason, we have monitored key posts within the System since 1991. RAFI's review gives cause for concern. When the CG began to take CSO calls for an External Review seriously, in 1994, two-thirds of the prime positions were held by the North. Two years later, three-quarters of the same posts were North-controlled. In 1996, 16 of the 16 IARC Board Chairs were from the North. Likewise, 14 of the 16 Directors-General were Northerners.

It is worthwhile comparing governance data for CGIAR with ratios within the UN System. In 1996, the 15 Executive Heads of major UN agencies were 59 per cent from the North (29 per cent were from the AgreeCulture). In the same year, 88 per cent of CG Directors-General were from the North (69 per cent from the AgreeCulture).

CGIAR members have replied to CSO concerns by saying that they have successfully avoided 'meaningless quotas' and that the System was determined to seek the best people for the jobs. This is not a credible response. First, the Technical Advisory Committee (TAC)—as the ultimate scientific authority—is officially committed to finding half of its membership in the South (although there has never been a TAC Chair from the South). Second, both IARC Boards and CGIAR continue to nominate an astonishing number of influential US and Japanese citizens, ensuring that at least one national

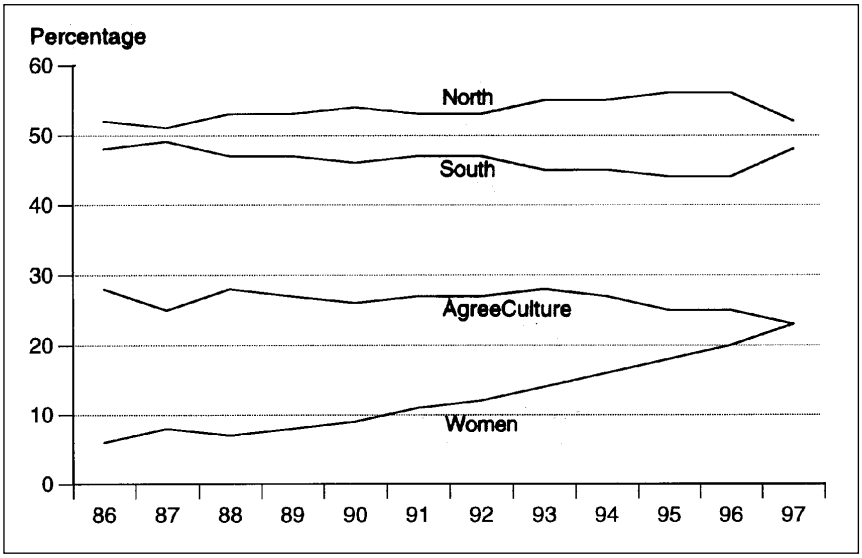

Figure 1 IARC Governance, 1986–97: membership as percentage of all trustees

from each country is on every IARC Board. The reason for this bias, of course, is donor pressure (or IARC desires to appeal to donors). Many—perhaps most—trustee positions are determined not on the basis of 'best', nor of representational 'balance', but on the requirements of the 'balance sheet'. The argument of political independence is dishonest.

CGIAR has performed better when it comes to improving the participation of women. From about 8 per cent of trustees in 1991 the share rose to over 20 per cent in 1997. While this is far from a stellar performance, it probably exceeds progress made by many UN agencies and national governments.

The second level of governance: donors and members

The second level of CG governance, of course, rests with the governments and foundations that bankroll IARC research and comprise the 'membership' of the invisible IARChy. On the eve of its impending External Review, close to half of the government members (19 out of 42) were from the South. This represents a major positive shift. Credit for this goes to Ismail Serageldin, CG Chair, who has consistently argued that the best way to strengthen the South's influence within the CG is by having them as paying members.

This is attractive logic for the North but poor reasoning for the South which, in effect, is being asked to pay twice. First, it is the South's germplasm that has fuelled an agricultural revolution both in the South and in the North. Now the South is being asked to prove its commitment with a second contribution of cash. Further, if 'money talks', then the South is only whispering: its contribution of just 2 per cent of total CG funds (1995) was exceeded by the contribution of Norway alone.

It is a fundamental matter of justice that those on the receiving end of CG initiatives should have a full say in the governance of CGIAR—especially when their germplasm and research so clearly benefits the North as well. Indeed, the 'pro-poor' orientation of the CG System, if it is serious, requires that it will work among countries least able to pay the unofficial membership fee of USD 500,000. Fee-based membership policies, therefore, institutionalise discrimination against CG's real stakeholders.

Benefits in the South?

The declared mandate of the CGIAR is to strengthen food security in the South, and some estimate that there are a billion people eating today who would go unfed were it not for CGIAR. The Green Revolution has revolutionised agriculture in the South. But it came with a tremendous socioeconomic and environmental price tag. As we shall see in Section 5, it ran roughshod over the centuries-old knowledge that resided—and still partly resides—in the farming communities of the South.

Table 3 identifies some of the primary concerns that have been voiced by critics of the CGIAR and of the Green Revolution, which saw the widespread introduction of high-response varieties (HRVs) of seeds. It also sets out the responses and counter- responses to the particular issues raised. The debate has been going on for well over two decades now.

Profits for the North

In a letter to the US Senate in 1994, the then Secretary of State Warren Christopher and two Cabinet colleagues argued that foreign germplasm contributed USD 10.2 billion annually to the US maize and soyabean crops.[1] A significant proportion of the maize and even some of the soyabean return can be traced to breeding material provided through the IARCs.

The International Centres that comprise the CG system have made—and continue to make—a fundamental impact on agricultural development in the North as well as in the South. Until recently, the benefits to industrialised countries were discreetly overlooked by the Centres and by their financial backers. However, the usual image of the IARCs as altruistic supporters of the poor took a beating when the IARCs watched donor contributions plummet at the beginning of the 1990s. The Centres started to make a direct appeal to their major financial backers by showing how much the donors themselves got out of the system.

Promotional brochures were prepared arguing the importance of Northern access to IARC-held germplasm, as well as a whole series of other benefits.

Table 3 The ongoing debate between CSOs and CGIAR

First critique by CSOs	Belated response by CGIAR	Comeback by CSOs
Big farmer bias? Fixed costs mean that large-scale farmers adopt high-response varieties (HRVs) faster than small-holders. Big farmers then gain unassailable market advantage that drives small farmers off the land.	But studies show that smallholders are catching up and their participation is roughly equal to that of larger farmers. Smallholders also sow a larger proportion of their land to HRVs than their big neighbours in order to equalise fixed costs.	But smallholders tend to be on less suitable lands (soil and slope), meaning that HRVs cannot perform as well. If they are increasing the ratio sown to HRVs, they are taking risks in order to minimise fixed costs.
High-yielding for all? HRVs are bred to need fertilisers and irrigation to increase yield.	No, HRVs equal or outperform folk-seeds under virtually all conditions. However, fertiliser bias may have been overdone.	But HRVs mine the soil if poor farmers cannot provide fertiliser or irrigation so yields are not sustainable.
Gender bias? Failure by CGIAR to examine the issue.	What's gender?	To the extent that HRVs lead to the capitalisation and mechanisation of tasks traditionally done by women, women are marginalised.
Nutrition? Emphasis on a handful of base crops has taken research away from poor people's crops that are often more nutritious.	IARCs have shifted from focus on wheat, rice and maize to about 25 crops offering the world well over 90 per cent of its food requirements.	But, the spread of HRVs has taken land from home gardens and minor but key nutrient crops important to poor families.
Disease-resistance? HRVs rely heavily on pesticides rather than breeding to combat disease and pests.	Yes, but yield maintenance is now a major focus in breeding programmes. Some IARCs have major successes to report which have been beneficial to small farmers.	But IARCs consistently overestimate chemical requirements and have endangered farmers by recommending high use of class I and II chemicals which are most dangerous.
Vulnerable groups? HRVs push families into the market economy, forcing sales of food needed at home. Women and children tend to be the first to suffer.	Studies show that new surpluses on the farm reduce intra-family food competition, helping pregnant and lactating women and infants more than anyone else.	There is growing evidence that folk varieties offered a wider range of nutrients than HRVs. Studies of benefits to vulnerable groups are weak. More information is needed.
Multi-purpose crops? *F*olk varieties were bred to meet a multitude of needs not met by HRVs.	A larger, more stable and less expensive food supply is most important to the poor.	Semi-dwarfs mean straw can no longer be used as fuel or for households. Some varieties take longer to cook, so fuel requirement goes up and forests come down. Dung has to be used for fuel rather than fertiliser. Special-purpose seeds for medicine, ceremony or certain recipes are lost.
National research? Green Revolution is an external input that truncates national research and perverts national priorities.	IARCs have trained well over 60,000 scientists. ISNAR (International Service for National Agricultural Research) was created specifically to support national programmes. NARS (national agricultural research systems) activity has expanded enormously.	But host countries often let IARCs do the work and both the type and focus of research is biased by IARCs. NARS expansion was probably due to other factors.

The Colombian-based International Centre for Tropical Agriculture (CIAT), for example, tries to convince US citizens and policy makers with the following language: 'by supporting CIAT's work, the USA helps tackle problems of concern to many US citizens. One of these is political instability, which stems from poverty and other social problems, and which threatens US trade and investment abroad.'[2] Having stoked the fires of fear, CIAT then makes a pitch to America's corporate heartstrings in pointing out its utility as a scientific centre with a unique international status and with access to the South's genetic stocks. 'Scientists need easy access to diverse genetic resources and to test new products in different environments. Because CIAT offers good facilities and access to a range of germplasm and environments, US scientists will continue to strengthen their links with the Centre.'[3] In the post-Biodiversity Convention world, this falls well short of politically correct and a long way below politically astute.

In similar brochures, IRRI—the CG's rice centre—claims that its 'improved germplasm has been effectively used as genetic building blocks for US rice varieties', and that US scientists have received more than 2,800 rice genotypes from the Centre.[4] Writing from Australia, researchers have identified 16 US rice varieties based on IRRI material and report similar benefits to their own country as well as Japan.[5] IRRI also argues that its technology directly helped Italian corporations bring rice varieties to market.[6]

It is impossible to fully quantify the germplasm and intellectual contribution of the South's farmers to the North's agriculture. But some estimates are possible and have been provided.[7] By far the best information is for wheat from CIMMYT (the International Maize and Wheat Improvement Centre in Mexico). Research institutions in four industrialised countries (USA, Australia, New Zealand and Italy) came up with figures that total almost USD 1.5 billion as the annual contribution of CIMMYT wheat to agriculture in those countries alone. CIMMYT's role is increasing by leaps and bounds. In 1984, barely a third of the US crop incorporated CIMMYT material. By 1994, two-thirds of the American wheat crop used the Centre's germplasm. Included in this is the country's entire source of rust-resistance genes—contributed from Africa.[8] Almost 90 per cent of the Australian wheat crop is based on CIMMYT research; 80 per cent of the New Zealand crop (not even a CG donor); at least 60 per cent of Italian pasta; and well over 25 per cent of western Canadian bread wheats.

The estimated value to the North of CG-derived wheat, rice, beans and maize is summarised in Table 4. These figures offer only a crude understanding of the North's 'hidden harvest', but the conclusion is inescapable:

Table 4 Estimates of value to the North for selected CGIAR crops (USD million)

Crop	Known data	The North's total extrapolation
Wheat[a]	1,436.5 (4 countries)	4,063.5
Rice[b]	126 (USA)	655
Beans[c]	60 (USA)	111
Maize[d]	20 (USA)	29
Total		4,858.5

Sources:
a CIMMYT, Mexico.
b Dalrymple, Dana, *Development and spread of High-Yielding Rice Varieties in Developing Countries,* USAID, Washington, DC, 1986.
c Personal communication to RAFI by CIAT officials during meetings at CIAT in Cali, Colombia, April 1992.
d Goodman, Major, *Economic Botany.*

the North is benefiting handsomely from Southern farmers. Together these crops account for about one-third of all CGIAR research. Extrapolating from the figures available, it becomes clear that the North benefits from CG germplasm by more than USD 4.8 billion per year for these four crops alone. For this princely sum, the North contributes a paltry USD 78 million to keep CIMMYT, IRRI and CIAT afloat.

These four commodities account for only 39 per cent of the CG's core research budget and the estimate excludes highly transferable research on livestock (US goat producers have improved milk yield and livestock exports through CG-funded research from Kenya),[9] potatoes, barley, triticale, soya beans, groundnuts, forage grasses and legumes (especially important to cattle in northern Australia)[10] and fisheries. If these commodities were added (or until more thorough studies can be completed) it is reasonable to assume that the North, for an annual investment of approximately USD 300–330 million wins back between USD 5 billion and USD 8 billion for its own food economy.

Nursery crimes

The most commercially useful genetic material sucked Northward passes through the IARCs either directly via Centre gene banks or indirectly as 'improved' nursery stock, exported on request or as part of international field trials. The distribution of nursery stock is an excellent opportunity for Northern institutes to test out CGIAR germplasm to see whether it is of use in their country. Although the official purpose of the trials is to help IARCs evaluate promising material through the use of Northern labs and trained

personnel, the 'spin-off' benefit is not lost on Northern breeders who are free to skim off duplicates of the most marketable germplasm for their own use.

From data published by CGIAR in 1992—and updates offered by some Centres—one can conclude that anything between 11 per cent and 33 per cent of CIMMYT's nursery stock of wheat, maize, barley and triticale has been sent North. Between 19 per cent and 26 per cent of CIAT's bean stock went in the same direction. Similarly, substantial amounts of sorghum (12 per cent) and millet (29 per cent of minor millets and 11 per cent of pearl millets) find their way North from ICRISAT in India. But the chickpea flows beat them all: 74 per cent of all chickpea nursery stock appears to have been shipped to industrialised countries such as Israel and Australia.[11] Indeed, ICRISAT and ICARDA virtually established the Australian chickpea industry, based on 16,000 farmers' varieties given to Australian breeders.

Clearly, benefits to Northern financial donors to CGIAR spread far beyond those few crops for which figures are available. Some of them go directly to private breeders. Like other IARCs, the International Potato Centre (CIP) in Peru has also made a large contribution to agriculture in North America and Europe. The Lima-based Centre donated the genetic source for golden nematode resistance to US potato-processors[12] and sent some 5,911 accessions to Germany for study by five private breeders.[13] In the late 1980s, Pepsico's snack foods subsidiary, Frito-Lay, and Escagenetics of California both visited the CIP gene bank in Peru to rummage through the collection. Plant Genetics Systems of Belgium (now a subsidiary of the giant agrochemical firm, AgrEvo) picked up commercially important resistance germplasm from CIP and even Monsanto, always on the lookout for herbicide-tolerant genes, has delved into CIP's stock.[14] Recently, CIMMYT maize breeders advised us that about 30 per cent (and growing) of the requests they receive for farmers' maize varieties (stored in CIMMYT's gene bank) now come from private companies. Not to be outdone, IITA has pioneered a hybrid maize breeding programme funded by the Nigerian Government, whose germplasm was commandeered by the world's largest maize breeding corporation, Pioneer Hi-Bred International. Pioneer is now selling the resulting varieties in both East and West Africa.

Balancing the benefits

The benefits the CG is providing to the North must be seen in the context of its contribution to the South as well. Forty million hectares of Southern lands are sown to CIMMYT wheat material, for example. This represents 56 per cent of all developing country wheat lands (excluding China).[15] Using

CGIAR crop value estimates, CIMMYT's spring wheat varieties (alone) contribute at least USD 3 billion to the South's economy and food requirements.[16] The proportion of the crop sown to CIMMYT stock may have a farmgate value as high as USD 20 billion. We calculated the farmgate value of CIMMYT's wheat stock to the North at USD 18.9 billion. This would suggest that North and South benefit equally from the CG in the case of CIMMYT's wheat.

IRRI and CIAT rice varieties are harvested on close to 70 per cent of developing country paddies. Here, the balance swings towards the South, as rice is far more important in the South. But these are not all the benefits. There are additional gains for Northern chemical enterprises when IARC research and husbandry recommendations drive Southern farmers toward high external input cropping systems. For example, IRRI's advice for its high-response rice varieties helped fuel a USD 2.4 billion agrochemical market. That profit too went North. Only recently has IRRI acknowledged that it drastically overestimated rice fertiliser requirements.

This is not to suggest that there is a plot to turn foreign aid funds into subsidies for Northern agriculture or agribusiness. There is no evident connection between the economic importance of an IARC crop to the North and the amount of funding that an IARC receives. The United States, for example, gives more or less equally to IRRI, CIMMYT and CIAT, even though US benefits from CIMMYT are massively greater than from the other two Centres combined. Conspiracy theorists must also take into account that about 43 per cent of the CG's budget goes to Africa whereas Northern economic and geopolitical interests would dictate more remunerative targets in Southeast or South Asia, the Near East or Latin America.

It is also evident that the financial donors have not truly internalised the CGIAR's value back home. In fact, most are genuinely surprised when presented with the facts. While they are vaguely aware that the CGIAR is appreciated domestically by home universities and corporations, aid agencies prefer to sublimate this 'kickback' effect and espouse loftier virtues.

All of these figures are very crude measures of impact, but they probably represent the range within which the truth lies.

Dialogues and diatribes: a brief history
Towards the FAO-CGIAR Accord on Germplasm Policy

The dominant concern of 'seed CSOs' in the 1980s—with respect to CGIAR—was the control and quality of Centre gene banks. We felt, very strongly, that the banks and their contents should be the property of the farmers who provided the seeds. On their behalf, the United Nations, in the form of the FAO Commission, should play a kind of trustee role over the banks. No one in the CG System seemed to agree with us, although we continued to press our point in every Commission meeting. Propelled by the momentum from the Keystone Dialogue, CGIAR invited RAFI to bring together a number of CSO critics during its 1991 Washington meeting. Despite areas of strong differences, the encounter was surprisingly amicable and both parties agreed to continue the dialogue.

By April of 1992, the goodwill from Keystone had all but evaporated. A meeting in Latin America between regional CSOs, RAFI and the IARCs active in the region, came within a hair's breadth of collapse. The central irritant was a 'draft' paper on intellectual property policy penned by CGIAR's Technical Advisory Committee. To CSOs, the document was a backward step in favour of intellectual property protection for CG research. To make matters worse, the paper only arrived as a draft the day the meeting began. Worse, the text was only available in English. Worse still, CGIAR introduced the text with the admonition that it was 'secret'. After two days of very angry exchange, CG officials declared the document a 'non-paper' and withdrew it. This being one in a long series of abortive attempts to produce a CG-wide policy on intellectual property, CSOs retorted by denouncing CGIAR's approach to dialogue.

In the summer of 1992, encouraged by the spirit not of Keystone but of the Rio Earth Summit, representative CSOs and CGIAR members gathered at RAFI's Ottawa headquarters. Reluctantly, agreement was reached to pursue other regional consultations beginning with a Dag Hammarskjöld Foundation-sponsored dialogue in Chiang Mai, Thailand, later in the year.

The Chiang Mai meeting brought together the International Rice Research Institute (IRRI), the International Centre for Living Aquatic Resources Management (ICLARM) and the International Plant Genetic Resources Institute (IPGRI) with a number of regional CSOs arranged by SEARICE with the collaboration of RAFI and GRAIN. The meeting went amicably enough. Much of the credit went to Klaus Lampe, IRRI Director-General, whose anti-patent passion rivalled that of CSOs. Much of the discord can also be credited to Lampe who told his Asian colleagues that IRRI was using transgenic technologies to develop a new rice phenotype that would yield not five but 15 tonnes of crop per hectare.

By 1993, relations between CSOs and CGIAR were uneasy but civil, with all parties striving to find a basis for constructive cooperation: so much so that I was invited to make a presentation to CGIAR's International Centres' Week at the end of that year as a prelude to joining a systemwide 'Stripe' review of CGIAR's commitment to plant genetic resources conservation.

The review team reported its findings to CG donors at their New Delhi session in May 1994. There was a remarkably high level of consensus and willingness to address the severe problems discovered within the CGIAR gene bank system. The New Delhi gathering agreed to establish a genuine system-wide policy and practical mechanism for genetic resources management under the direction of IPGRI. Most notably, the donors acquiesced to one of the major issues concerning CSOs: that policy control over gene bank accessions should be brought under the FAO Commission. For the first time in its quarter-century history, the CGIAR was being asked to accept the policy authority of the United Nations.

It was in New Delhi—gingerly testing the changing waters of the CG System with Rene Salazar—that I first met the CG's new Chair, Ismail Serageldin. I found him at once forceful and reflective. I had been concerned when my old Keystone colleague, Henry Shands of the US government (and Chair of our Stripe Team), stepped aside from his Chair role in presenting our report to caution against a hasty adoption of the agreement with FAO. But, it was only in the meeting's closing moments that I felt any cause for worry. The Chair, quite unexpectedly, summarised the discussion of an FAO-CGIAR gene bank accord with the comment that he would like to have World Bank lawyers review their legal agreement before finalisation.

Knowing the CG's antipathy towards FAO, I was sufficiently disturbed to write to Ismail Serageldin on June 7 and ask him to ensure that the FAO-CGIAR Accord was completed as quickly as possible. On June 16—literally as I was racing to the airport for the final preparatory meeting of the Biodiversity Convention—I received Serageldin's faxed reply. The riveting paragraphs read as follows:

'Now to the question of the proposed agreement between each Center and FAO. It is of course closely related to my comments on CGIAR as an international entity. Acceptance of the system-wide program on genetic resources in Delhi was an important step towards CGIAR coherence on key global issues. However the proposal for individual Center agreements with FAO runs counter to the spirit of the new found coherence. Indeed such a fragmented arrangement implies subsequent interactions

with centers on an individual basis, something which may impair the development of system-wide policy and procedures for the collections as agreed in Delhi.'

'A related point, strongly made in Delhi, which you support in your letter, is the upcoming sequence of international meetings through 1996. These meetings will have outcomes which deserve weight in any agreements on CGIAR collections. It would be foolhardy not to bring a CGIAR voice to these meetings and equally foolhardy to lock into agreements which the meetings themselves may render obsolete.'

On planes and at airports en route, I called CSO colleagues and CG and government contacts for advice. No one could offer me any other interpretation of the letter than that the CG was reneging on its Delhi decision to sign the policy accord.

RAFI was left with no alternative but to interpret the letter as a possible attempt by the World Bank to gain some kind of control over CGIAR's undervalued gene banks and to keep policy oversight out of the hands of the appropriate United Nations agency. If so, action would have to be immediate at the Nairobi intergovernmental conference.

Within hours, Serageldin's letter and our news release were the subject of television and newspaper reports ranging from the Nairobi press to the *Financial Times*. Madame T'ing of Malaysia told the conference that the World Bank's action was a 'dawn raid' on the genetic resources of the South. Sweden's Ulf Svensson was equally critical. The political security of CGIAR gene banks and the urgency of bringing the banks under the auspices of FAO became a conference *cause celebre.* Before it ended, Geoff Hawtin, Director-General of IPGRI—and the senior CGIAR official on the spot—read out a statement to the intergovernmental plenary confirming that centres would indeed sign the policy accord with FAO, probably before the first formal Biodiversity Convention meeting in Nassau that November.

After my return to Canada a few weeks later, I had an anxious phone conversation with Alexander von der Osten, CGIAR's Executive Secretary, who had faxed the letter from Serageldin. I had always been on friendly terms with von der Osten and explained that the letter's contents and timing had left me with no choice but to take action in Nairobi. The Executive Secretary adamantly denied that the June message contained the points I was attacking. When I forced him to scrounge about his desk and look for the original copy, he came back to the phone mumbling that he could, after all, understand how I might have interpreted the letter the way I did.

The conversation was disturbing for at least two reasons. First, that von der Osten's confusion was genuine and that at least he had not intended to sideline the accord with FAO. Second, that despite the high-profile media feud, at least some key CGIAR figures had failed to return to their own statements and reread them. I agreed to fly to Washington in late August and to meet with von der Osten and Serageldin. If the whole thing was just a drafting error, then it was important to clear the matter away quickly.

With exquisite bad timing, I received a copy of letters from von der Osten and Serageldin to the IARCs concerning the Nairobi ruckus and the pending accord with FAO. One piece damned RAFI and other CSOs for our polemics and defended the Chair. That was to be expected and was no cause for concern. The second piece asked Centre Boards to surrender policy responsibility over germplasm to the CG Chair who, in turn, would use his authority to negotiate agreements with FAO and other international bodies. Included in the list of those Serageldin suggested as appropriate for germplasm agreements (both in letters in June and August) was the World Trade Organization. Since the new missives did not explicitly confirm the FAO Accord, I felt we were back where we started in June.

What was to have been a 'kiss-and-make-up' meeting turned into a shouting match with CGIAR's embattled Executive Secretary, Alexander von der Osten, and my old Keystone colleague, Wolfgang Seibeck. I argued that the letters reinforced CSO concern that the World Bank might want to take over control of the CG gene banks. Von der Osten denied this but, upon rereading his own message (drafted for Serageldin's signature), conceded that the wording might have been clearer. In the end, I left them to have a private lunch with Serageldin. My greatest regret of the day was that what seemed to be incomprehensible ineptness on the part of the CGIAR might actually be correct. I was still not certain whether or not there had been a real plan to take over the gene banks—or that the Secretariat was merely hopeless. My second regret of the day was that I never really had the opportunity to talk matters through with Wolfgang Seibeck—a man whose personal decency and integrity was unassailable, and who died not long after in a boating accident. The loss of a brave opponent is greater than that of a weak ally.

As I had been in New Delhi, I was once again impressed by Serageldin's competence and directness. We separated that afternoon with the understanding that I would draft a letter for him stating my concerns and suggesting the appropriate wording for Centre Boards. I left Washington confident that Ismail Serageldin was not the enemy. I was much less confident about those around him in the World Bank—and very disturbed about the compe-

tence of some of his colleagues in the CG Secretariat. Hopefully, the roller-coaster ride would be over.

Hope Shand, Jean Christie and I flew to Washington late that October for the signing of the FAO-CGIAR Accord. Though you could cut the tension in the IMF auditorium with the proverbial knife, it was a good moment.

The call for an external review

The CGIAR is almost exclusively directed and controlled by its AgreeCulture—its accidental beneficiaries. Aside from our initial concern for the safety of their gene banks, we were—and are—alarmed that so powerful a research entity could escape even the rudiments of responsible intergovernmental supervision. Following the signing of the FAO-CGIAR Accord, the outstanding issues are transparency, equity and democracy.

The excuse for the anti-democratic nature of CG governance has variously been that the System deals with 'science' or that 'it works'. As Americans are fond of saying, 'If it ain't broke, don't fix it.' The problem arises when the commercial value siphoned Northward is not acknowledged and not compensated. The situation worsens massively when Northern governments allow the patenting of material wholly or partially derived from farmers' varieties, freely given and held in trust in the CGIAR Centres. As private companies move into the South's seed markets, farmers risk paying for the end product of their own genius. In that context, the entire enterprise risks becoming a huge klepto-monopoly, taking freely given germplasm from the South and winning patent monopolies in the North. Cooperative innovators—including indigenous and other rural societies—deserve credit and respect for their contribution. They deserve support in helping improve their farming systems, rather than undermining and replacing them. They deserve a place at the helm of a ship that is meant to transport them to improved livelihoods.

A fair calculation of the real flow of benefits is critical to any effort to change the CGIAR. The System's funders defend their utter domination of the CG system with the claim of openhanded altruism. If the governance and scientific composition of the system seems biased towards the North, supporters argue, it is the price that must be paid to ensure the system's commitment to apolitical scientific excellence. But since it is clear that the CGIAR germplasm gathered from the farmers' fields in the South is also an engine of agricultural improvement in the North, the picture radically changes. Both donors of dollars and donors of DNA have the right to a voice in the operation of the CG, and the North's dominance over it must be relin-

quished. It is not always appropriate for the left hand not to know the whereabouts of the right hand—especially if its nuzzling somebody else's pocket.

CSOs are not the only ones to have called for fundamental changes in the way that the CGIAR operates. On the boards of IARCs, the Canadians, Scandinavians, Dutch and Swiss have become a pressure for liberalisation. Not only have they criticised the CG's lethargic approach to sustainable agriculture but they have repeatedly voiced their concerns about the System's governance. Sweden's SAREC has been particularly strong in their 'loyal opposition' to the dominant AgreeCulture.

Nevertheless, it must be difficult for these more progressive agencies to reconcile their general positions on the participation of the South in the development and guidance of programmes for the South, and their continued financial support to an IARChy that has remained insular for 25 years. Have Europeans and Canadians been wrong to encourage a Third World voice in other multilateral fora or is agricultural research so specialised that it can be isolated—beyond all other sectors—from what governments would think of as normal democratic proprieties?

The real push to force a review of the CG System began with the signing of the FAO-CGIAR Accord. Faced with declining donor enthusiasm, CGIAR was attempting to bolster its prestige through a 'renewal process' that had begun with its New Delhi meeting in mid-1994 and was to conclude at its annual conflab in Washington in late l995. En route, Ismail Serageldin proposed to convene another 'Bellagio' meeting—a coming-together of ministerial-level donors early in l995.

Working closely with Henk Hobbelink and his colleagues at GRAIN, we followed up on the Accord signing by contacting a number of other CSOs to prepare an 'open letter' to the governments that would venture to Lucerne, Switzerland (Bellagio had become too small for the CG). Along with a sharp critique of CG research, we pressed delegations to undertake immediately a full systemwide external review. The open letter was sent to the CG Secretariat in Washington as well as to governments and foundations.

The Secretariat's response was, at best, testy and a trifle silly. We were informed that, in its wisdom, the CGIAR had moved beyond blunt instruments such as external reviews of the whole system and that they had determined to use more finely tuned monitoring mechanisms. Asked when this revelation had occurred, they made no reply.

In the midst of the Lucerne meeting (which the CG called 'Launching the Renewal' and which CSOs called 'Lunching the Renewal'), the call for review struck a responsive chord. The Lucerne closing statement—the meeting's only visible 'product'—had been intended to call for a major increase in funding. The text laboured through at least three drafts during which the pledge to increase declined to a pledge to maintain current funding. Early drafts also called for a system-wide external review. This, too, was whittled down and then dropped in the final text. Instead, the Lucerne gathering called for the creation of an NGO Committee and a Private Sector Committee—presumably to help the System manage its critics.

Within days of the Lucerne 'Lunch', the Dag Hammarskjöld Foundation brought together key 'seeds' and rural development CSOs in Uppsala. Although the initial intention of the gathering was to prepare for the Leipzig Conference scant months away, Olle Nordberg and Sven Hamrell immediately saw the need to address the fallout from the CG's Swiss retreat. The group spent a couple of long evenings considering how CSOs should respond to the formation of an 'NGO Committee' and the System's failure to accept the external review. It was quite clear from talking to several delegates returning from Lucerne that many agreed with our position but had been forced into silence by the CG Chair who was determined not to appear to be capitulating to outside pressure. Our analysis in Uppsala was that donor governments would ultimately insist on the review if we continued our pressure. Renée Vellvé of GRAIN and I drafted a letter to CSO partners not with us in Sweden, and plans were made to increase the pressure.

The pressure continued throughout 1995 and culminated that October in Quebec City. There, CGIAR officials participating in the 'People at the Heart of Development' symposium expressed genuine shock at the strength of the criticism of the Green Revolution and of CG governance. It was almost equally shocking for CSOs to discover how poorly informed Centre trustees and directors were of their own governance data. In the end, more than 250 CSO leaders from more than 40 countries told the conference (and the subsequent ministerial-level meeting) that there was no choice but for the CGIAR to conduct an immediate external review of its entire System. There is no better reason to conduct an external review of CGIAR than when those who have power are unaware of their role. They cannot be expected to undertake meaningful renewal without outside encouragement.

Short days after Quebec City, CGIAR was back in the IMF auditorium and, in the quiet, informal, unofficial way that legal non-entities have, agreed to the external review. A month later, I saw Ismail Serageldin at another round

of the Biodiversity Convention. During one open session with CSOs and governments, the CG Chair described the System as an 'AgreeCulture' that had to be changed and announced that there would be an external review.

At the time of the last formal external review of the whole CGIAR system, the review panel wrote, 'The inherent vitality of the System is well illustrated by its willingness to subject itself to periodic review, based upon an independent study by an external panel.' That last review was 16 years ago, more than half the lifetime of the CG system.

In mid-1997, CGIAR formally announced that the Chair of the external review will be Maurice Strong, fresh from his review of the UN System and after a long history of remarkable work including his leadership of the Stockholm Conference on the Human Environment and the Earth Summit. Almost forgotten in any recitation of his accomplishments is that Maurice Strong is also one of the founding patriarchs of the CGIAR—one of the original 'Boys from Bellagio'. At the outset of the review, Strong and his fellow panellists announced their commitment to 'sustainable agriculture' yet two of the nine reviewers come from a corporate world committed to anything but that. One has a long history with Novartis, number two in global seed sales and far and away the world's dominant pesticides marketeer—in fact, a company that profits from unsustainable agriculture. The other is a recently-returned chief executive of Cargill, one of the world's top seed and fertiliser companies and the world's number one grain trader—a company that depends for its fortune on sustainable hunger. The future of the Green Revolution institutes is by no means secure.*

* * *

On the last week of October 1997, RAFI reviewed the governance data for the CG system. They showed that two-thirds of the trustee posts filled during the year had gone to persons from the South and to women. There was also a significant shift in posts for Board Chairs and for DGs. During the CG annual meeting, Maurice Strong invited Antonio Quizon of ANGOK (Philippines) and me to join the external review process. We both accepted.

* In the first weeks of 1998, the renewed struggle for common ground was put to an acid test. RAFI's Edward Hammond uncovered more than fifty plant varieties claiming Plant Breeders' Rights in Australia that appeared to be nothing more than the BioPiracy of Farmers' Rights around the world. Among these varieties were several from the gene banks of ICRISAT, ICARDA and CIAT that had been placed under the 1994 Trust Agreement with FAO. Although ICRISAT and CIAT moved quickly to demand that the Aussie claims be dropped, ICARDA rather absurdly attempted to pretend that it had the right to violate the FAO Trust and allow the claims. During the war of press releases and e-mails, I contacted Ismail Serageldin privately and

Notes

1. United States Secretary of State Warren Christopher in a letter of 16 August, 1994 to 'Mr Leader' of the United States Senate. The figure is for maize and soyabeans. The letter is supported by the Secretary of Agriculture and the Secretary responsible for the Environmental Protection Agency and calls for the Senate to ratify US participation in the Convention on Biological Diversity.
2. White, J., 'The United States of America and CIAT', *Shareholders in Sustainable Development series*, CIAT, Colombia, July 1993, p. 1.
3. White, J., *op. cit.*, p. 8.
4. 'Facts about cooperation, United States of America and IRRI', IRRI, Manila, October 1994, p. 3.
5. Tribe, Derek, *Feeding and Greening the World: The Role of International Agricultural Research, 1994,* CAB International and the Crawford Fund for International Agricultural Research, 1994, p. 224.
6. 'Facts about cooperation, Italy and IRRI', IRRI, Manila, October 1994, p. 7.
7. RAFI used three different parameters to assess the benefits the North derives from its investment in the CGIAR: estimates of the dollar value of the IARCs' contributions to Northern agriculture provided by Centres or national public sector researchers; calculations of the percentage of industrialised countries' land area sown to varieties with substantial amounts of CG germplasm, which offer an idea of the farmgate value of the CG's contribution; distribution of nursery trial stocks from the Centres for testing in industrialised countries, with data taken from a series of 17 CD ROM disks published by CGIAR in 1992.
8. Tribe, Derek, *op. cit.*, p. 225.
9. *Ibid*.
10. *Ibid.*
11. The data cited for ICRISAT is taken from tables available in CIARL-BRS files ICRI4011, ICRI4016, ICRI4018, ICRI4019, and ICRI4020.
12. Tribe, Derek, *op. cit.*, p. 225.
13. CIARL-BRS file CIPP2040.
14. For further information see 'Emerging Technologies for Potato', *RAFI Communiqué,* September/October 1992.
15. Byerlee, D., and Moya, P., *Impacts of International Wheat Breeding Research in the Developing World, 1966–90,* CIMMYT, Mexico DF, 1993, p. 31.
16. Byerlee, D., and Moya, P., *Impacts of International Wheat Research in the Developing World,* CIMMYT, Mexico DF, 1993, pp. xi-xii.

asked him to intervene by calling for a global 'volontary moratorium' by all countries on any intellectual property claims involving CG germplasm. In India at the time, Serageldin acted immediately and authoritatively issuing his own news release making the call and asking the FAO Commission to take up the issue at its next meeting. Meanwhile, several Australian agencies abandoned the contentious claims and the PBR Office announced that it was undertaking a full investigation of the piracies. ICARDA was left looking particularly foolish as the Aussie parties it had defended voluntarily abandoned their applications—and as the Chair of CGIAR publicly thanked RAFI for its research. What could have been another round of bloodshed over the FAO Trust turned instead into a model example of effective international cooperation.

5 First Parts

Putting the Particulars Together

The World Food Summit of November 1996 focused international attention—after more than two myopic decades—on food security. Although some of the Summit's rhetoric was attractive, it is clear that the North believes food security to be a matter of trade and investment and not a matter of domestic self-sufficiency. This is extraordinarily dangerous. Food security must be built and maintained on the foundations of rural communities led by the genius of indigenous peoples—the world's First Farmers. The tragedy is that these farmers and their communities are disappearing. One of the recommendations in The Law of the Seed *was to encourage a seed conservation strategy supported by farmer-curators. It was thought to be a new idea back in 1983, but it originated in China 12,000 years ago. The revival of the idea in 1983 was, perhaps, a generation too late. Our generation may become the first in the history of the world to lose more knowledge than we will gain. What is taking place is a kind of genius-cide the world may not survive.*

He who would do good to another must do so in Minute Particulars;
General Good is the plea of the scoundrel, hypocrite and flatterer;
For Art and Science cannot exist but in minutely organized Particulars.
William Blake, Jerusalem

Genius-cide

We've used infrastructural development. We've looked for technological miracles. We've tried the marketplace (at least the 'demand side'). We've done everything but use our heads. For half a century, the multilateral community has approached food security from the outside—as though it were an item of mechanical manufacture; as though it only required external intellectual and material input. We have, at best, worked with less than half a brain. More than half the world's people continue to live in rural areas closely concerned with food production. About 20 per cent of the rural population is composed of indigenous peoples with vast innovative experience and an intimate knowledge of foods and ecosystems. For half a century, we have neglected to work with the hundreds of millions of researchers with their tens of millions of field laboratories and billions of annual experiments that should be the starting point of food security. Now it is almost too late.

When the United Nations was young, and foreign aid was a bright promise of equity and development, the North campaigned to bring industrial medicine to every village; to declare war on illiteracy; and, as Dean Acheson told Lester Pearson at the founding of FAO, to deliver a 'hot meal to every Hot-

tentot'.[1] These campaigns were premised on the assumption that the poor were empty vessels waiting to be filled with the wisdom of their masters. A half-century later, the arrogance of the campaigners is evident. The North's aid agencies have neither the necessary fortune nor fortitude to do the job.

Despite monumental mediocrity and intellectual ineptitude, the North has succeeded in gutting the genius of the poor. The noble call to 'develop' also 'destroys'. The homespun safety net of community knowledge and experience that provided at least a modicum of security is now vanishing into the mists of time. These days, no one is wining and dining Hottentots and they themselves are on the menu.

At the forefront of the eradication of indigenous knowledge (more appropriately, the dynamic and ongoing processes of community adaptation and invention have been dubbed cooperative innovation systems) are literacy campaigns that ignore or demean community experience rather than build upon it. Literacy campaigns have made the poor skilled in the recitation of unavailable Northern technologies while rendering them illiterate in their own life-critical technologies.

In the light of a half-century of failed adventurism in development theory, and destroyed wisdom, the resurgence of interest in food security (well-timed after its destruction under the Uruguay Round) and other mantras such as Sustainable Human Development must be welcomed with caution. As attractive and comfortably 'holistic' as it is to merge Basic Needs and the Environment with Human Rights, such concepts are hollow without credible points of departure. The old (but largely untried) notion of Food Security—best seen in the context of support for Cooperative Innovation Systems—has the merit of building other securities around a centre point fixed in the daily needs and environmental realities of local communities. In a sense, FAO's focus on food security brings it all home—the foundation for meeting local needs; for safeguarding the neighbourhood ecosystem; and for strengthening cooperative systems of community development. Despite the devastation wrought upon indigenous (and other rural) societies over the past half-century, there remains a base of vital information upon which communities can build.

Food security should be understood to open the first of a number of interconnected rooms. Local cultures, food, health and the environment can be almost indistinguishable. But the focus is food. Staple foods are what you take to keep your body well. What we might call 'medicines' (usually medicinal plants) are mostly non-staple foods used less frequently for the

same purpose. The availability of both staple and non-staple foods depends on the health and diversity of the community ecosystem. There are complex interrelationships in fields, forests and waters between cultivated species and what we may call 'partner species' (sometimes erroneously referred to as 'wild species'—allowing others to expropriate resources with impunity), and these must be nurtured by the community. Most of humanity's knowledge, then, is highly specialised for the survival of the community in a specific, ever-changing ecosystem. The traditional Northern approach to rural and community development has ignored this reality, and has attempted to divide (food, health, etc.); destroy (local knowledge through literacy campaigns); and 'develop' (through specialised external agencies).

People premises

The evolving knowledge of indigenous nations and rural communities is the basis for not only the advancement of their own interests, but for the further development of the world community. In this section, the contributions of indigenous peoples and of non-indigenous farming communities are discussed together under the umbrella term, cooperative innovation systems. This is not to suggest that the interests (or experiences) of indigenous peoples—their rights to self-determination and land, for example—are identical with those of other rural societies. (Neither is it to intimate that institutional science cannot be cooperative, as well, and play an extremely valuable role in advancing our common well-being.)

Indigenous and other rural societies share some important concerns. Both are fighting for their rights and for their survival. An evolutionary and generally cooperative approach to scientific and technological innovation characterises almost all rural cultures. In each case, their knowledge has been discounted. If they are to prevail and if their genius is to continue, there is common strategic interest in emphasising the importance of community development and food security as the grounding for human security. Indigenous and rural societies had common cause in the Committee on World Food Security and the World Food Summit and in the International Technical Conference on Plant Genetic Resources in Leipzig. In addition, the same issues arise in such fora as the Biodiversity Convention—whose 1995 and 1996 sessions focused on intellectual property and indigenous knowledge; and in UNESCO's Biosphere Programme; and in WHO's work with medicinal plants and primary health care; and as the UNDP develops its approach to Sustainable Human Development.

Let's first consider the experience of cooperative innovation systems in food, health, environment and education and then discuss how these often separated parts come together.

Food security: lost genes, lost crops, last crops and first farmers

There are at least 800 million hungry and malnourished people in the world—most of them children and women. Even the technological optimists don't think the situation will improve significantly. The political realists are battening down the hatches for Armageddon. The issue is not how we can produce more. It is how farmers who know and understand crop genes can work with others to make better use of the lost crops and the last crops in each micro environment.

Fifty years ago when the Green Revolution was but a twinkle in the eye of its founding father, Norman Borlaug, virtually 100 per cent of poor people's food was provided by local means. Local production was not always sufficient. Food shortages were chronic and famines were common. Neither communities nor nations were self-sufficient.

Self-sufficiency in food production has long been a goal for most countries. Political experience dictates that the poor cannot trust the rich to feed them. Food continues to be a weapon in international trade and politics. However, there is no such thing as politically correct hunger. Fifty years ago, it was clear to everyone that something had to be done. What was 'done', however, led to the destruction of much of the genius of food producers and the decimation of our sources of food.

In its campaign to provide food security for 'every Hottentot', the North adopted the production model that served Henry Ford so well. With the motto that everyone could have any colour car they wanted so long as it was black, Ford invented the Model T and the assembly line. This gave us the freedom of the road; gridlock; an exotic new cause of death; Exxon, and the Exxon Valdez.

In modelling food security along Ford's industrial lines, agribusiness and multilateral institutions found it convenient to overlook four vital facts. First, with seed, (as Ford would not have understood), the means of production is also the end product for consumption, and the forced introduction of high-response seeds means the loss of farmer-bred seeds, leading to massive genetic erosion. The push for the mass production of genetically uniform plant varieties precipitated a hidden environmental crisis that drew international concern only in the 1980s. As plant geneticist Garrison Wilkes warned decades ago, institutional plant breeders were building the roof with stones from the foundation. Second, farmers sow (and hungry people eat) many more crops than rice, wheat and maize (the Green Revolution's rejoinder to the Model T) and the diversity of crops was ignored. Third, depending on the context and season, between a fifth and a half of all foods consumed by

the poor are not cultivated but harvested from forests, streams and untilled fields.[2] And finally, farmers do not merely have their mouths open at the end of a technology assembly line; they are the innovators best situated to develop new technologies and adapt germplasm to their ecosystems. Critical within this fourth mistake, the architects of industrial agriculture also failed to notice that the majority of the world's farmers were—and remain—women. As a result, agricultural engineers usually concentrated on the wrong foods in the wrong places with people from the wrong background and of the wrong gender.

These are not modest mistakes. Ignoring these fundamentals makes feeding 'Hottentots' next to impossible. A half-century after the start of both FAO and the Green Revolution, farmers are being driven into urban ghettos of hunger, genetic erosion is threatening the future of food production (and the nature of food control), and the habitats of non-farm (partner) food species are in ruins. A brief review of some of the hidden essentials of food security is in order.

Lost genes

At the World Food Summit in 1996, the Green Revolutionaries were once again girding their spending girths to rejoin the War against Hunger. Paradoxically, though, scientific interest is swinging from mass-produced, high-response, semi-dwarf crop varieties to a belated acknowledgement of the capacity of farm families to develop their own plant varieties and livestock breeds. This has been a reluctant discovery. With something less than the speed of summer lightning, the 'stone-age seeds' of the 1970s academically metamorphosed into the 'landraces' of the 1980s and are graduating as the modern 'farmers' varieties' of the 1990s—the environmentally sustainable, macro-strategic responses to the micro-climates of local communities.[3] A scientific education is a wonderful thing.

Sadly, the honorary degree for farmers' varieties may have to be awarded posthumously. Our best estimates suggest that agriculture has lost close to three-quarters of the genetic diversity of its major food crops and that the rate of erosion continues at close to 2 per cent per annum.

Whether 'discoveries' are tardy or not, where cutting-edge scientific thought leads, private enterprise will eventually follow. Seed companies and biotechnology boutiques are sifting through the ashes of destroyed wisdom in search of the crop genes that will carry the world's food supply into Agenda 21.

It's a rewarding scavenger hunt. Through the World Bank's Consultative

Group on International Agricultural Research (CGIAR) alone, the flow of indigenous agricultural knowledge (crop genes) from South to North is worth not less than USD 5 billion a year—and that flow is increasing.[4] The US government has placed the value of foreign germplasm—for its soya bean and maize crops alone—at more than USD 10 billion. In the light of the Biodiversity Convention and in recognition of the pace of crop genetic erosion, the North's governments and corporations are looking for secure access to the South's long-neglected genetic diversity in food crops. Behind all the continuing debate in the FAO Commission and at the CBD lurks the highly-convoluted debate over access and benefit-sharing for these remaining resources.

We also tend to forget that our food crops—without a single exception—were each domesticated by indigenous peoples. Indigenous peoples and other rural societies continue to hold the most genetically diverse farmers' varieties. Indigenous peoples also live in—or adjacent to—the lands that host the close relatives of cultivated crops. In Latin America, for example, 27 per cent of the continent's rural population is comprised of indigenous peoples. These are the Founding Farmers of no fewer than 70 of the world's most important food crops.[5]

Lost crops

The operating assumption in most food security work has been that half the world lives on rice and the rest make do with a combination of wheat, maize, potatoes and beans. Everything else is haggis. This is absurd and disastrous reductionism. People have died—and continue to die—because of the so-called strategies that emerged from this assumption.

In 1989, the US National Research Council published a 415-page tome titled *Lost Crops of the Incas*[6] describing literally hundreds of cultivated species almost totally unknown to present-day agronomists. One could have hoped for more from such a prestigious body. The crops are not lost to the people who nurture them. They continue to be sown. The North lost them—not the farmers. More recently, the National Research Council 'discovered' (in a still uncompleted six-volume analysis of Africa's 'lost' crops) that there are more than 2,000 traditional food plants on that continent. The US scientists concede that these food sources are far from 'lost'—except, again, to the North.

In fact, the First Farmers fought long and hard to protect their crops and ecosystems. Alejandro Argumedo of the Indigenous Peoples' Biodiversity Network recounts the history of the Totonacs of southeastern Mexico who, in 1786, rebelled against Spanish rule to save a tree species widely used for

food, fodder and construction. Argumedo's own Quechua nation waged successful rebellion for a century against the Spanish in Peru, in part to protect their food and medicinal plants and to throw out exotic animal species, such as the pig, which the Quechua saw to be harming their environment. The protection of traditional food crops and the removal of unwelcome livestock played a role in numerous resistance movements from Mexico to the Andes.

The assumption that food security should focus down on a few plants is everywhere. When ASSINSEL (the International Association of Plant Breeders) published its slick monograph, *Feeding the 5000 Million*, back in the early 1980s, the breeders provided a table listing the world's top 30 crops and noted that the first seven crops accounted for two-thirds of the list's total production weight.[7] Common wisdom among agronomists (and RAFI as well) has been that 90–95 per cent of global human nutritional requirements are met by ASSINSEL's 30 crops, and that three-quarters of our requirements come from only eight crops. Food security, urban mythology decrees, is most readily achieved by concentrating on these essential crops.

A decade later, however, Christine and Robert Prescott-Allen demonstrated how greatly we depend on a much wider number of species. The Prescott-Allens evaluated the food supply of 146 countries, and tabulated the number of species that account for the lead 90 per cent of each country's per capita consumption (by such criteria as weight, calories, protein and fat). They found that not just eight but 103 species were important.[8] They stress that even these figures are an underestimation. FAO, after all, has only collected data on the crops that looked important several decades ago, from faraway Rome. 'Crops such as fonio, *Digitaria exilis* Stapf, and quinoa, *Chenopodium quinoa* Willd., are lost in global production data', the Prescott-Allens argue, 'but to conclude that they are unimportant is to conclude that the people of Guinea, Gambia and Bolivia who rely on them are unimportant.'[9] Some significant countries, such as Ethiopia, are not in the calculations at all. This excludes unique and important national species such as teff and ensete ('false banana') that would have increased the total species figure.[10] Often, those countries not surveyed are—for a variety of sociopolitical reasons—likely to be more diverse in their food sources than those that are included in the study.

If our objective continues to be to ensure food security for the poor, local foods are vital. 'Just as global data can miss species of national importance', Christine and Robert Prescott-Allen advise, 'so national data can miss species that are important for particular socioeconomic groups'.

For example, the Bambara bean is reputedly the third most important food legume in sub-Saharan Africa. Although listed by FAO, the bean is not cited in any African country table. The same data problem holds true for the generically-described 'roots and tubers' of Belize and St. Vincent that actually account for 18–19 per cent of total plant weight and 9–10 per cent of all plant calories consumed by the people. In Vanuatu, roots and tubers are still more important, providing 34 per cent of plant weight, and 23 per cent of plant calories consumed. Were the species involved identified, the list of critical food crops would grow still greater.

Humanity's dependence on a wide range of foods would still be underestimated even if the data for 'food legumes' and 'roots and tubers' were made clear. The Prescott-Allens properly point out that leafy vegetables, and herbs, spices and other flavourings, may not only have cultural importance, but also offer key vitamins or moderating nutritional qualities that make staple foods more useful or meet essential, if small, needs not met by the more widely-grown crops. Examples include galangal, limau purut, turmeric, lemongrass, Stapf, kantan, and kesom. There is no food security if a single essential food source is absent.

Last crops

The multilateral community's third major oversight in food security includes the foods not grown—what Ian Sconnes, Mary Melnyk and Jules Pretty have brilliantly termed the 'hidden harvest'.[11] The hidden harvest includes both famine foods (plants and animals only eaten under extreme conditions) and other 'wild' produce that forms a regular part of the local diet. These have sometimes been called the 'last crops' although they are sometimes the first choice for taste and nutrition. Both kinds are essential to food security. During the Bihar famine of the mid-1960s, the poorest of the poor survived on tree and vegetable leaves. When famine struck a decade later in Bangladesh, leaves and roots again kept knowledgeable people alive. Had it not been for their practical knowledge of 'wild' grasses, more farmers in southern Sudan and Ethiopia would have died during the horrendous famine of the mid-1980s.

Hungry, or simply in search of a varied and wholesome meal, rural communities look far afield for their nutritional requirements. Indeed, they look beyond the fields to the forests and streams. Chin See Chung, a Malaysian botanist, has documented communities in Borneo that routinely seek nourishment from 800 different plants and more than 100 species of ground fauna along with hundreds of bird species. Barely a third of the community diet comes from cultivated crops. Almost as much again comes from fish, and the remaining third is acquired through hunting and gathering. Not far

away, in Indonesia, in a region where we tend to think rice dominates, almost two-thirds of food production, four-fifths of consumption, and nearly half of all income is drawn not from rice fields, but from the home gardens of transmigrant communities.[12]

The nutritional importance of these partner species is often overlooked. R. B. Lee's 1979 study of the !Kung community in southern Africa showed an average daily adult intake of 2,355 calories. In other words, the !Kung have a higher per capita calorie intake than the average for either Africa or Asia, and manage to do this by hunting and gathering 84 plant and 54 animal species over a working week of only 2–3 days at six hours per day.[13]

Women tend to make better use of partner species than men. Men lay first claim to hunted animals and to the best of the cultivated crops. Urban myths rightly say that 'necessity is the mother of invention'—neglecting to add that women often have to innovate because men exploit. During the rainy season in one region of Kenya, for example, women drew 35 per cent of their plant material (for food, fibre and medicinal purposes) from so-called 'wild' plants.[14] Poor women in Uttar Pradesh, India, derive almost half their income from forest species and plants found on the Commons. By comparison, middle-class women in the same region obtain only a third of their income from partner species, while men take barely 13 per cent of their earnings from this source.[15]

Sometimes Northern researchers misjudge the importance of partner species because they overlook significant cultural differences within a region. For example, in Turkana, Kenya, less than 10 per cent of the Ngikamatak diet—even in the dry season, comes from non-cultivated foods. The Ngiboceros in the same region, however, draw a quarter of their annual food supply from the 'wild' and their dependence rises to almost half of their diet during the dry months.[16] On the other side of Africa, the Mende of Sierra Leone draw less than a fifth of their nutrition from cultivated species, and more than half from forests, streams and fallow fields. The remainder comes from local markets.[17]

The Green Revolution not only overlooked the importance of non-cultivated foods; it laid claim to some of the land that poor people use to collect the last crops. As larger farmers pressed for more land to grow high-response seeds, the Commons was privatised. In one semi-arid region in India, common lands have declined by between a third and more than a half since the 1960s. Still today, the region's poorest families derive 14–23 per cent of their nourishment from 'wild' plants and animals found on these lands. In drought years, this vital harvest can rise to 42–57 per cent of the diet of the poorest.[18]

Across the Indian Ocean, the Barabaig pastoralists of Tanzania experienced the same loss of common lands when the Canadian International Development Agency (CIDA) launched a massive Green Revolution wheat programme that drove the local people off the land and away from their traditional food sources.[19]

Fifty years ago, the North dismissed this reservoir of cooperative innovation represented in the use of non-agricultural foods, declared these vital but uncultivated foods to be 'weeds' or 'pests' and set about exterminating the food security of the world's poorest and most hungry.

Lost genius

The greatest loss of all is neither genes nor food sources but the destruction of our own human genius. In farming societies, diverse crops and crop varieties are a logical response, in part, to changeable environmental and market pressures, and in part, to the reality of different soils, slopes, labour availability and family needs. This requires constant research and evaluation. Consider the Mende farmers of Sierra Leone so well studied by Paul Richards. Independent of foreign experts, these farmers conduct field trials, testing new seeds against different soil types and comparing results within their community.[20] 'It is quite common,' Richards wrote, back in 1986, 'for farmers to take careful note, using their own system of volumetric measurement, on input–output ratios when they lay out trials of this sort'. [21]

While Richards' discovery of the Mende breeding programme attracted early attention, other researchers were quick to follow with a long list of additional examples from around the world. In the Horn of Africa, Bo Bengtsson, former Director-General of SAREC (Swedish Agency for Research Cooperation with Developing Countries), now the Department for research cooperation in the Swedish International Development Cooperation Agency (Sida), recalls visiting Ethiopian farmers and finding carefully documented variety performance records inscribed on doorposts.[22]

Farmers breed for their specific micro-environments, but it is often the case that their own varieties can perform remarkably well in roughly similar environments in other parts of the world. Plant collector David Wood makes this point strongly in a 1991 paper. 'ICRISAT reports an Ethiopian land race released in Burkina Faso, and South African land races released in Ethiopia', Woods advised.[23] While we despair at terms such as 'land race' when formal sector scientists are really talking about farmers' varieties, Wood argues very well for the recognition of and wider use of these varieties in formal sector research. Even the World Bank, in a special study of African agriculture, notes: 'There has been a tendency to underrate the value of tra-

ditional cultivars... .'[24] When Cary Fowler and I met former gene bank director, Dr Melaku Worede, in 1985, he marvelled at the skill of Amharic farmers to distinguish between varieties of teff or sorghum. 'They only need to look', he said. 'I look and see nothing. They look and sort out the different types.'[25] Botanist Mark Plotkin, working in Brazil, expressed a similar sentiment: 'Because you have a PhD and the other guy can't read, it doesn't mean you know more about botany than he does.'[26]

Among the most important scientific innovations used only indirectly by the North are the highly sophisticated approaches to taxonomy taken by indigenous peoples. If Carl Linnaeus was an imperialist (and what Northerner wasn't in those days?), certainly his approach to taxonomy served extraction rather than education. It is hard to imagine a less useful method of working with diverse species. Only plant explorers on the run and seeking a highly simplistic means of cataloguing species on a continental or global scale would see merit in the Linnaean method.

A serviceable taxonomy is essential to innovative agriculturalists, be they community- or institution-based. Calestous Juma describes the Bukusus people of Kenya's Bungoma region who developed a plant classification system superior to the Linnaean.[27] Cary Fowler and Norwegian observers at Noragric call this folk taxonomy and describe the work of Andean potato farmers with a four-level classification system. Potato farmers know an average of 35 types, and as many as 50–70 names have been found in single communities.[28] According to Noragric, some Southeast Asian farm communities have a five-level taxonomy for rice, involving 78 varieties in a district.[29] Writing of Europe's disruption of agriculture in the Americas, Kirkpatrick Sale extols the merits of indigenous peoples' technology: 'Some tribes had forty words for different parts of a leaf—species were bred and nurtured (varieties of white grape, for example, which are not found in the wild).'[30]

Industrialised country agronomists are generally distrustful of cooperative innovation. American scientists devoted most of a decade, for example, to exploring the merits of sorghum varieties collected in Ethiopia, rather than ask local farmers who had clearly described them with names such as 'Milk in My Mouth' for a high-lysine variety, and 'Why Bother with Wheat' for the top milling sorghum.

The real challenge for global food security lies in creating a nurturing and equitable connection between the genius of farming communities and the genius of the institutional scientific system—a non-exploitative merger of micros and macros.

First Farmers

The search for food security begins where the food is harvested and with the people who do the harvesting. Food security cannot be isolated from either ecosystem conservation concerns or economic and market considerations. The critical difference between constructive and destructive food security policies is perspective. Policies founded upon the needs and capabilities of farming communities will succeed. Policies that take as their point of departure macro-environmental or macro-market considerations will fail.

The Green Revolution affords us a monumental example of missed opportunities and failed macro-policies. Rice—the Revolution's success story—is also an example of its failure. Ever since the Han Dynasty (AD 25–220) in China, farmers have practised a combined fishing and rice cultivation system that is both nutritious and efficient. Green Revolution rice production introduced pesticides that killed off the high-protein fish and lowered local nutritional levels. Beyond importance in human nutrition, the fish/rice system enriched paddy soils and the fish provided pest control. When the best rice varieties are cultivated in the traditional way, yields are 7–14 per cent higher despite a 10 per cent reduction in the rice area (for the fish trenches).[31] Why couldn't the Green Revolution work with farmers and build on this kind of practical local expertise?

This is not to claim that farming communities have captured the holy grail of agricultural truth, or that the burgeoning billions of urban poor will all survive on cellar mushrooms and window-box gardens. Farmer-led food security policies simply acknowledge what Henry Kissinger (inadvertently) taught us (had we but listened!) in Rome two decades ago, that only farmers can feed the hungry. Only small-scale farmers and their communities can both put food on the world's table and do so with a grace that is just and sustainable.

If food is the first link in the security chain, it is not the only link. Food security, properly conceived, leads communities to security in health, the environment and knowledge. We can summarise the principles of farmer-led food security as follows (see also Table 5 overleaf, which includes health and environment aspects):

- The operational starting point for human security is food security.
- There is no food security without secure farm communities.
- The more farm communities the greater our collective food security.
- Food security requires diversity—of germplasm, of species, of production and distribution systems.
- Sustainable food security cannot depend upon external inputs of either chemicals or human genius.
- Farmers have the right, however, to access the best possible materials and

Table 5 First Peoples—First Principles: the value of cooperative innovation systems in community and global development

Health and medicine	Food and agriculture	Environment and diversity
Local 80 per cent of the South's medical needs are met by community healers using local medicine systems.	Almost 90 per cent of the South's food requirements are met through local production. Two-thirds is based on community farming systems.	Almost 100 per cent of the biodiversity 'hot spots' are in areas nurtured by indigenous communities and/or border the South's farming communities.
Global 25 per cent (and growing) of western patented medicines are derived from medicinal plants and indigenous preparations.	90 per cent of the world's food crops are derived from the South's farming communities and continue to depend on farmers' varieties in breeding programmes.	The wild relatives of almost every cultivated crop are found in biologically-diverse regions of the South nurtured by indigenous communities.
Market The current annual value of the South's medicinal plants to the North is estimated conservatively at USD 32 billion.	The direct commercial value derived from farmers' seeds and livestock breeds, per annum, is considerably more than USD 5 billion.	90 per cent of the world's most biologically-diverse lands and waters have not government protection and are nurtured exclusively by indigenous communities.
Expertise 99 per cent of all health practitioners are community healers.	99 per cent of all plant breeders and other agricultural researchers are based in rural communities.	99 per cent of all practised biodiversity expertise resides in indigenous and other rural communities.
Risk Almost all local knowledge of medicinal plants and systems—and the plants themselves—could disappear within a generation.	Crop diversity is eroding at 1–2 per cent per annum. Endangered livestock breeds are vanishing at rates of 5 per cent. Almost all farmer knowledge of plants and research systems could become extinct within one or two generations.	Rainforests are coming down at a rate of 0.9 per cent per annum and the pace is picking up. Much of the earth's remaining diversity could be gone within one or two generations.

Source: Information for column one is extrapolated from Bodeker, Gerard, 'Traditional health knowledge and public policy' in *Nature and Resources,* UNESCO, Vol. 30, No. 2, 1994, pp. 5–16, along with a wide number of RAFI information sources. Information for columns 2 and 3 is based on RAFI's experience since 1977.

technologies and to choose to work with institutional innovation systems.
- Food security both supports and is sustained by biodiversity and environmental stability.
- Human rights—including the inalienable rights of indigenous peoples and of farmers—are prerequisites for food security.
- Food security cannot be isolated from the equity issues of land tenure, pricing policies and trade practices.
- Holistic approaches to food security within the farming community must be matched by holistic national and international institutional structures.

What happens when crop diversity is neglected (and political structures, too, are harmful) is explored in a case study below (pp. 100–105).

Health security: following through on food security

Adequate nutrition is, of course, one of the cornerstones of health. Safeguarding indigenous knowledge about the diversity of food crops that can be grown in the fields, or gathered from forests and streams, is therefore vital to the health of communities.

Health is, as we know, far more than the absence of disease: it has to do with physical and mental well-being, and it implies a productive and supportive interrelationship between individuals and society. However, ailments and injuries are also facts of life, and medicinal plants that can be used in the prevention or treatment of disease should be highly prized, along with the knowledge of the health-restoring properties that these plants possess.

For numerous ailments, indigenous knowledge has a cure. Garlic significantly lowers cholesterol; valerian roots help people sleep; the purple cornflower relieves cold symptoms; and migraine sufferers have been found to benefit from dried feverfew leaves. These are not new medical revelations. Most of these medicinal plant uses—together with thousands of others—have been known for generations.

According to the World Health Organization (WHO), 80 per cent of the world's population relies on local health practitioners and indigenous medicines for all (or almost all) of their medical needs.[32] Yet, rather than strengthen the existing infrastructure and technology found in community systems of health care, the North has often been more concerned to replace it. Although traditional healers are the medical professionals most people can reach most easily (see Table 6), almost nothing has been done to safeguard their knowledge or strengthen their contribution to local communities.

Table 6 Access to medical information: number of persons per health worker

Country	Persons per medical doctor	Persons per traditional practitioner
Swaziland	10,738	110
Ghana	20,028	224
Tanzania	25,229	400
Nigeria	5,998	110
Kenya	8,219	245
South Africa	17,400	980
Zambia	26,038	130
Zimbabwe	8,528	956

Source: Data for pharmacists, medical doctors and nurses is taken from *PC Globe Maps 'n' Facts* as transcribed from World Health Organization statistical yearbooks for 1991, 1992, and 1993. Data for numbers of Traditional Medical Practitioners is derived from Cunningham, A. B., *People and Plants Working Paper 1,* 'African medicinal plants: setting priorities at the interface between conservation and primary healthcare', March 1995, p. 8, and from Vongo, R. S. M. 'Traditional Medicinal Plants: Our Cultural Heritage' in Mshigeni, Keto E., *et al.* (eds), *Proceedings of International Conference on Traditional Medicinal Plants,* Arusha, Tanzania, February 18–23, 1990, p. 206.

Global cures

Paradoxically, traditional medicines are now being recognised as having global importance—and enormous commercial value for drug companies. Industry is catching on to the fact that a quarter of its profits (globally, more than USD 40 billion per annum, and USD 10 billion in the United States alone) are drawn directly from traditional remedies. Between the late 1950s and 1980, medicinal plants consistently accounted for not less than a quarter of all prescription drug sales in the US. Since then, the role of plants in medicine has increased, and some researchers place the current figure for all industrialised countries at an astonishing 57 per cent.[33] The US National Academy of Sciences reports that 70 per cent of the 3,000 plant species known to have anti-cancer properties come from tropical forests[34] and, according to Colombian experts, at least 3,000 antibiotics have been commercialised from tropical bacteria.[35]

Our dawning awareness of our global dependence on the cooperative innovation system is marvellously timed. Now that the North has weakened traditional health systems almost beyond recognition, every significant pharmaceutical company on this planet is scavenging the tailings of indigenous knowledge of medicinal plants and preparations for cures to everything from obesity to AIDS. Moreover, the most cost-efficient route to new drugs

is now accepted to be through the genius of ageing (and irreplaceable) traditional medical practitioners (TMPs).[36] The most conservative industry estimates suggest that companies are 60 per cent more likely to find commercial products through screening traditional medicines than they are through random sampling.[37] With a shopping list of several thousand recorded plant-based medicines, and with the 'best-before' date about to expire on the entire drugstore, ethno-botanists are seeking shamans and shamelessly patenting long-known medicines.[38]

Local costs

The need to conserve and strengthen community medical knowledge grows every year. The costs of the North's medicines are prohibitive. India's Ayurvedic tradition holds that industrialised medicine extracts information from the plant but discards the wisdom.[39] If the wisdom is absent, the price tag is much in evidence. The Vietnamese have a saying that traditional medicine costs one chicken, western medicine costs one cow, and Western-style hospital care costs the entire herd.[40] In much of the South, 80 per cent of health budgets are spent on services for 20 per cent of the people; and even before new World Trade Organization (WTO) patent rules kick in, 30 per cent of the South's health budget goes on the North's pharmaceuticals.[41]

With the closing of the Uruguay Round of GATT, Argentina was predicting a 273 per cent jump in drug prices with an additional USD 367 million a year flowing North.[42] India has already charged 200 drug companies with making USD 82.6 million in excess profits (between 1979 and 1987) and Brazil has launched a similar investigation of 40 foreign pharmaceutical houses.[43] Nevertheless, both India and Brazil have also moved to accept new Uruguay rules that would strengthen the international companies. Throughout Latin America and Asia, governments have enacted legislation or regulations that are likely to raise national health care costs.

Safety

Still today, many medical practitioners (and the North in general) regard traditional medical systems as witchcraft or charlatanism. This is not new. In Natal Province in the 1930s, it was illegal to sell medicinal herbs or practise local medicine. Similar laws were imposed in many other parts of Africa.[44] The prevailing opinion was that traditional medicine was, at the very least, a threat to business, if not also a threat to patients. Can self-respecting doctors tolerate (much less encourage) the use of traditional medicines? In 1989 in the United States, a country where one in three admits to using 'alternative' medicines on occasion, there was one known fatality caused by the ingestion of a plant. (The plant was ornamental, not medicinal.) In the same year and country, 414 (non-suicide) deaths were caused by the mistaken or inappropriate use of synthetic drugs.[45]

The great problem about traditional medicines is that they are difficult to patent and, therefore, sell too cheaply for the pharmaceutical industry. An extract of saw palmetto leaves, for example, is said to be every bit as effective as Proscar (finasteride) in treating enlargements of the prostate gland, sells at a third of the price and has significantly fewer side effects.[46]

The issue of effectiveness and safety is much more appropriately directed at the North's medical system. According to the US Office of Technology Assessment (OTA), American drug companies (in 1990 dollars) spent USD 65 million bringing a new drug to market in 1969, and USD 194 million in the 1980s. Merck now insists that the cost of a new drug ranges between USD 300–350 million. Is it worth it ... in health terms? Not according to researcher Anita Kunz: 'Of the 348 drugs introduced by the 25 largest pharmaceutical companies between 1981 and 1988, only 12 (or 3 per cent) were deemed important therapeutic advances by the FDA [US Food and Drug Administration]. The vast majority (97 per cent) were seen as having little or no potential for advances in treatment.' For this, ill Americans paid out USD 67 billion in 1990.[47]

Were most American drugs merely useless, we might have cause to complain, but not to panic. As drug prices soared at four times the rate of inflation in the early 1990s, the US General Accounting Office revealed that more than half of all new drugs (51 per cent) pose serious, even life-threatening, risks, even after FDA approval.[48] By contrast, medical researchers are now acknowledging that traditional medicines seem to carry fewer side effects than their synthetic copycats. The case for traditional medicine looks better all the time.

Drugs back from oblivion

At least partially in response to rising costs, Vietnam has catalogued and tested the efficacy of 1,869 medicinal plants. Today, traditional preparations account for a third of all formally prescribed treatments in that country.[49] Nearby Thai officials recognise 66 medicinal plants for formal usage, and are studying many others.[50] On the other side of the Pacific Rim, Mexico has documented more than 1,000 traditional medicines.[51] During its war with the United States, the Nicaraguan government—cut off from Western medical supplies—surveyed 20,000 citizens to rediscover traditional medicines that could replace Western imports.[52] By 1990, it was possible for health officials from 33 Southern countries to convene in Arusha, Tanzania, to share—and celebrate—their experiences in acknowledging and cooperating with traditional medical systems.[53] One can hope that the North's medical establishment may not be far behind.

The level of activity has stirred at least a few funding sources. Of late, the International Development Research Centre (IDRC), the World Bank, the Rockefeller Foundation and WHO have supported the development of traditional medicines in Uganda (against AIDS), and Ethiopia (to combat schistosomiasis). A traditional Chinese medicine is now being used in Vietnam and in Africa to counter chloroquine-resistant malaria.[54] Even the New York Botanical Garden—often seen as more of a pirate than a provider—is working with educators in Belize to bring medicinal plants back into common usage. The USA's National Institutes of Health (NIH) have begun to finance research into cost-effective primary health care involving traditional medicines (see section 6 on control of medicinal plants).[55]

Among the principles of health security, then, in addition to those relating to food and nutrition, the following may be identified as of crucial importance:

- Community medical knowledge and the medicinal plants associated with this knowledge are, first and foremost, for the community, and the community should be supported in the conservation and development of its health system for its own purposes.
- Support for the development of national and community health care should be premised on the continuation and strengthening of existing traditional systems and of traditional medical practitioners as the main experts in the system.
- The protocols of the World Medical Association, WHO and national governments should be revised immediately to ensure that Prior Informed Consent* applies to the taking of indigenous knowledge and medicinal plants as well as to the people themselves. Prior Informed Consent must also be obtained from the community before any information or material can be commercialised in any way.
- The World Medical Association, WHO and national governments should recognise that proposed intellectual property monopolies over indigenous knowledge or medicinal plants contravene the ethics of medical research by distorting and favouring the interests of the medical researcher and demeaning the interests of communities.

Environmental security: keeping the pieces together

Communities that nurture and develop the natural resources that secure their food and medicine do so with an explicit sense of the integrity of their ecosystem. The practical need to conserve biological diversity is fundamental.

* Prior Informed Consent is a term commonly used in WHO and FAO to describe the obligation of the provider or exporter of a good or service to have the advance consent of the recipient. The term usually refers to pharmaceuticals or agricultural chemicals.

There is a logical progression from food security through health security to environmental security. The only remaining question is whether or not the people who love panda bears can respect the genius of the poor.

The problem we have always had with saving the planet is that it is not ultimately endangered. We are. True, global warming and species loss are changing things quickly. The planet could find itself once again muddling through traumas akin to past ice ages, and species decimation and transitions comparable to the end of the dinosaurs. But the planet will bounce back in a couple of hundred million years. We don't bounce. And the loss of any of us through environmental degradation is unacceptable.

This is not a theoretical point. Historically, the advocates of 'development' and 'growth' have been industrialists wanting to rip up rainforests in the name of progress. Recent advertising by the World Wide Fund for Nature, however, goes to the other extreme, accusing indigenous peoples of blindly and/or wilfully destroying their sacred lands and survival systems with no care for the species they destroy. First, this isn't true. Second, it is not for the rich to call the poor 'speciesists'. In translation, this means that the rich want to have the sole right to determine who is to live and who is to die. The starting point for a sustainable environment is the people who live in the environment. If the poor are well served, then the environment will flourish. Below is a short summary of the work of cooperative innovation systems in selected fields of activity.

Soil conservation

The work of rural societies in protecting soils is impressive. Soil erosion is often a major concern for those who farm the steep slopes of Pacific islands. On Pentecost, in Vanuatu, with a population density of 110 per square kilometre, farmers plant fast-growing trees along slope contours in rows 10–20 metres apart to hold the soil. For the same reasons in Papua New Guinea, Cordyline fruitcosa, a tall shrub, is planted along hill contours. The Machakos in Kenya have managed to respond to a fivefold population increase while still feeding their people and actually improving soil quality. Given the opportunity—and no economic or regulatory interference from the marketplace—rural communities will devise unique approaches to soil problems that will usually work well for their ecosystems.

Plant genetic conservation

Who is conserving genetic and species diversity? In Mali, the Dogon people have a clearly-defined conservation strategy for everything from wood to water but especially for crop diversity and medicinal plants.[56] The Huastic of southeast Mexico are known to nurture 338 different species in home gardens—more wild species than can be found in the region's surviving for-

ests.[57] The Suazi of Swaziland nurture and use about 200 species,[58] and the Tembe Thonga of southern Africa commonly employ 106 species for their daily needs.[59] In a community context, use equals conservation.

In 1977, Stephen Brush at the University of California reported that Andean potato farmers developed frost-resistant varieties for the flat bottom lands in valleys where frost—but not late blight—is common. Leaf-blight tolerant varieties are sown on hillsides where frost is less of a threat. In a single valley in the Andes, community innovators may grow between 70 and 100 distinct potato varieties and a typical household keeps 10–12.[60] Once again, as long as the marketplace doesn't work against community innovators, farmers will maintain and develop an incredible array of genetic and species diversity.

Even confronted with population pressure and urbanisation, long-standing community conservation regulations often continue to work. Communities have ways of safeguarding valuable plants. For example, the burial sites of Zulu kings are protected areas in southern Africa. Firebreaks are maintained annually, and despite tremendous population pressure and demand for arable land, the sites remain open for the collection of medicines and herbs.[61] In Swaziland, there are prohibitions against the gathering of certain medicinals, herbs and fruits until after seeds have set. In Zimbabwe, herbalists must be consulted before plants are gathered in designated areas. The medicinal plants involved are all 'popular, scarce, and effective', according to ethno-botanist Tony Cunningham.[62]

Farming systems conservation

Some environmental organisations have been apoplectic in attacking the South's agriculture in general, and especially critical of shifting (or 'swidden') cultivators whom they accuse of tearing down the rainforests. Consider the 'slash-and-burn' farmers of Santa Rosa, a Peruvian village on the Ucayali River.[63] The village's 46 farming families practise 12 distinct kinds of agriculture. In 1985, they employed 39 different combinations of those 12 farming systems. A year later, three-quarters of the families had substantially altered their combinations to respond to changing environmental pressures.[64] Far from destroying diversity, such farmers create it. The so-called 'fallow' fields left behind from swidden farming systems are a sore point for some environmentalists but, in fact, are often intensely harvested. Peru's Bora peoples, for example, gather as many as 118 useful foods and medicines from their fields.[65] The Lia of northern Thailand routinely reap 42 medicinal plants and as many as 110 food plants from fields that institutional agronomists think of as 'wasted'.[66] Could a national government or an international agency manage diversity better?

Forest conservation

The extent to which rainforests are exploited cannot be exaggerated. But, in the case of indigenous communities, the extent of the utilisation is roughly equal to the extent of the conservation. The Chacoba of Bolivia, for instance, make use of almost four-fifths of the woody species in their surrounding forests. Brazil's Ka'apor use three-quarters of their tree diversity, while in Venezuela, the Panere use about half the documented diversity.

Genius conservation

If there is any doubt that farmers are innovators, consider the spread of Latin America's sweet potato in Asia. The Portuguese brought the tuber to the Philippines, where farmers immediately developed breeding strategies to adapt it to their conditions. In little more than a century, farmers carried the sweet potato throughout the Philippines and Indonesia, and the plant became a staple in the highlands of Papua New Guinea on some of the most challenging lands in the world. Highlanders piled plant debris into composting mounds with sweet potato vines planted in patterns around the top and sides. As well as being widely used for housing, fencing and shade, *Casuarina oligodon* is also planted in circles around the same mounds (some mounds are five feet high) for its nitrogen-fixing qualities. By the 1930s, bemused Western agronomists were reporting the presence of the highly efficient mounds across hundreds of miles of Papuan hills and valleys.[67]

North of Borneo's Kapuas River, the Tara'n Dayak offer one of the most impressive combinations of innovation and conservation to be found anywhere. Labelled slash-and-burners by environmentalists and agronomists, these people are successfully feeding and sheltering a population of 88 persons per square kilometre with no evident environmental damage. The Tara's have historically maintained diverse systems of managed woodlands that often seem more like gardens than forests. With their numbers expanding, the Tara's are adopting rice cultivation with the same creativity they displayed in the forest. The switch from the swidden technologies of the highlands to irrigated rice cultivation in river valleys could hardly be greater, but the Tara's have dug out paddy fields in response to new needs and new market opportunities.[68]

If a Bangladesh family has one hectare spread over 17 different fields, what do they do? This is not a mathematical quiz. But the family's response would drive most of us to our computers. Over a five-year study, the family undertook 61 different crop rotation patterns involving 13 different rice varieties and 10 different crops. The family was guided by both environmental and economic considerations—and they were successful.[69] It is this kind of genius that must be supported and entrusted with the care of our planet.

Conservation of aquatic diversity

Indigenous communities not only manage water well; they seem to be almost the only people concerned about managing fish genetic resources. One third of all the freshwater fish species in North America are either bordering on extinction or have already gone.[70] The actual work of habitat protection and fish gene banking is being done by people like the Shuswap Nation's Fisheries Commission on the west coast of Canada.[71] With salmon production on the Columbia River down to 4–7 per cent of its pre-dam levels, and three-quarters of the salmon to be found there now from local hatcheries, the Shuswap and other indigenous nations on the Pacific coast have cause for alarm.[72]

The loss of fish genetic diversity is not exclusively a Northern problem. Only half of the fish species previously recorded in one Malaysian survey now remain. None of the fish species found in the Valley of Mexico at the time of the Conquistadors can be found among the ranks of the living today.[73] From the Orinoco River of Venezuela to the Yangtze River in China, the fish that feed the poor are slipping through the conservation net into oblivion. Indigenous peoples—and, here and there, universities and government agencies—in Colombia, Venezuela, Canada and China are working with the International Fisheries Gene Bank (IFGB) to provide local conservation of endangered fish species, and, as a back-up only, fish sperm gene banks. Much of the problem is traceable to hydro-electric projects that dam rivers, silting up streams or preventing fish from reaching their spawning grounds. In the Orinoco, the problem is also industrial pollution. If the vast Three Gorges Dam is completed on the Yangtze, Dr Sifa Li expects the entire ecology of the 6,500 km river to change and many of the fish to vanish.[74] Li is working with the IFGB to safeguard species.

Many of the fish found near coastlines are the target of international commercial fishing companies. Most of the dam projects in the South are backed by bilateral and multilateral aid programmes or lending facilities. For a generation now, these same institutions have been telling us: 'To give a man a fish is to feed him for a day. To teach a man to fish is to feed him for a lifetime.' Setting aside the thundering arrogance and ignorance of this statement, we can now add, '... unless you then dam the rivers, pollute the streams, and eat the fish yourself'.

The principle underlying environmental security is that the biosphere is not a seamless robe but a patchwork quilt. It is made up of the unique cultures, ecosystems, and knowledge systems of our planet. The solutions to environmental problems will be found patch by patch, threaded together with the cooperation of community and institutional innovation systems.

Knowledge security: countering the great botanical lobotomy

Talking about crop genetic diversity, Lawrence Hills, an old gardening curmudgeon, used to say that saving a few farmers' varieties—rather than all farmers' varieties—was akin to saving a few Rembrandts rather than saving all Rembrandts. The plain truth is that life-critical knowledge is now an endangered species. Rapid inroads made by the mass media, aided and abetted by new communications technologies and the numerous other ills we are accustomed to ascribing to globalisation are destroying entire knowledge systems. Tragically, the literacy campaigns we have always associated with freedom and self-reliance could be helping to accelerate the destruction of traditional knowledge as well as languages.

We are told that the world's stock of scientific knowledge doubles every decade. And, as though it were an equal symbol of human advancement, that new technologies are obsolete within five to seven years of their introduction.[75] Why we should take such comfort in our capacity to turn out and trash new technologies should give cause for reflection. We are trashing some technologies faster than we can understand how to manage them. RAFI can't open up most of the data disks our first computers created for us in the early 1980s. Slightly more worrying is that both the US Department of Defense and the US Department of Agriculture share a common safety problem 'opening up' (and understanding) nuclear missile silos and long-term seed storage canisters stashed away when Eisenhower and Adenauer reigned supreme. The world has forgotten much.

Life-critical literacy

Knowledge is not doubling—it is dwindling. We may lose half of our accumulated knowledge with this generation. Of the 6,000 languages spoken today, between 20 per cent and 50 per cent are not being taught to children.[76] In fact, Michael Krauss of the University of Alaska warned a Unesco Conference late in 1995 that only 5 to 10 per cent of the world's languages (300–600 tongues) are actually 'safe'.[77] But this is the devastation to come. What has already been lost? Willem Adelaar at the Dutch university at Leiden argues that only 600 indigenous languages survive in South America today. Five hundred years ago, Brazil alone had about 17,000. But the 'punch line' in a presentation Adelaar made to the same Unesco gathering, was '... that there are no native languages left in more than half of the South American territory ...'.[78] Half of our eco-specific knowledge of the continent has already been trashed.

Most of what we know to feed our families and to heal ourselves and this planet is verging on extinction. Most of the knowledge we perceive to be doubling will soon be non-recyclable landfill. Meanwhile, the essentials of survival are slipping through our fingers. The 'life literacy' of indigenous

peoples and rural communities is the cornerstone of tomorrow's food security, health security and environmental security. 'You see devastation of both plant and animal life, and you know that devastation to humans is not far behind', says Dr Michael Balick of the New York Botanical Garden. According to Balick, indigenous Central American communities have had 'at least 200 generations of trial and error experimentation', adapting and developing their land, identifying sustainable sources of food and medicine.[79]

The findings of a 1994 World Bank survey of literacy among indigenous communities in South and Central America arouse very mixed feelings. The Bank, of course, decries the discrimination in education between indigenous and non-indigenous peoples in the region. While literacy is improving, indigenous peoples are still well behind the rest of the population in access to schools and books. But it is also possible to see the illiteracy figure as more a description of a people's lack of familiarity with Western knowledge systems than an absence of socially and economically important knowledge. Indeed, the level of 'literacy' in terms of life-critical knowledge may be in inverse proportion to the World Bank's 'illiteracy' figures. If this is so, has the rate of illiteracy among indigenous peoples in Bolivia declined from 42 per cent in the 1970s to 24 per cent in the 1980s—or has the rate of 'illiteracy' increased during that period from 58 per cent to 76 per cent? Should we be celebrating or commiserating?

Restructuring human capital

When, early in 1995, the Commission on Global Governance enthused that the overall rate of literacy in the South had sprung from less than half (46 per cent) in 1970, to more than two-thirds (69 per cent) in 1992,[81] they did not consider the possible downside. Does this mean that life-critical literacy has tumbled globally to less than a third of what it used to be?

This is not an argument to burn books or to manacle teachers. It is an argument to promote literacy campaigns that will strengthen and build upon community knowledge systems. National education systems need independent indigenous school systems with indigenous teachers and curricula determined by the communities themselves. Rather than focus on men, such systems could give particular prominence to the knowledge of women (as teachers and students). Because most literacy programmes draw more men than women, women's knowledge is correspondingly demeaned. Literacy programmes that prize local women as teachers of arts and sciences, could serve to strengthen cooperative innovation systems. Anything less and those who propose to 'educate' should only be allowed to do so if their 'students' sign Prior Informed Consent forms. If a new approach to education is not achieved—now, and carefully—it will be too late.

Literacy as another Green Revolution

Any critique of literacy campaigns must begin with the frank acknowledgement that the wholesale loss of language and culture must be laid at the door of much broader socio-economic forces. Literacy has been a bit-player—for good or ill. The concern, in fact, is that the literacy movement has not been notably self-critical and that alert educators could have played a significant role in defending and promoting local cultures and knowledge systems. It is more what has not been done than what has been done that is of concern.

Until a few decades ago, the knowledge and experience of local healers, herbalists and farmers was passed on from generation to generation through arts and apprenticeship. Literacy campaigns could have strengthened local knowledge. Instead, the first wave of literacy campaigns derided community knowledge systems in favour of the North's technology and culture.

In the late 1950s, even as the forebears of the CGIAR were launching their Green Revolution, based on the simplistic assumption that the 'good' created by the mass-production of uniform crop varieties outweighed the risk of genetic erosion and the devastation of farmer-based technological advance, a similarly-minded army of educators were laying the foundations for a Reading Revolution. Like their agricultural brethren, the educators of the 1950s were so convinced that mass-produced Western literacy was 'good' that little thought or concern was given to the possible destruction of eco-literacy or local innovation systems.

A more sophisticated second wave, while accepting other languages and cultures, continues to deny or dismiss the local science. In a literature search and internet survey conducted in 1997 as part of a doctoral programme, Susan Walsh was able to find only one reference connecting literacy studies to indigenous knowledge.[80] Literacy campaigns often put into place unmain-

It is also late in the day for indigenous peoples. If the rate of Western literacy has been increasing among communities in Latin America, the actual number of indigenous people has been dropping at a desperate rate. In a survey of 15 countries in the region, the total number of persons identified as 'indigenous' dropped more than 13 per cent in a single decade—among countries whose general population is expanding. We cannot separate the knowledge from the people. If we are to conserve life-critical technologies we must also work with indigenous nations to ensure their survival.

Literacy campaigns have especially disempowered women. In most agricultural communities, women undertake seed selection and plant breeding. Women and children (far more than men) utilise non-cultivated forest and roadside plants for their own nutrition and for marketing. Habitat destruction and the Green Revolution emphasis on externally-bred rice, wheat and maize, robbed women of their innovative role, and much of their own essential food security. Women were also often the custodians of medicinal plants and the local healing practitioners. This role, too, is being destroyed. That two-thirds of those in the South who remain 'illiterate' (in Western terms) are women is of no comfort.[82] Less sensitive to life-critical local knowledge systems, 'literate' males are still more likely to demean women's knowledge and marginalise them further since women are not part of the new literacy.

Indigenous organisers like Alejandro Argumedo express special concern about bilingual education. Coordinating the Indigenous Peoples' Biodiversity Network (IPBN), Argumedo has witnessed the most rapid loss of culture in bilingual education systems. Bilingual education is 'very effective in teaching indigenous people that their own knowledge is irrelevant', Argumedo points out. Rodrigo Contreras formerly of the World Council of Indigenous Peoples makes a further point: 'The dominant culture has also to become bilingual in the indigenous culture. That never really happens. Within five years, the good intentions break down and everybody is back into the majority language and culture.'[83]

Education for conservation?

The 1994 World Bank study insists that 'schooling reduces tropical deforestation'. Interestingly, where the UN talks (albeit whimsically) about Sustainable Human Development, with respect to indigenous peoples, the World Bank talks about 'human capital'.

According to the Bank, education lowers the pressure on forest resources by encouraging people to leave home; by allowing those who remain to adopt 'modern' agriculture; and by reducing family size. The central value, as viewed by the Bank, is the ability of, for example, literate Sumu in Nicaragua to speak Spanish—the language of their conquerors. Sumu individuals with a Spanish-language education become their communities' 'brokers' with respect to access to forest resources, says the Bank. The study does concede, however, that the short-term consequences of literacy may cause 'damage to rural areas' by encouraging those who stay home to clear forest land for cattle grazing; allow them to buy better forest-clearing machinery; or increase the market for forest goods.[84]

Education benefits farmers, saith the Bank, by improving their 'cognitive skills', thus helping them manage information, inputs and markets. The study argues: 'In the long run, agricultural modernisation helps forest conservation.' Most of us are still waiting for the long run. How does farm 'modernisation' help? 'Greater fertiliser use is found in nations with lower rates of deforestation', the Bank suggests with magnificent simplicity. True enough. Greater fertiliser use is also found on farms with lower rates of human fertility and higher rates of cancer. It is even found among nations that have less forest. In fact, the greatest fertiliser use is found on golf courses that clear away forests. Has the Bank omitted the golf course-to-forest (putts-to-parks) analysis?

Despite the Bank's concern for 'cognitive' powers, most indigenous nations will not be cheered by the prospect that the current style of schooling drives

them into urban ghettos and presses cultural homogenisation upon them. The Bank concludes poetically '... as one Sumu reverend put it, "Education is for the future, not for the present" '. Back to the future. The only thing any of us know about the long run is that we will all be dead.

To date, almost all literacy campaigns have amounted to a kind of botanical lobotomy—anaesthetising and ultimately destroying knowledge the world may not be able to live without. The farm families of Santa Rosa and Bangladesh and the Dayaks of Borneo do not lack 'cognitive skills'—it's the Bank that is development-dyslexic.

Intimate intellectual integrity

That the World Bank is developmentally challenged would be less of a concern did it not share in the Bretton Woods drive to patent the cognitive powers of rural communities. Through the Uruguay Round agreement on Trade-Related Intellectual Property (TRIPs), for example, the World Trade Organization must ensure that plants, micro-organisms and even human material is made available for intellectual property monopoly. Indeed, about the only knowledge that remains outside the patent system is that of rural communities. Macro-technological inventions designed for micro-environments do not fit into commercial patent systems readily—but they can be plundered for their marketable parts. True enough, indigenous communities might be able to do this themselves—if they had teams of lawyers in Munich, Washington and Tokyo ready to license or litigate on their behalf. In the meantime, farmers' varieties and medicinal plants (or parts thereof) can be pirated with impunity. FAO is trying to protect Farmers' Rights through a Code of Conduct for germplasm collectors, but a legally-binding Prior Informed Consent accord is needed at the global and local level to make certain that the intimate ecosystem knowledge—and the intellectual integrity—of rural societies is safeguarded. Our generation may be the first generation in all of human history to lose more knowledge than we gain. Is there a greater crime?

> *All that has value was then counted as nothing.*
> An indigenous Mexican leader (around 1520)*

The essential principles of knowledge security are as follows:

- For indigenous peoples and rural societies, literacy can only be defined within their own context and culture.

* The quote was part of an exhibition of installations by the Canadian artist Ron Benner. The exhibition was shown nationwide in Canada during 1996.

- To be literate does not mean to be able to read and write—it means to be able to understand and interpret our relevant socioeconomic and ecological environment.
- Literacy campaigns, as a primary goal, must recognise and strengthen local knowledge systems and offer the tools to adapt other knowledge systems to the community context.
- Literacy campaigns must especially focus on the knowledge of women and support their self-defined needs.
- Education should not be an extractive industry that facilitates the removal of indigenous knowledge for the benefit of others.
- Indigenous knowledge cannot be removed from the community without its Prior Informed Consent.

Human security
Through food to security for the human community

Food security is the first security on the road to a new and participatory approach to integrated rural development. Along that road, we need to learn that indigenous knowledge is not a commodity to be extracted—its primary purpose and development is in the community that created it.

FAO's initiative in resurrecting international concern for food security should be supported and applauded. Food security represents a practical starting point. Food is so central to community that it can be the rallying point from which other securities are developed.

This is not to exclude the further development of the UN Development Programme's (UNDP) concept of sustainable human development. Human security is an attractive concept as the merger of the basic needs concept of the 1970s (development assistance focusing on food, education, health, shelter) with human rights. It bears emphasis, however, that the safest route to human security is by focusing on farmer-led food security.

To argue that the search for human security begins in the community is also to argue for new partnerships in what is often called integrated rural development. Those of us who approach rural communities from the perspective of our experience in the area of plant genetic resources have found ourselves in the midst of community life by force of logic (both the social and scientific strains). Quite inadvertently, we are now conjuring with cooperative innovation systems and working with indigenous peoples in order to achieve food security. So it is too for researchers coming from other perspectives. Concerned medical professionals, ethno-botanists, geneticists, environmentalists and agronomists are alike caught up in the effort to strengthen indigenous communities. Our common meeting point is linked

Table 7 Legends of our fall? Scientific Myths constraining the use of cooperative innovation systems in three sectors

	Health and medicine	Food and agriculture	Environment and diversity
Myth 1 Real value comes from extraction and incorporation	Traditional medicines are only of value when their active ingredient is known and they can be purified for mass production.	Farmers' varieties are only of value when specific (often resistant) genes are isolated and incorporated into modern varieties.	Biodiversity is only of value when it has been collected, catalogued, and studied. Even then, its contribution will largely be to the carbon cycle and our sense of beauty with commercial rewards rare.
Myth 2 Traditional systems have limited value in their own right	Based on findings from the plant screening programmes of the pharmaceutical industry and of national drug development programmes, there is only limited therapeutic benefit to be found in traditional medicines.	Based on findings from the genetic screening programmes of commercial plant breeders and public sector breeding institutes, farmers' varieties may be cheap and durable, but commercially-bred varieties usually perform better under the same conditions.	Based on findings from environmental and agricultural agencies, traditional farming systems may have been sustainable once but, under modern conditions, they lead to greater degradation and hunger.
	Traditional health systems may have some use in the provision of care for chronic, low-level conditions, but they are of no value in providing acute or emergency care.	Farmers' varieties may have a role to play among orphan crops grown by subsistence farmers on marginal lands since neither public nor private breeding institutes will develop varieties for such non-commercial areas.	Shifting cultivation systems may have some merit on marginal lands not under population pressure, but slash and burn agriculture is generally destructive to both people and nature.
Myth 3 Scientific validation is lacking	Little scientific knowledge is available on the safety and efficacy of traditional medicine, and all national and international efforts regarding traditional medicine should be directed to toxicity and efficacy research.	Scientific data on farmers' varieties is scarce and often rendered questionable due to imperfect research procedures. In the context of choice, these old seeds may be both nutritionally and environmentally counter-productive.	The hard reality of traditional conservation practices are obscured in the mists of romanticism. We live in a world dominated by population pressures, global warming and environmental erosion. Traditional systems come from a time before these pressures were in play. New approaches are needed.
Myth 4 Global value is most important	The global value of traditional medical knowledge is twofold: (i) it serves as a source of leads for the development of new western drugs; and (ii) the potential medicinal value of tropical rainforest species provides a basis for generating international support to preserve the world's rainforest areas and to conserve regional biodiversity.	Farmers' varieties can serve as an initial source of variation for modern plant breeding and, to the extent that public interest is stirred, their link to wider biodiversity may provide scientists with the funding needed to collect and conserve this variation in crop gene banks for future exploitation.	Wider recognition of the contribution of community knowledge to global conservation strategies will have a marginally-positive industrial benefit and could assist in biodiversity conservation if it is not blown out of proportion.

Source: Information for column 1 is taken directly from Bodeker, Gerard, 'Traditional health knowledge and public policy' in *Nature and Resources*, UNESCO, Vol. 30, No. 2, 1994, pp. 5–16. Information for columns 2 and 3 is based on RAFI's experience since 1977.

by both indigenous knowledge and genetic (mostly—but not exclusively—plant) resources.

Ending an extractive industry

The case for a different kind of integrated rural development—building with indigenous knowledge and strengthened by community innovation—still needs to be developed further. This requires a fundamental change in perspective. Cooperative innovation systems have given rise to an extractive industry valued by the North's doctors, agronomists or environmentalists to the extent that they can be synthesised and/or commercialised. To argue that local knowledge should be nurtured within the community for the community amounts to a radical departure. To further suggest that the patchwork of communities' knowledge makes for a national, regional, or even global quilt that is strong and richly textured (a human security blanket?) is a heresy whose time has arrived.

Blake, the bio-ethicist

Yet, even as the Biodiversity Convention and the biotech industry search for new silver bullets with which to save the ozone layer, the oceans, the soil and biodiversity, the evidence is mounting that William Blake was right all along; that we will be saved only through the management 'of minutely organised particulars'; and that those who propose sweeping changes on behalf of 'the general good' are 'scoundrels and fools'. The environment will be restored and kept whole from farm to farm, and community to community.[85]

The lesson is that—especially where human lives are at stake—we must build from people's strengths. The last thing we should do is jettison local knowledge—the more so when we can't be sure we will have the money, the will or the brains to replace what we tear down.

The essential principles of human security, then, are the following:

- The Universal Declaration of Human Rights supersedes the WTO and all trade agreements made through the WTO or other organisations.
- Human security is the composition of food security, health, knowledge and environmental security together with all aspects of human and cultural rights.
- The measure of human security is the well-being of the poorest.

Notes

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Case Study

Parts Parasitic

When Crop Diversity Is Neglected

The fungal disease that destroyed food security 150 years ago is stalking the earth again in a new and more deadly form. The classic tale of crop genetic vulnerability—told repeatedly by plant geneticists around the world—is that of the Irish potato famine. Phytophthora infestans *(late potato blight) attacks the species homo sapiens by cutting off its food supply. Unlike in the 1840s, Western industrialised countries face only the economic loss of their multi-billion dollar food crop. But in the intervening 150 years the potato has come to represent food security for many in Africa, Asia and Eastern Europe. If the harvest this year or next continues to weaken, the lives and livelihoods of millions of poor people will be imperilled. As with the epidemic of 1845, an epidemic now will kill because of two blights—the disease itself; and the unwillingness of governments to wage a true war against hunger.*

The Phytophthora disease

The first epidemic

Although we can never be completely certain, analysis of both nuclear and mitochondrial DNA fingerprints and of the allozyme of *Phytophthora infestans* (late potato blight), argues strongly that the disease lived undisturbed, in the shadow of the Toluca volcano, for perhaps thousands of years.[1] As a fungus, it propagated clonally and gradually mutated in the cool, humid, rainforests that dominated the valleys of Mexico's central highlands. Then, in 1530, the Spaniards pushed into the region and the Cortes family turned the Toluca valley into its personal fiefdom—burning the forests into fields and farms. Some time, possibly early in the 19th century, the relatively benign fungus hopped from its forest hosts to other species. What havoc it may have wrought among the Otomi, Huastec and other agriculturalists is not recorded.[2] The Huastec, however, practised (and still do to this day) a highly sophisticated form of forest management known as *te'lom* which allowed them to utilise as many as 300 different forest species, including 81 species directly for food.[3] This diversified production strategy would have kept *P. infestans* in check until the Spanish introduced monoculture.

Researcher William Fry at Cornell University theorises that an American biologist may have accidentally brought *P. infestans* home with him from an expedition to the volcano in the early 1840s,[4] not long before American soldiers occupied the region during the Mexican–American War. What is known is that some time in the autumn of 1843, news of the outbreak of a devastating new disease was reported in Philadelphia. Somewhere on the city's outskirts an epidemic was boiling and defences were unknown. Whether because of a change in the temperature, or some other factor, the disease did not advance further. Worries subsided until the following year—again in the autumn—when the disease seems to have hopped to the maritime provinces of Canada and the American mid-west.[5] It killed wherever it landed. The disease seemed airborne—capable of moving as much as three or four miles a day. Wherever it landed, destruction occurred within 24 hours.[6] But, once again, as quickly as it came, the disease vanished. It was not seen again on the shores of North America and those left behind sighed deeply with relief.

In June of 1845, *Phytophthora infestans* struck again. Belgian newspapers reported the first signs of the disease, and the country braced itself for disaster. During the summer, *P. infestans* surfaced in the Netherlands and then in Germany. Not long afterwards, it was on the fringes of Moscow, ravaging Spain out to the Canary Islands and searing the Balkans.

On August 17, 1845, newspapers announced the arrival of the death fungus in Ireland. On October 15, Ireland was officially declared a disaster area. For almost four years, it held sway over the lives of everyone, sweeping from one shore to the other almost

overnight. Before it vanished—as suddenly as it had arrived—more than a million (perhaps as many as 1.5 million) people were dead and a quarter of the population had fled.[7]

Rumours of its devastation continued sporadically. Tales of destruction came from as far away as China and parts of Africa hardly known to Europeans. Modern DNA probes now show these rumours to have been true. The disease even doubled back from Europe into Brazil where its impact was the same as everywhere else. By the 1860s, however, the rumours petered out and the world gradually forgot. All that was left were the unmarked mass graves and the continuing devastation to the psyche of the nations and the families who survived.

The second epidemic

The fungus was quiet for more than a century. In the Toluca valley, towns and cities grew and farmlands spread deep into the rainforest. Where the dairy herds didn't wander, mines were bored into the sides of the volcano to extract ores. But, in 1976, the disease broke free of the volcano's shadow once again. Epidemiologists know for a certainty that a more aggressive strain (dubbed genotype A2) of *P. infestans* was found in Switzerland in 1981 and that scientific evidence traces the pathogen directly to the central highlands of Mexico. The disease may have come to Europe directly through the extensive agricultural traffic between the two regions during the 1970s. In the same year, the 'new' *P. infestans* struck the Netherlands and Germany. The UK was hit in 1984 and the disease materialised in Poland in 1988 and Ireland in 1989. According to Dutch and American investigators pursuing the fungus, European traders—mostly Dutch—inadvertently carried the disease with them to Egypt in 1984, Japan in 1985 and then to points as diverse as Rwanda, Israel and Brazil in the late 1980s. By the beginning of the 1990s, Korea, the Philippines, Taiwan and Bolivia were all reporting outbreaks of the new disease strain. In every encounter, the disease mysteriously presented itself only to vanish, reappear and vanish again, causing limited but recurrent destruction. Some claimed it was the weather. Others simply counted their blessings.

In 1992, epidemiologists noticed that *P. infestans* had changed. Not only were there two distinct types of the same Mexican disease; they were also mutating rapidly and multiplying differently. The disease also continued to invade new hosts. As best as can be surmised, it infected tomato seedlings shipped from either the Toluca valley or, possibly, Northwest Mexico, to Florida and California. When rot was discovered, the infected plants were probably composted. Somehow *P. infestans* survived. Somehow, the new disease strain in its new host slipped into Pennsylvania, New York and Washington. In 1994, like a tropical depression, *P. infestans* gained hurricane force and leapt through the United States, spreading alarm among scientific workers from Florida to California. It also surfaced, almost overnight, in the West of Canada. In British Columbia, the two strains of the disease were—for the first time—discovered together. *P. infestans* expanded beyond the mere clonally propagated. The old variations of type A1 were pushed aside not by the virulent new strains of a year earlier, but by sexually-reproducing strains.[8] Suddenly it was mutating with incredible speed. Two years later, the scientific sleuths tracking it counted numerous different forms of the fungus—each more virulent than the last—and the last forms were resistant to every available chemical remedy. Ridomil, a defence designed by Ciba-Geigy, had proved effective against the original 1840s strain that had reappeared in Europe in the 1980s.[9] It was impotent in the face of later forms of the type A1 fungus as well as all the type A2 strains.

Around 1994, as it had 150 years before, type A2 bridged the Atlantic and began another march through Europe. Whether via the United States or through a separate pathogenic migration, the disease also spread from cargo shipments originating in the Netherlands to Rwanda and other parts of southern Africa—and again to Latin America via Bolivia and Ecuador. In the late summer of 1995, investigators knew they were dealing with one of the most dangerous pandemics the world had ever seen—deadly and unstoppable. They could only hope that the weather—or whatever controlled its progress—would put an end to it before it killed once more.

Food security and human security

The Irish potato famine of 1845–49 disrupted a whole nation, not only causing death on a huge scale but forcing millions to risk treacherous ocean crossings and begin new lives on the farthest shores of the Baltic Sea and in North America. In La Laguna (in the Canary Islands), late potato blight launched a series of human and natural disasters that plagued the region for the remainder of the century. Locusts, drought and storms followed on the heels of repressive taxation and the collapse of the cochineal industry. In the Balkan Dutchy of Carniola, the fungus's blight lingered on into the 1860s and the population's suffering was exacerbated by the ferocity of their Habsburg rulers. If the death rate was lower in the Netherlands, the social and economic impact remained enormous. Dutch Corn Laws were repealed and tax laws were restructured—for once, to support those afflicted by *P. infestans*.

With such a history, it is understandable that even the hint of a new potato famine in 1995 doubled potato prices in some parts of the United Kingdom.[10] Farmers in New York State hit by the blight in the same year suffered USD 100 million in crop losses, and another USD 100 million in extraordinary expenses trying to contain the disease. These losses pale in comparison to the worldwide implications of a new pandemic. When RAFI first began tracking the path of *P. infestans* in 1992, the farmgate value of the global potato market was USD 40 billion and the world potato industry was valued at USD 160 billion.[11]

The real threat, however, lies outside the West. The potato has become—after rice and wheat—one of the world's most critical sources of carbohydrates and a farm product for more than 129 countries. Since the 1970s, international agricultural research programmes have evangelised throughout Africa and Asia, extolling the undoubted merits of the bountiful tuber. Some of the world's poorest countries—Rwanda and Burundi are examples—have been encouraged to plant potatoes as a new staple. Researchers now speculate that the original strain of *P. infestans* was spread, accidentally, by seed potato companies—to Southern Africa, the Middle East and East Asia. It also looped back from Holland to its centre of diversity in the Andes. Outbreaks of the more aggressive disease genotype have been identified in Bolivia, Ecuador, Colombia and Brazil. Seed company interest in the Third World market grew as the potato acreage in the North declined. Between 1961 and 1991, land sown to the crop in industrialised countries was almost halved. During the same period, acreage doubled in Asia and almost tripled in Africa, making the South the growth region for commercial varieties.[12]

By 1992, CGIAR's CIP (the International Potato Centre headquartered in Lima, Peru) estimated that the disease was cutting Third World yields by 30 per cent and that fungicide control campaigns, related to late potato blight, were costing the Third World USD 600 million each year (global fungicide costs are estimated to be USD 1.8 billion—making potatoes the most chemical-intensive food crop in the world).[13] In a frantic effort to outbreed the fast-mutating fungus, CIP released more than 250 new potato clones to 27 countries around the world. In the summer of 1997—as the northern temperate zone contemplated its autumn harvest, the virulent forms of the disease were being monitored in the high Andes, hardly a day's march from the birthplace of the potato itself. Of grave concern: the potato harvests of Eastern Europe where economically-battered populations sometimes depend almost exclusively on the potato. Russia is the world's number one potato producer. Poland, the Ukraine, Belarus, the Czech and Slovak Republics and the war-torn bits of former Yugoslavia are all leading potato growers—and consumers.[14] Scientists recognise, however, that nothing offers farmers or consumers true security. The lives of millions—and the livelihood of hundreds of millions—depends on the weather at harvest time.

In April of 1997, I had the opportunity to tour CSO potato conservation programmes from the shores of Lake Titicaca and Comanche in Bolivia to the highlands surrounding Cajamarca in Peru. I saw farmers working to conserve as many as 140 distinct varieties on a single hillside. Most were unaware that the new sexually-reproduced strains of late blight could be in

Late potato blight
Phytophthora infestans

A fungus, *P. infestans* is indigenous to the central highlands of Mexico. Late potato blight actually afflicts both potatoes and tomatoes (and their related species). It strikes under cool humid conditions just before harvest and can turn a 300-hectare field into mush within 24 hours causing lesions and dry rot in the tubers. The first evidence of the ingestation is usually grey spots on the foliage which turn quickly into a cottony film that envelopes the plant.

Propagating clonally, the 1840s epidemic included several strains of genotype A1. The much more aggressive genotype A2 first appeared in the 1980s. The fungus can abandon its clonal form of reproduction for sexual reproduction when types A1 and A2 occur in the same field. This was discovered in Canada in 1992. Since then, the two types—with numerous new strains—have been found in several other US states. *P. infestans* travels by air in two respects: air currents can carry it three–four miles a day. With today's aircraft, however, cargoes of diseased potatoes and tomatoes can reach any corner of the globe within 24 hours. It is often difficult to detect the disease on seed potatoes until it is too late.

the next valley. I also visited the International Potato Centre in Lima and talked with its Director-General, Hubert Zandstra. According to Zandstra and his colleagues, late blight was then costing Third World farmers close to USD 3 billion—and blight-caused losses were running at between 38 and 98 per cent in some parts of Tanzania. Losses in Ethiopia were running at 68 per cent.

Adding to the concern, CIP investigators are worried that the most commonly used fungicide may be contributing to the disease's mutations. There is also new evidence that the fungicide has increased the toxicity of crop insecticides—destroying beneficial insects, attacking useful organisms, and threatening farmers with cancer and Parkinson's disease. Was concern about late blight exaggerated, I asked Zandstra? The answer was a loud, angry and desperate, 'No'.

While CIP and national governments need to be supported in their fight against the disease, we must proceed carefully. CG funding of CIP's potato research has dropped by almost half in the past ten years. After all, two-thirds of world production is still in the North, and governments and agrochemical companies there have their own oxen to gore. Further, the push to find solutions should not simply be an open-pocket invitation to Novartis—the leading fungicide manufacturer for this crop—to bring out new and potentially more dangerous chemicals. Chemicals have already added to the problem. They may even have created the worst parts of the problem. CIP seems to recognise this and is working constructively with others to find sustainable solutions. In a sense, CIP and the potato blight represent a major challenge to the will of the CGIAR truly to take on the hard work of sustainable agro-ecological development.

The Part of the Political Disease
Wakes and anniversaries

In 1995 the potato harvest in eastern Canada and the United States took place under auspicious circumstances. It was on October 15 exactly 150 years earlier that the British government acknowledged that the potato crop in Ireland had failed. Over the following years, tens of thousands of Irish refugees washed up on a little island in the St. Lawrence River near Quebec City, known as Grosse Isle. The largest mass graves in Canada are still to be seen on that island. One hundred years—plus a day—after the British recognised the Irish famine, government delegates from an independent Ireland joined their British counterparts and delegations from 42 other countries in Quebec City to establish the first United Nations agency—the UN Food and Agriculture Organization—dedicated (in the altruistic post-war glow of atomic radiation) to ending famine. On October 16, 1995, agriculture ministers from 165 nations convened at the

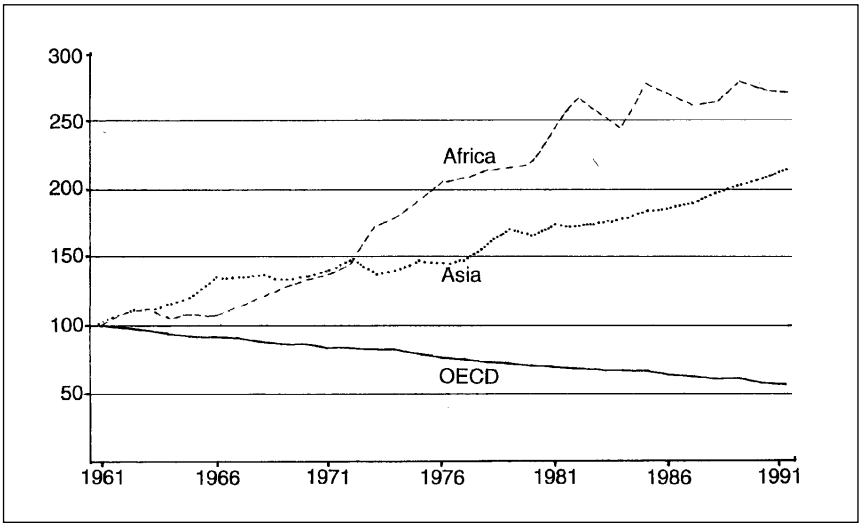

Figure 2 Potato crop area in Africa, Asia and OECD countries, 1961–91 (1961=100).

Chateau Frontenac in Quebec City to mark FAO's 50th anniversary with a special conference on world food security.

Investment security?

As every politician knows, you can't hold a conference on food security without a clarion call for a war against hunger. This was said in 1945 when conference Chair, Lester Pearson (later Canadian prime minister), called for 'Welfare not Warfare'.[15]

In November 1996, Heads of State gathered in Rome for the first-ever World Food Summit. One of the leaders' major tasks was to approve a draft declaration. Nothing too arduous. The draft initially circulated for intergovernmental debate read more like a stockholders' report than a campaign to vanquish starvation. The word 'farmer' arose only once in the brief text. 'Investment' or 'investor', on the other hand, appeared 22 times—more often than governments refer to 'government'. Exchange or interest rates and discussion of GATT's Uruguay Round were more common than the word 'hunger'. There were more references to the economic or investment 'environment' than to the ecological 'environment'. On the only occasion in the draft Declaration where the word 'sanctity' arose, it was in the context of the 'sanctity of contracts'. The solution to world hunger, it would seem, lies in private investment and the marketplace. This is the language of the IMF, the World Bank and the World Trade Organization—not of a United Nations Summit dedicated to a war against hunger.

It is also, however, the language of the potato famine. Responding to criticism that the British were not buying enough food to feed the starving Irish, the government's famine coordinator replied, 'Our purchases, as I have more than once informed you, have been carried out to the utmost limit short of seriously raising the price in the London market.'[16] Historians could well argue that the havoc wreaked in the 1840s was caused not so much by *P. infestans* as by private investment and the marketplace. Historians concur that there was never a food shortage in Ireland. For every shipload of (usually indigestible) food aid that

reached Irish docks, six or more shiploads of cereal crops left the same ports for markets in England and Europe. The land tenure system, taxation and the mercantile theories of the time were what killed people. As it was in Ireland, so it was in La Laguna where Spanish tyranny and the replacement of cochineal with analun dyes threw the unemployed and landless onto the vicissitudes of a devastated potato crop. Thus it was also in the little Dutchy of Carniola under harsh Habsburg rule.

We seem to be turning full circle. One hundred and fifty years ago, a fungus slipped out of the Toluca valley through the USA and Canada to decimate Ireland and terrorise Europe. Today, more virulent forms of the same fungus have again escaped the eroded forests of Toluca to sweep across North America into Europe and, propelled by international trade, to the Third World. In 1845, the solution to hunger was a free market. Almost at the end of the 20th century the answer is still the same.[17]

Notes

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14. Personal communication from Dr William Fry, Professor of Plant Pathology at Cornell University to Pat Roy Mooney of RAFI, on 9 August 1995.
15. *The First FAO Conference—Quebec, Canada*, 1945, p. 1 and pp. 46–48 (as made available by the FAO archives).
16. Woodham-Smith, Cecil, *op. cit.*
17. In preparing this information on *P. infestans*, RAFI wishes to acknowledge the pioneering and remarkable contribution of Dr William E. Fry, Professor of Plant Pathology at Cornell University along with a number of his colleagues at Cornell and at the US Department of Agriculture (USDA).

6 Forgotten Parts

Pirated Diversity in the Seas, Soils, and in Ourselves

Whatever its shortcomings, the Biodiversity Convention changed our concept of biological diversity. The connections between flora and fauna, between ecosystems and indigenous knowledge, came home to CSOs and policy-makers. If we struggled to look beyond plant genetic resources to grasp agricultural biodiversity, the Convention forced us to look wider still. RAFI began to deal with the livestock breeds that depend upon crops and forages. We also looked beyond food crops to medicinal plants. As some of our colleagues looked on in amusement, we dug into microbial resources in the soil and oceans. Then, one day, we came face-to-face with ourselves—the piracy of human genetic material. As with crop germplasm, there are issues of erosion and of ownership. Despite the South's faith in 'sovereignty' as protected under the Convention, the signing of the 1992 treaty, in fact, opened up a whole new world of bio-piracy.

In March, 1997, the RAFI Board held its annual meeting on the island of Bohol in the Philippines. Rene Salazar could point from the board table across a small bay to the still smaller island of Siquitor. Siquitor had made headlines short days before when US cancer researchers reported that a tiny cave-dwelling relation to the sea squirt, something called *diazonomide A*. has a molecule that combats colon cancer in humans. The problem is that the little critter—first pulled from an island cavern 80 metres beneath the sea in 1991—has not been seen since. Repeated expeditions to find it have all failed and some fear the animal is extinct. With Siquitor in the background, we debated the wider elements of genetic erosion and of biopiracy.

As surely as *P. infestans* struck northward from the highlands of Mexico, a day-flying moth, *Urania fulgens,* ranges from the same highlands venturing southward as far as Brazil. Although it may not seem like it, *U. fulgens* ('wild' though it may be) plays a role in both agriculture and medicine. The moth has co-evolved with *Omphalea*—the sometimes vine, sometimes 25-metre tree—whose derivatives span the moth's own terrain. The moth coordinates its flight plan with *Omphalea's* production cycle of DMDP (naturally produced chemical compound). DMDP renders the leaves of *Omphalea* inedible to almost all herbivores except *U. fulgens*. The arrival of the moths signifies harvest time for local communities. *Omphalea diandra*, the Panamanian vine, gives up its DMDP (non-toxic to humans) to protect the Guaymi people's bean harvest. Beyond its agricultural use, *O. diandra* leaves are warmed and the DMDP is secreted on wasp stings and infected wounds. A decoction is made for treating skin ulcers and sores. The stem sap soothes headaches and the fruit oils are employed as an oral anthelmintic.

Based on the indigenous knowledge of the Guaymi, and others, the British Technology Group (BTG), in August 1993 (barely a year after the signing of the Biodiversity Convention), applied for what was to become US Patent 5,376,675 for the control of parasitic nematodes. A year after that, Shaman Pharmaceuticals placed *O. diandra* on its hit list for possible use against everything from AIDS to diabetes. Also, in August 1993, we learned that the Guaymi themselves were on somebody's hit list.

Biopiracy in plants and soils
The new search for biological wealth

You can extract DMDP from *O. diandra's* leaves—or you can take it in concentrated form from the belly of the moth, perhaps scraped off the forest floor as part of a soil sample. In 1983, en route to release *The Law of the Seed* at the FAO biennial conference in Rome, I stopped at Cornell University in New York State to fight with the local breeders over the pirating of Farmers' Varieties. On the way to the lecture hall, Jack Kloppenburg walked me past a large windowless building which, he told me, was filled with soils from different parts of the world. While the soils were primarily used in the study of agricultural productivity, their secondary value was in any bacteria, funguses or microscopic 'left-overs' contained in them that could prove interesting to the pharmaceutical or cosmetic industries. Microbial resources had interested me for years—ever since I heard about a kind of microbial gene bank in Rockville, Maryland, known as the American Type Culture Collection (ATCC). If the US crop gene bank at Fort Collins in Colorado was the 'Fort Knox' of seeds, the ATCC was, apparently, the Fort Knox of the creepy-crawlies that contribute enormously to everything from food-processing and biocides to human health care and finishing waxes. Most of this minutia is in the soil. It can have staggering monetary value and its removal creates the kind of socioeconomic loss that plant genetic erosion does. It's a new kind of soil erosion. It raises all the old issues of who owns it, who controls it, and who benefits from it.

When, finally, ten years later, I was able to pursue my curiosity, I found that the data at ATCC was a mess. Going back well over half a century, the ATCC only rarely offered the name of a collection site and was inclined to use colonial names like Rhodesia, Borneo or Malaya rather than any standardised United Nations designation. Patent references, too, were far from complete. As it was with crop gene banks, so it was with microbial tissue culture collections.

In the end, it was easier—that very long weekend—to search for information by company name. For someone used to dealing with plants and having nothing more disagreeable to manage than leaf blight, the sojourn through

the ATCC databases was a grisly affair. Aside from a certain sense of revulsion over some of the materials collected, the overwhelming conclusion was that both medicinal plants and medicinal soils have enormous social and commercial value. Some examples:

Mighty Mucky Merck. The company is on record as having dug up soil samples in at least nine countries from Canada to Namibia. Merck scooped up soil bacteria from a heather forest on the slopes of Mount Kilimanjaro (located in Kenya, according to the ATCC!) found a soil fungus in Mexico for the making of the infamous male hormone, testosterone, used by Merck to, among other things, treat acne;[1] and, at Bosna's Pass, Namibia, dug in the dirt for a lowly fungus, now elevated to a treatment for manic depression.[2] While Merck has been sifting through the soil, it has not neglected the plants. In 1991, it contracted with a non-profit research foundation in Costa Rica to win access to the biodiversity of that country's national parks (see box).

Miner-Miser Pfizer. Merck isn't in the trenches alone. Pfizer, another giant pharmaceutical concern not likely to let the grass grow under its feet, has been dredging the fungi and bacteria of at least 15 countries. At least 22 ATCC samples—most of them the ubiquitous soil accessions but also canvas leggings and a cotton duck—have resulted in patent claims back in the United States. The soils have come from as far afield as China, Egypt and Jamaica while Papua New Guinea and Panama have volunteered fungi for the production of steroids. All under US patent and all beyond the reach of the Biodiversity Convention.

Lilly of the Field. Another company, Eli Lilly, began sending medical researchers out grubbing in the grime back in 1948. A year later, a young Filipino doctor named Abelardo Aguilar turned in a sample he had already evaluated. In the American Type Culture Collection, the sample is merely identified as soil from the Philippines. But by 1952, the world knew it as *Ilosone* or *Ilotycin* and doctors called it Erythromycin. Although Eli Lilly grandly named its new antibiotic after the island from which it came, the company refused to share its profits with either the local doctor or the Philippines. Erythromycin is one of the most commercially lucrative drugs the world has ever seen.[8] A year after Abelardo Aguilar's death, traditional medical practitioners, the Philippine Government and Aguilar's surviving family demanded that Eli Lilly return at least USD 500 million in royalties that would go to provide medical services in rural areas. So far, no luck.

Absentee landlord. Bristol-Myers Squibb (BMS) has 38 foreign accessions

Can the South benefit from its own biodiversity? The Case of Costa Rica

Costa Rica's rainforests are estimated to hold 5–7 per cent of the world's remaining species diversity.[3] If the much-applauded 1991 Merck-INBio deal were widely replicated, the South's biodiversity could be auctioned off for about USD 10 million per annum. Merck's sales in 1991 were USD 8.6 billion, while Costa Rica's entire GNP that year was USD 5.2 billion.[4] Merck's research budget in 1991 was roughly USD 1 billion; the company also has three drugs with sales in excess of USD 1 billion each. Given that pharmaceutical companies invest an average of USD 200-300 million on research for each new drug, the discovery charge for one single new drug arising from the deal is barely loose change.[5] The 1991 deal required Costa Rica to provide Merck with samples in exchange for an average payment of USD 113 per sample.[6] Non-commercial plant collection costs often run to USD 400 per accession.

For Merck, the Costa Rica contract was 'cheap labour'—a money-saving exercise, and useful propaganda. If, 20 years from now, Merck disputes the origin of a plant-derived compound, Costa Rica's capacity to appeal to the international courts is mostly theoretical. Merck has access to more patent lawyers than can be unearthed in all of Costa Rica.

Are the origins likely to be contested? *Beta selinene,* for example, can be extracted from tree leaves in Costa Rica, but biopirates know from published literature that the same material is available in Venezuela, Mexico, Brazil, Honduras—and the home turf of many pharmaceutical transnationals—US-controlled Puerto Rico. Pharmacologically interesting *Isertia* compounds appear to be in abundance in Costa Rica where high percentages of the active material have been recorded. Other samples, however, have been extracted from Colombia and Brazil, and Shaman Pharmaceuticals notes six samples where the origin is simply 'not given'.

Costa Rica's attractiveness for Merck, of course, is not merely its impressive, if non-exclusive, diversity, but also its political uniformity and the low visibility of complicating indigenous communities in that country—communities that could prove much more difficult in other parts of tropical America.

Merck certainly got a good deal out of Costa Rica but other pharmaceutical companies have dirty hands too. Ortho Diagnostics, for example, managed to scrape enough bacteria off a sick dog's eyeball to make a patented product.[7] In all, the country has surrendered at least 97 accessions to the American Type Culture Collection. The sources of material are impressive ... beach mud and a range of soils, lily ponds, 'Cathedral' pools, hot springs and maize plants. How much of the material is involved in patent claims is uncertain.

Pharmaceutical houses are not just sniffing around Costa Rica's medicinal plants and soil organisms. Some—like Hoffmann-La Roche—are after the country's very essence—its smells. Givaudan-Roure, one of the world's largest flavour and fragrance companies (and a subsidiary of Roche) has contracted with INBio in Costa Rica so that it can use its Scent-Trek technology to capture every odour from a single orchid to an entire tropical beech. Trying to prove the origin of a smell—especially a decade or two after it is collected—should prove an interesting legal challenge.

deposited with the American Type Culture Collection and each comes with at least one patent claim. In all, 15 countries have made soil bacteria and fungi available to the company. BMS (Buy-My-Soil?) seems to have made soil mining in India a major preoccupation. The company and its subsidiaries have scraped together enough soil to either secede or to become India's largest absentee landlord with absentee land. All patented.

Diggers and Diggings. Sifting through the ATCC's half-hearted documentation is not easy but even a crude survey of a few countries indicates the extent of the piracy. India has been a popular sandbox for the corporate set. The diggers include Bristol-Myers, Pfizer, Groupe Lepetit, Lederle Labs, and the ever-present Merck. The ATCC notes a total of 35 bacterial accessions with patent claims. All 35 are assigned to only these five companies.

Beyond India, the ATCC records 258 accessions from Brazil. Two patented products are taken from a member of the pea family found in Brazilian soil and 'invented' by the General Hospital Corporation in the USA. The material is useful as a renin inhibitor. Bristol-Myers has taken Brazilian soil bacteria for the production of *hedamycin*,[9] while Warner-Lambert has taken bacteria from another soil sample to produce an antibiotic.[10] Lepetit Labs has used a soil accession in the production of *selenomycin*.[11] From Japan, Kaken Pharmaceuticals has found Brazilian microbials useful in the production of anti-tumour agents.[12]

Brazil's contribution to the North is clearly underestimated. The University of Florida, for example, patented a Brazilian fungus known to be lethal to fire ants that can cause a billion dollars in damage to US crops.[13] Neither the patent application nor the ATCC registration mentioned that the fungus was given to Florida researchers by Brazilians. Only anecdotal accounts in biotechnology industry journals made the connection.[14]

When the Convention on Biological Diversity convened for its second COP in Jakarta late in 1995, delegates were confronted with an infuriating local example of biopiracy. The family of a Novo Nordisk employee holidaying in Indonesia had used a company-provided sample kit to scoop up soil from a local monkey temple. Subsequent research showed that an enzyme extracted from that sample could be widely used in soft-drink manufacture to convert starch to sugar.[15] The advice for temple guardians in Indonesia? Have tourists wipe their feet *after* they leave.

Dirt cheap. So what if companies profit from medicinal plants or soil bacteria found in the South? Whose skill and knowledge identified the value of

otherwise 'worthless' germplasm? Two points need to be emphasised. First, this is an issue of national sovereignty. Governments must determine policy for land and resources. The removal of resources from national territory is a violation of the rights of people through their governments. The United States did not surrender Texas oil to the British merely because British petroleum technology was superior. The Canadian uranium industry would not exist without American technology. The same can be said for the coal industry of Russia or even the pulp mills of Norway. No country in possession of a valuable raw material has ever, intentionally, given it away.

Every year the US National Cancer Institute sifts through more than a tonne of soil material (more than 1,000 individual samples) seeking valuable germplasm. According to microbe-hunters at the University of California (San Diego), the drug industry spends a sizeable fortune every year screening more soil organisms.[16] Why shouldn't the South benefit?

Second, to a degree that would be astonishing to many scientists, the particular properties of certain soils have long been recognised and valued by indigenous peoples. They may not be aware of the exact chemical compound resident in the plant or soil, but the anti-tumour, antibiotic or steroid characteristics of certain soils are known and valued. Community healers customarily apply both plant remedies and soil samples to wounds and diseases. Competent biopirates make use of this community knowledge when they go off 'inventing' in the Andes.

African-Americans in Stokes County, North Carolina—not far from RAFI's offices there—have long prescribed a soil 'sandwich' rich in iron and iodine for children and young women. A fine yellowish soil from China's Hunan province has long been used as a famine food. Researchers have discovered that the soil was literally stuffed with micro-nutrients desperately needed in times of drought. Perhaps the classic example is from Zimbabwe where people with upset stomachs in one region have used a red soil found in termite mounds. The *New Scientist* reports that the soil contains kaolinite—the key compound found in kaopectate, the commercial anti-diarrhoeic.[17]

While corporate pressure to 'get down and dirty' may be on the rise, a Brown Revolution is hardly in the offing for the South. That which has not yet been patented in the ATCC could still be patented in our post-UNCED world. Bristol-Myers' cosmetics and facial creams may have been gouged out of Guatemala and the company's clients may go forth into Agenda 21 unblemished—but not unsoiled. The company got something for nothing—and that isn't right. In the summer of 1993, as Americans watched their own

top soil wash into the Gulf of Mexico, Bristol-Myers introduced its new deodorant, 'BAN Clear' offering to do for its customers what the South would like corporate diggers to do for them—adopt a germplasm collection policy that doesn't stink, and is transparent.

Transfer-sourcing. Back in the 1970s, UNCTAD traced the profit trail of transnational drug companies across Latin America, Asia and Europe. UN officials documented case after case of companies arbitrarily declaring their profits in whatever country they found most useful for tax or political purposes. As pharmaceutical companies traded within their own subsidiaries (about 30 per cent of all international trade in the 1970s was between subsidiaries of the same parent, and the proportion is thought to have increased substantially since then), concepts such as cost, price and profit were largely theoretical. Extractive mining companies operated in the same way. Whether it was Orinoco ores or Andean tin, the mining company proclaimed its profits either in Latin America or in the USA or elsewhere, as convenient.

The new extractive industry is biomaterials, and accompanying indigenous knowledge about them. As well as transfer-pricing, however, biopirates can now use transfer-sourcing. They can claim the source of the biomaterials to be the country and community from which they extract the best deal—or they may be able to get away without acknowledging any specific source at all. Sound market economics, perhaps? But what about the principles of benefit-sharing and respect for indigenous knowledge and Farmers' Rights?

Pharmaceutical enterprises have wooed traditional healers and ethnobotanists, seeking their advice on the pharmacological merits of more than 150 plant species and soil organisms. Almost 1,000 indigenous medical uses are under investigation. The Indigenous Peoples' Biodiversity Network (IPBN) and RAFI have compiled obtainable corporate lists in order to assess the scope of the industry's interest. The substantial majority of species used medicinally by one indigenous community are also used, often for the same purpose, by another community and, for 35 per cent of the plants, in at least one other country. Despite the much-hyped commitment of some drug companies to recognition of—and compensation for—indigenous knowledge, barely 6 per cent of the uses studied are ascribed to a named community. Often, the community is identified only as 'Amerindian' or 'Creole'. In almost 20 per cent of the cases, the origin of the technology is given neither as an indigenous community nor even as a country, but simply as 'multiple sources' or 'elsewhere'. When the time comes to commercialise a new plant or soil-based pharmaceutical, it will be entirely up to corporate good will whether a company credits an indigenous community's contribution.

Benefit-sharing
One law for the stone, another for the seed

In 1296, Edward I of England pirated the Stone of Scone from Scotland. The seat of Scottish kings since 840 AD, the stone was to spend the next 700 years holding up the backsides of English monarchs, until John Major, in a desperate bid to win Scottish votes, repatriated the stone at the end of 1996. The case of the Stone of Scone poses many of the issues raised by the Biodiversity Convention regarding the status of *ex situ* collections of biomaterials gathered prior to the coming into force of the Convention. It also poses the problem of identifying the origin of biomaterials. After all, the Scottish stone had been taken from Ireland in around 600 AD.

According to the Biodiversity Convention, 'sovereignty' over biomaterials dates from the time when a country joins the Convention. Anything in the possession of a country—be it in a forest or a gene bank—is regarded as the property of the country. Anything acquired by a country after joining the Convention must be obtained with the permission of the country that makes it available. When the final negotiations for the Convention ground to a close in May of 1992, however, governments recognised that the status of *ex situ* collections such as gene banks—obviously containing large quantities of potentially commercial germplasm gathered (for the most part) over the previous couple of decades—was a bone of unresolved contention.

Industrialised countries uniformly argued that it would be improper to make the Convention retroactive. The South argued that it would be unfair to do otherwise, since the vast majority of the South's biomaterials that have been catalogued and studied are in collections held by the North.

In the case of non-living cultural artefacts, the notion of repatriation and retroactivity, seems to be North-centric. For example, German and Italian art treasures heisted by Napoleon's armies have usually, when requested, been restored to their countries. Germany repatriated art treasures taken during World War II to France, and Russia has similarly returned treasures to Germany. The British have been a little less enthusiastic about returning Greek art treasures ... seeming to feel that the Rolling Stones are a fair exchange for the Elgin Marbles. Neither have they been keen to restore the Benin Bronzes to Nigeria or the treasures of ancient Egypt to that country. Repatriation seems much more a matter of politics than justice.

It was during the Leipzig Conference on Plant Genetic Resources that Christine von Weizsäcker of ECOROPA told us about an initiative by Phytera Corporation to 'buy' tropical plant collections held by the North's botanical gardens and arboriums. The US-based biotech boutique had already approached both the Frankfurt and Berlin gardens, offering them

The Aksum Hope: 1897–1997

The North finds the South's sense of injury and passion for justice in the negotiations surrounding genetic resources and Farmers' Rights difficult to understand. The delegates need only look out of the window of their FAO meeting rooms. In front of the FAO buildings, intended to have been Mussolini's Colonial Ministry, stands the imposing Obelisk of Aksum. Almost two millennia old, the Ethiopian Obelisk was pirated from the ancient capital in 1937—sixty years ago. As delegations debate a new legally-binding 'treaty' on the exchange of crop germplasm, Ethiopians mark the 50th anniversary of Italy's contractual commitment to repatriate the Obelisk. Recently, the Italian government reiterated its intention to restore this sovereign treasure to the people of Aksum and Ethiopia. The Obelisk has come to represent the failures of the System of Greed—and of its broken promises—that have plagued South-North relations from the founding of the United Nations.

As luck would have it, 1997 also marks the 100-year anniversary of the ransacking of the Palace at Benin by British troops and the pirating of the famous Benin bronzes—a fabulous collection of several thousand religious and artistic pieces that symbolise—with the Obelisk—the thwarted history of Africa. Following the theft in 1897, the British auctioned off most of the collection to the Berlin Museum. During the chaos of World War II, the treasure disappeared. Another example of the System of Greed.

But there is hope in the Aksum Obelisk—battered as it is by the traffic of Rome. History—and food security—make clear that the System of Greed overlooked the real treasure of Aksum. Every year, on the Feast of Tsion Mariam (which, coincidentally, fell as governments convened in Rome for the December session of the FAO Commission) the people of Aksum gather at the church near where the Obelisk once stood to exchange seeds. From far and wide—from the vast diversity of plateaus and valleys of Ethiopia, those who have given freely and without question to those who have not. The poor are restored and the diversity is reinvigorated. This is the System of Generosity. This is Farmers' Rights. Nicolay Ivanovich Vavilov would have appreciated the connection. Seventy years ago—in 1927—Vavilov visited Aksum and wrote admiringly of the Obelisk. Local farmers gave him an awnless hard wheat—a characteristic Northern breeders had only dreamed about for years—and one which Vavilov regarded as among his most important samples. Awnless hard wheats can still be found at Aksum but they have also been shared with the world.

There is hope, too, in the Benin bronzes. Lost for almost half a century, the Berlin collection reappeared mysteriously with the fall of the Berlin Wall. Africa's heritage was rediscovered—not in Berlin—but in Leipzig. For the diplomats at FAO—in the shadow of the Aksum Obelisk and of Vavilov—the message should be clear.

USD 15 for every specimen, plus a fraction of 1 per cent of any royalties that might be earned through the commercialisation of compounds extracted from the plants. Cooperating with ECOROPA and with the Indian environmental activist, Vandana Shiva, RAFI convened a news conference attacking the initiative. Short days later, *New Scientist* reported that Phytera had managed to strike deals with at least seven European gardens. By the end of the summer, RAFI's Edward Hammond was in touch with the five major botanical gardens in Hawaii and learned that all had been approached with roughly similar propositions by the New York Botanical Garden, acting on behalf of Pfizer.

Meanwhile, Pepe Esquinas at FAO had commissioned a paper on the plant

wealth of the world's botanical gardens. The preliminary survey indicated that between a third and a half of all the world's flowering plants could be found in the North's gardens—all collected well before the coming into force of the Biodiversity Convention. All part of the national sovereignty of industrialised countries. Phytera was quite open about it. John McBride of its British operations told *New Scientist* that the Convention had made negotiating with the South's governments difficult and that new assay technologies made it possible to screen and study plant compounds from single specimens. Forget the rainforest, take the tube to Kew. Pfizer was hardly less self-serving. Through the New York Botanical Garden, it warned the Hawaiian Gardens that it was solely interested in US plant species—thus including the vast collection of Pacific, Latin American and Asian species all gathered up before the 1992 Convention.

Rural societies, indigenous peoples, the South—will not find it easy to benefit from the biological resources that have been nurtured and developed through their care and genius. Not only must they overcome longstanding Western scientific prejudice; they must also rectify recent intergovernmental agreements and defend the origins of living resources. This is possible. On the basis of South–North; on the basis of what Nyerere used to call the Trade Union of the Third World, there can be benefit-sharing. If, however, the North can divide the South and force it to negotiate country by country and specimen by specimen, then the South will gain nothing.

The extreme parts

Searching for hidden treasures

Although the utility of marine micro-organisms in drugs is not well known, the pharmaceutical industry—aided by new biotechnologies and computerised screening methods—is now looking at our oceans and estuaries with considerable interest. Marine organisms often withstand intense heat, cold and atmospheric pressures. In transitional zones such as the Grand Banks or the Humboldt current off Peru, these pressures are exacerbated by the shock of sudden changes. Microbes and molecules that can withstand these pressures can offer characteristics important to industrial manufacture and medical research.

For example, Kainic (amino) acid has been isolated in Japan from a red alga traditionally employed against intestinal parasites.[18] In 1991, Kainic was catalogued in Taiwan, by Sigma Chemicals, at USD 19 per 100 mg.[19] Another marine microbe, Okadaic acid, is isolated from Gulf of Mexico sponges. The organism is useful in cases of shellfish poisonings. The sponge's compound is in demand for drug research at a cost of USD 100 for minute doses.[20]

Some of the most recent medical research into marine life is well founded on indigenous knowledge. The classic example, of course, is cod liver oil, much used as a food supplement and medicine because of its high Vitamin A and D content. Based on this historic experience, marine scientists are now looking at other fish oils that appear to have a positive effect on human cardiovascular ailments.

To support marine biotech research, the US Department of Commerce has established the Sea Grant Program to discover new drugs and chemicals. A still more ambitious effort is underway in Japan where the Marine Biotechnology Institute (MBI) has brought together 24 major companies with an initial budget of USD 6 million and their own research vessel. Led by international giants like Suntory, Nippon Steel and the Kupwa Hakko Pharmaceutical company, MBI's ship is trawling Micronesia in search of profitable microbes.[21]

Ninety per cent of all living organisms are found in the ocean. Yet, only 10 per cent of the ocean has undergone even cursory exploration and some biologists estimate that at least 10 million marine species remain to be discovered.[22] One third of identified phyla are exclusively marine.[23] Few have been investigated for their medical or commercial merits. Thermal vents in undersea ridges hold the greatest diversity of marine life. Despite the enormous diversity of the Grand Banks, marine species diversity is greatest at the equator and tapers off towards the polar regions.[24] RAFI research has revealed that, in the US alone, at least 80 companies are actively engaged in marine biotechnology, and many of these are seeking new organisms that may yield promising drugs.

The most powerful indicator of the unique importance of deep sea organisms came in August 1996 when researchers announced the discovery of a new type of life near an antarctic vent. The micro-organism differs substantially from the two known forms of life on earth—protozoa and the group encompassing bacteria, plants and people. The new organism appears to exist without solar support at temperatures and pressures that could make it an industrial eldorado. RAFI has learned that Craig Ventner, the ubiquitous former gene sequencer for the National Institutes of Health, has already sequenced 60 per cent of the new life form's DNA.

Unattributable parts

Industry's most recent moves have been yet more exotic. Australian scientists have cut a deal with US companies to collect soil and marine samples in the Aussie zone in Antarctica. Microbial materials that survive under such severe conditions—temperature and atmospheric pressure among them—

Grand Banks Robbers

In March 1995 a row flared up between Canada and Spain ostensibly over international fishing rights on the North Atlantic's Grand Banks. But below the surface the issue also involved the biopiracy of marine micro-organisms. The world's oceans are a commercially bountiful source of ingredients for the pharmaceuticals, chemicals, cosmetics and food industries. The pirating of marine micro-organisms found within sovereign waters violates the Biodiversity Convention. The expropriation of marine resources outside national boundaries represents another grey area in need of Convention resolution. Spain's largest fishing fleet operating on the Grand Banks was working with Spain's leading biotechnology company to collect invaluable marine organisms in its fishing nets. Here's what's at stake.

Among the most biologically productive marine environments in the world, the Grand Banks lie at the crossroads of the warm Gulf Stream coming up from the Caribbean and the arctic Labrador currents whose icy waters merge with the freshwater from the St. Lawrence/Great Lakes system. The result is a biological 'soup' of vast diversity in everything from fish to fungi. In a recent survey covering a piece of the North Atlantic ocean floor no larger than a small room, 898 marine species representing a dozen phyla were identified—more than half of these had never been seen before. This gives the Grand Banks the kind of biodiversity we normally associate with the Amazon rainforest.[25]

The fisticuffs engaged in by Canada and Spain in March of 1995 drew world attention to the problem of 'straddling stocks' (fish stocks that are only partly in national waters). Spanish and Canadian gunboats were on the verge of confrontation and the European Union was straddling internal fishing disputes between the British (who were pro-Canadian) and the Spanish (who were pro-Spanish). While fisherfolk and environmentalists are properly exercised over the pillaging of fish stocks wherever this occurs, gone unnoticed is the poaching of other, generally microbial, marine treasures at least as economically valuable and almost as endangered.

And, as in the case of the Grand Banks robbers, the biopirates of marine organisms may also be Spanish. The Estai, the Spanish fishing trawler arrested by Canadian officials on the open seas, hailed from Vigo, an old port on the northwest coast above Portugal.[26] Four centuries ago, Vigo was the repeated target of Sir Francis Drake's privateers. Now, Vigo may be home port to the 20th century's biotechnology pirates.

One of the world's leading marine biotech companies is PharmaMar, headquartered (like the Estai and the Pescamaro Uno whose nets were cut by the Canadian coastguard) in Vigo. The plot thickens. PharmaMar is 72 per cent owned by Zeltia (one of Spain's largest chemical companies) but 7 per cent of the biotech enterprise's shares are held by Pescanova—one of the world's largest fishing fleets[27]—and a further 12 per cent of shares are controlled by Euroventures España (a venture capital firm involving both Zeltia and Pescanova).[28] Pescanova, too, is based in Vigo. Whether it directly owns or controls the Estai and the Pescamaro Uno could not be confirmed. Canadian fisheries officials were unable to unravel the Byzantine tangle of shipping contracts and ownership systems that make the industry one of the most secretive in the world.

According to Spanish industry sources, PharmaMar specialises in developing molecules from marine species captured in the nets of its shareholder, Pescanova. Finely-meshed nets—the kind brandished by the Canadian fisheries Minister at the UN—are illegal under international and Canadian rules, but are of the greatest value to any biotech concern interested in sampling the *fruites de la mar*. The micro-organisms they seek could be in the intestines of a turbot or attached to the shell of a minuscule crustacean.

The company's hitchhiking strategy is serving PharmaMar well. At present, PharmaMar claims 13 marine organisms whose anti-tumour compounds are in trials with the US National Cancer Institute.[29] Among them are a microbe from the Caribbean that may prove useful in treating non-Hodgkin lymphomas, and other marine samples for breast and lung cancers.[30] According to the Spanish financial newspaper, *Cinco Dias*, the company has established a marine gene bank with 20,000 accessions and has identified at least 250 active ingredients that have culminated in 30 patents.[31] PharmaMar also has agreements to sell marine organisms to pharmaceutical giants such as Glaxo, Pfizer, Bayer, Sandoz and Boots.[32]

PharmaMar's partner and part-owner, Pescanova, has been carrying PharmaMar scientists far and wide as the fishing corporation conducts its operations in 20 countries. Recently, Skeleton Coast Trawling, Pescanova's African subsidiary, became 'the prime beneficiary' of a World Bank Group move to enhance fisheries in Namibia. Pescanova itself is 20 per cent owned by Imperial Cold Storage of South Africa.[33] The World Bank is providing USD 6.5 million to the Spanish company.[34] Such deals couldn't serve PharmaMar's interests better. Africa's southwest coast borders the Benguela Current, arguably (with Peru's Humboldt Current) among the most biologically rich waters in the world.[35]

In 1990, Pescanova bought two French fishing enterprises, Interpeche and La Miquelonnais, operating within the Grand Banks area. Industry observers, at the time of the acquisition, reported that the move was expected to lead to an expansion of Pescanova's business in Canada.[36] National fishing authorities around the world, however, continue to assume that Pescanova is after fish. They are uniformly unaware that its PharmaMar subsidiary is also trawling for pharmacologically important microbes.

could prove uniquely valuable to the pharmaceutical and chemical industries. Not to be outdone by the Aussies, British biologists prowling the dry valleys of the eastern Antartic have found sandstone rocks with layers of black lichens, white fungi and green algae eking out a dark existence between the grains of rock several millimetres inside the stone. The ability of these tiny life forms to survive—if not thrive—in the cold and dark makes them automatically interesting to industry.

Antarctica is not unique for life in dark places. Under a maize field in southern Romania lie the Movile Caves. Opened in 1986 after 5.5 million years, the caves are a series of subterranean chambers often separated by lakes and rivers whose source is not above—but further below. Some estimates place the water at 25,000 years old. Living along the underground shorelines are a wide range of insects and micro-organisms that can be found nowhere else in the world. Their ability to sustain themselves without light makes them, once again, attractive to industry. Aside from the Romanian cave, some of the incredibly deep caves of France (many more than a kilometre below ground) are also drawing commercial interest. With similar enthusiasm, researchers are exploring the cold depths of Siberia's Lake Baikal (at 1940 metres, the deepest lake in the world); the dense biomass of swamps along the Zaire river; and the saline and soda lakes of East Africa. While industry investigations in these locales are rarely supported by indigenous knowledge, the extreme nature of the sites makes them worthy of study. In fact, in the politicised world of genetic resources, the absence of human involvement is probably an attraction for some companies.

From flora to fauna
Loss of diversity among livestock breeds

FAO argues that close to two billion people rely on livestock for some—or most—of their livelihood. In a sense, this underestimates the importance of domesticated animals for world food security. Excepting Texas cowboys and Pampas ranchers, those who tend livestock rank among the poorest in the world. They are the nomads and foragers clinging to the edge of deserts or arid mountainsides. They are also the women and children who feed and shepherd the chickens and pigs that forage in the farmyard or around the urban compost. Perhaps as little as 15 per cent of our food security rests on meat and dairy products but livestock's contribution to the most food-vulnerable peoples is much greater.

According to FAO studies, 5 per cent of the breeds of major livestock species are vanishing every year. This can't last for long. If action isn't taken very soon, no action will be needed. Today, in India, 80 per cent of poultry production is based upon exotic introductions and 50 per cent of India's goat

Indigenous knowledge and micro-organisms

> *Precautions must also be taken in the neighbourhood of swamps because there are bred certain minute creatures which cannot be seen by the eyes, which float in the air and enter the body through the mouth and nose and there cause serious diseases.*
>
> Varro (Roman scientist and physician, 116-27 BC)

The Laws of Life (*Development Dialogue* 1988:1-2) began with the story of Anton van Loeuwenhoek—the Caretaker of Delft—and the inventor of the microscope. Loeuwenhoek's 17th century invention, we wrote, exposed a world beyond our sight and opened the sequence of doors to current-time biotechnology. Not quite. If our earliest record of the use of medicinal plants dates back 60,000 years to northern Iraq, our first indication that ancient societies could magnify and study the world's smaller forms of life also comes from northern Iraq at least 4,000 years before the Dutch inventor made his discovery. Lens found in Crete dating from the fifth century can magnify perfectly up to seven times and, with distance distortion, up to 20 times.[37] Were ancient physicians aware of microbial life as well? Varro's warning from first century Rome suggests that knowledge of micro-organisms is far from recent. Indigenous peoples the world over know how to use certain soils for wounds or tumours. Traditional medical practitioners talk knowingly of the 'living soil'. When pharmaceutical companies go searching for soil, the smart researchers talk with local people before reaching for a shovel.

breeds are threatened by extinction. Across the Kaber Pass in Pakistan, the Pak-Angora goat is down to its last herd of 380 animals. The goat is both heat-tolerant and disease resistant. Meanwhile, the Yakut cattle of Siberia, which can withstand temperatures of -60°C and boast a highly-concentrated and nutritious milk, count no more than 900 living animals. In the Philippines, fewer than a thousand of the country's hardy Banabo chickens survive even though they are resistant to most pests and predators. One of the most hardy and best milk-yielding dromedaries in the world, the Arvana-Kazakh (of Kazakhstan), is also on FAO's endangered list. China, the home of the pig, is losing its breeds to North American and European imports at a terrifying rate.

What's being lost—as always—is the diversity that, today, keeps the poor alive and, tomorrow, could be vital to us all. What's being done about it is almost nothing. At FAO, an energetic Aussie named Keith Hammond is working night and day to win the attention of governments for DADS—FAO's Domestic Animal Diversity programme. While Hammond has managed to piece together a network of about 70 national contact points and about USD 2.5 million in core support, he is left to work almost single-handedly with a couple of civil society organisations—to maintain the endangered breeds.

Goodbye Dolly?

I was en route to the Philippines when the news that Scottish scientists had succeeded in cloning an adult sheep first broke in the *New York Times*. When I disembarked from a small prop plane in the provincial capital of Bohol,

Rene Salazar of SEARICE handed me the local paper—headlining the cloning story.

The news about Dolly, of course, rang around the world. Except for that initial story in the *New York Times*, however, nobody talked about the potential impact livestock cloning might have on animal genetic diversity. In theory, the cloning technique—when perfected—could allow us to multiply individuals from rare breeds to improve their survival odds. Since it took Dolly's 'inventors' 177 false starts, however, the prospects of Keith Hammond's endangered breeds being salvaged by cloning seem slim. It is far more likely that the perfected technique—by being able to mass-produce elite individuals—will add to the extinction pressure.

When I saw Keith Hammond in Rome about three months after Dolly made her debut, the FAO geneticist added another dimension to the story. As much as the media have ignored the potential impact on diversity, they have also overlooked the underlying scientific breakthrough that Dolly represents. About eight months before the *New York Times* account, the Roslin Institute published its development of 'reverse DNA quiescence'—the ability to walk inside an adult cell and switch on all the lights, to take a mature cell that is busy growing hair and restore all the dormant genes inside so that cell could become part of your liver or brain ... or a whole new cloned sheep. Hammond theorises (but does not confirm) that reverse DNA quiescence might allow impoverished national governments—solely as a back-up to the ongoing use of rare breeds—to maintain an *ex situ* stock of endangered animals at extremely low cost. If the technique works, Hammond reasons, then the current expensive, complex, and unreliable system of nitrogen storage of sperm and eggs could be replaced by a few tufts of hair preserved under very low-tech conditions. Conservationists would need only to walk up to a herd of animals and pluck a few hairs from each in order to replicate the entire herd should the need arise.

That's the theory ... Meanwhile, the poor and powerless have learned not to count their chickens before they hatch.

Parts-mortem

There's an old axiom in law that anything found in the soil is the property of the finder—or of the state—if there is no clear land title. This holds true for nature's creepy-crawlies and for people too. It was with this presumption of law on his side that Ales Hrdlicka opened the graves and removed the bodies of 756 Alutiiq people of Larsen Bay, Alaska, in the 1920s and 1930s. According to elders, some of the bodies were only ten years buried. The biopirate shipped the remains to the Smithsonian in Washington DC where they were crammed, pel-

vic bone to pelvic bone, with almost 18,000 other indigenous cadavers owned by the museum. Some threatened human communities have more dead members in the Smithsonian than live members in their traditional territories.

A 1986 Louisiana court decision (Charrier versus Bell) is changing all this. The Tunica-Biloxi community won back the graves of several indigenous members even though the land was not titled to them. Partly as a result of the law suit, the US government enacted the Native Graves Protection and Repatriation Act and the Alutiiq were free to rebury their ancestors in 1991. Many other aboriginal communities are forcing museums to surrender their grisly displays and return the bodies for traditional burial.

Most notable in these efforts is the global struggle waged by the Hui Malama i na Kupuna o Hawai'i'i Nei (Group Caring for the Ancestors of Hawaii), organised in 1989, to block the destruction of 1,100 graves on the island of Maui. Ultimately, a Ritz-Carlton Hotel had to give way and turn the land over to the State of Hawaii. The Hui Malama have since campaigned successfully to recover human remains from 18 museums in the USA, Australia, Canada and Switzerland.[38] The task that awaits, of course, is to achieve as much for the living.

> *Soon we will have all the instructions on how to make a human being—what thinking means and what memory means—it will totally transform how we view ourselves...*
>
> Alan Bernstein, Director, Samuel Lunenfeld Research Institute, Mount Sinai Hospital, speaking at the University of Toronto, 12 June 1996

Human biodiversity: What would Abraham Lincoln do?

Early in 1993, RAFI followed up scattered rumours about something called the Human Genome Diversity Project (HGDP) by contacting scientists who appeared to be attending its meetings and asking them to send us information. En route to Rome, I picked up a large stack of papers sent to us from California and read them on the plane. Normally, I am asleep before the plane takes off and only wake up when the jet is bouncing down the tarmac at the other end. This was a sleepless flight.

'Isolates of historic interest'

The HGDP is an informal consortium of individual scientists—molecular anthropologists, population geneticists, etc.—and their academic institutions, whose stated interest is in mapping the ebb and flow of humanity's journey around the world and throughout recorded and unrecorded history. According to the correspondence and papers, members of the HGDP have a thirst to know who crossed the Red Sea first and when and where 'who' in

the human family first made it to the Western hemisphere.[39] They want to know whether it was the 'idea' of agriculture that travelled from ancient Anatolia (modern Turkey) or the farmers themselves. (It was the farmers.[40] Europeans seem to be notoriously slow learners!)

To solve these unsolved mysteries of the human pilgrimage, the stack of papers told me, the Project was debating whether to grid the planet in 50-kilometre squares and sample people in every block—or to track down the many thousands of distinct human communities scattered about the globe. Either way, molecular geneticists would use the genetic information in siphoned blood samples to build a retrospective map of our past meanderings. The physical task of obtaining living DNA samples seemed a titch ghoulish—researchers would draw blood and take hair roots and cheek scrapings from, optimally, 50 people in each sample group and then 'immortalise' human cell lines (the entire DNA of a human being), via liquid nitrogen, in a tissue culture bank.

Hair-pulling aside, the difficulties of the task, as perceived by HGDP members, lay in reaching remote ethnic communities in rainforests or on mountain tops and scampering back fast enough to get their grisly cargo into cold storage before it deteriorated. There are between 4,000 and 6,000 distinct languages,[41] and, therefore, at least as many indigenous peoples, to be sampled. Working in geographic task groups, scientific experts concluded that it was possible to put together a priority list of genetically distinct human communities in imminent danger of extinction. At one meeting, the group came up with more than 720 such 'endangered' peoples. The threatened indigenous peoples were listed and identified, with awesome scientific insensitivity, as 'isolates of historic interest'.

Saving the 'good' Samaritans

The Project's members were, according to their papers, aware that the collection of human cell lines around the world held a number of worrying implications. There was the issue of obtaining medically approved 'prior informed consent' from indigenous peoples, many of whom speak none of the UN's official languages, and are rightly distrustful of strangers with sharp instruments wanting blood. There was also the problem of racism. The Project's results could be interpreted as feeding into the twisted analysis of race supremacists willing to manipulate the genetic data to prove their own right to domination. Less grandly—but very realistically—the collected genetic information could facilitate more subtle forms of employment discrimination, or be abused by insurance companies to curtail access to health care.

As legitimate as these concerns were and are, the HGDP missed a few. DNA sampling of indigenous peoples might give governments facing land disputes a means of claiming that the community involved was not wholly 'indigenous'—or that another group may have settled the area first. An indigenous nation is not a blood type, it is a culture. Then there are questions of life view: some individuals or communities might reject the concept of 'immortalisation' even if it only involves a blood sample. Others, with a strong sense of land, might resist the idea of having an 'immortalised' part of themselves exported and stored on foreign soil.

But there are still other concerns. Although the viruses and bacteria we found in the American Type Culture Collection were mostly from soils, they were also from the diseased ears of cats and the entrails of insects, and from 'blood from an American soldier, New Guinea, 1943' and the 'stool of an Iowa man' who had recently been in Bangladesh. We also found that the WRAIR/WHO Leishmania Reference Center (formed by the World Health Organization) sports deposits simply identified as 'human'. The more we explored these strange-seeming entries in the ATCC catalogue the more we encountered the admonition that the collected sample was part of a US or other patent claim. The ATCC is the world's premier repository for microorganisms incorporated in patent claims. Not only soil samples, insects, and mammals, but even human biomaterials, were obviously patentable subject matter. Biotechnology—relatively old aspects of it—offers a kind of life-after-death. Bits and pieces of life, including the complete DNA of a human being, can live on—'pickled'—in a liquid nitrogen cylinder stored at the American Type Culture Collection. Human genetic material—material of the kind that the HGDP proposed to collect—could be commercialised and patented.

We needed to know where the HGDP's funding was coming from. The US government is not known for its love of history. Yet, the HGDP either had—or was seeking—funding for its history project from the US Department of Energy and the US National Institutes of Health (NIH). At the NIH, medical research was often a shared venture with the private sector. In early 1992, Camila Montecinos and I were in Cartagena, Colombia, at UNCTAD VIII when we saw the headlines in the *Wall Street Journal* reporting that Craig Ventner (then of the NIH) had submitted a patent claim on thousands of DNA fragments and genes that his computers had discovered in the human brain. The NIH defended its patent claim arguing that Ventner's computer system had found parts of the brain no one had ever found before; that the patent requirement of an inventive step was met by the computer process and that the requirement of inventive utility was met by the mere fact that the

DNA fragments were part of our brains. A year later, as I read the HGDP papers on the plane to Rome, the NIH patent grab was still making headlines. Could the history project of collecting the human cell lines of indigenous peoples lead to NIH patents and commercialisation?

Patentable people parts

That human material is worth patenting might be a surprise to some. Certainly it was to leukaemia patient John Moore. In 1976, Moore had cells from his diseased spleen removed by a University of California medical team who, after some additional research, patented what became known as the 'Mo' cell line in 1984.[42] In time, the university licensed the cell line to the Genetics Institute which, in turn, surrendered rights (for a price) to the Swiss pharmaceutical company, Sandoz. At the beginning of 1996, Sandoz merged with Ciba-Geigy to form Novartis. There, now, lies the legal right to a piece of John Moore's body. One estimate places the long-term commercial market for the cell line at about USD 1 billion. This being a fighting figure, Moore demanded the return of his spleen cells and rights over his own bodily parts—cancerous or not. In 1990, the California Supreme Court determined that Moore had no direct claim on any parts of his body once they were removed, but that he did have the right to sue his doctors for improperly appropriating his spleen cells. The wise doctors settled out of court.

Ambiguous though the decision was, the door was left ajar for the patenting of human material with or without the consent of the human.

Then, as we were trying to make sense of the HGDP's well-intentioned effort to fill in the blanks of history, *Genetic Engineering News* reported, also in 1993, that 30 citizens of Limone, an isolated Italian community, have a unique gene that codes against many forms of cardiovascular disease. Pharmacia, a Swedish pharmaceutical company (now merged with Upjohn) working with the University of Milan, swarmed all over the townspeople, taking blood and other samples, and applying for patents. If the genetic trait can be turned into a marketable drug—and this remains a very big 'if'—the profits will be tremendous. As RAFI dug into the story, we learned with the considerable help of Miges Bauman of Swissaid that researchers had targeted one man who had donated more than 46 litres of blood (over several years) for what he thought was university research. He didn't know that the University doctor was passing the samples on to Pharmacia in Sweden nor that Pharmacia had acquired a patent related to the research. Could the HGDP result in other such patents?

Everything happens at once. AIDS researchers in Kenya, working through

Canada's International Development Research Centre (IDRC), discovered, also in early 1993, a kind of immunity among some Nairobi prostitutes who would have been expected to contract the fatal disease. Although their good luck is less likely to be due to unique DNA than to the disease's surprisingly low-level infection in these instances, researchers are studying the women in the hope that at least clues if not cures can be gleaned from their germplasm. Not long after, other researchers collaborating with IDRC discovered a similar group in the Gambia.

Back in Ottawa short days before Easter 1993, further RAFI research at the ATCC computer database revealed information on the use of genetic material from a 'six-year-old male human' who appears to have died in Cincinnati in 1939. In 1984 the little boy's immortalised cell line was resurrected by the University of Kansas to become US Patent 4,473,549. The patented material seems to be part of a vaccine for the immunisation of animals (especially birds) and people against Toxoplasma gondii—a parasitic disease that can damage the brain, muscles and nervous system. Half a century after his death, the Cincinnati Kid has returned to active service and can now be injected into Colonel Sanders' broilers.

The computer search also turned up the immortal remains drawn from the breast of a cancer victim. The material was patented in 1987 by Tel Aviv University and Teva Pharmaceuticals and the woman's hepatoma cell line is now part of an immuno-assay for breast cancer.[43] Another ATCC sample is the cell-line leftovers from 'an eight-year-old Negro male', now also patented.[44] The incidents became morbidly monotonous.

We regarded our computer screens with very uncertain emotions. With the concurrence of the donors, there was certainly nothing wrong with human genetic material being employed in the service of humanity—be it to safeguard chickens or in the more noble service of combating breast cancer. If the ATCC collection was undeniably ghoulish, it was hardly immoral. Nevertheless, it was difficult to accept that the tenants of the tissue culture repository would have waived their right to secure benefits for their families or communities when their genetic material was commercialised. It seemed even less credible that they would have agreed to have their material patented for the private profit of others. We were absolutely certain that the Human Genome Diversity Project had substantial moral and commercial implications that the HGDP itself seemed reluctant to acknowledge.

On the last working day before the Easter break, we sent out a fax to everyone we could reach among indigenous peoples' organisations and many

governments, outlining our growing alarm over the Project. Along with the retinue of worries described above, we added another: that human biomaterials could be used in biological warfare research. In *The Laws of Life*, Cary Fowler wrote a deeply-disturbing chapter on 'Mars and Microbes', examining the potential use of new biotechnologies to develop a much more insidious generation of biological weapons. The compilation of human genetic diversity in tissue culture collections would, we reasoned, facilitate the development of diseases that could target specific age groups, gender groups or ethnic communities—if not today, then in the decades ahead.

Delivered in our usual modest style, the fax excited considerable reaction. Among the most excited was a Stanford law professor named Henry Grealy who was volunteering his time to the HGDP as the Chair of its North American Ethics Committee. The professor and I spent the spring and early summer of 1993 e-mailing one another about various points in our fax and Communiqué. We were hung up on two points. First and most fundamental was Grealy's sincere desire to win RAFI over and to make us a go-between for the HGDP and indigenous peoples. I kept sending the professor mailing addresses for indigenous peoples' organisations and he kept trying to make RAFI 'middleman', when no such service was needed.

To be crystal clear—RAFI was not opposing the HGDP in principle. We were saying only that its work had to be negotiated with indigenous peoples in a UN forum. If indigenous peoples supported the HGDP, we would too.

It was both astonishing and telling that the HGDP seemed to have no notion how to reach indigenous peoples. For people—among them anthropologists—so interested in people and history, they displayed a stunning lack of familiarity with the social dynamics of indigenous organisations today. Grealy's entreaties were so persistent and so oblivious to our insistence that the HGDP 'dial direct' to the folks they wanted to sample, that we finally made the unprecedented decision to close the dialogue and force the negotiations to the people most involved.

'Human nature' and monopolies

In the summer of 1993, I was responding to a request from a civil society organisation in India looking for more information on soil patents involving that country. Once inside the ATCC database, I typed in a query for accessions with the words 'India or Indian'. Among the 'hits' was ATCC CRL-10598, comprising the remnants of 'a 26-year-old female Guaymi Indian patient in Panama'. The accession contained an entire human cell line established by a Dr Michael Dale Lairmore of Columbus, Ohio. The not-always-accurate notation on the screen indicated that the accession was part of a

patent claim. Further, companies could have their own immortalised Guaymi from the ATCC for USD 127—assuming they could make a deal with Mr Brown.

We hadn't yet broken off contact with the HGDP and I sent a note to Henry Greely noting that the ATCC reference implied that an indigenous person was currently the subject of a patent claim. Henry Greely immediately replied that the woman's cell line was probably an irrelevant part of a larger claim.

The last time I'd felt this way was in 1983 when I received a 'brown envelope' containing a signed memo from the US government to IBPGR advising the institute that the United States regarded any donated germplasm to be US property—and that the USA reserved the right to embargo access to other countries—including the original donors—as it saw fit.

With absolute incredulity, I placed our monthly CD ROM of world patents into the computer drive and called up 'Guaymi'. There was one hit. The patent title read, 'Human t-lymphotropic virus type 2 from Guaymi Indians in Panama'. The world patent claim had been made in 1992 and Michael Lairmore was cited as the woman's 'inventor'. The patent application stated: 'This is the first isolation of HTLV-II from a defined non-intravenous drug using population. The present invention further relates to methods of identifying anti-HTLV-II ... and to a variety of bioassays for the detection and diagnosis of HTLV.' Lairmore's employer—and the holder of the patent claim—was the late Ron Brown, the US Secretary of Commerce and thus responsible for the US Patents and Trademark Office and the signing authority for any US government patent claims made abroad. Appropriately, it was Ron Brown who—with (then) Trade Representative Mickie Cantor—was responsible for GATT negotiations. It was at GATT that Messrs Brown and Cantor were demanding global acquiescence to the patenting of all forms of life. Coincidentally, the world patent application was published exactly one week after the United States succeeded in keeping cell libraries and gene banks outside the final text of the Biodiversity Convention and short days before the Rio Earth Summit adopted the Treaty. While the Summit took every opportunity to extol the virtues of indigenous knowledge, the US was patenting indigenous people.

Over the next few days, I talked to Lairmore and his former employer, the Centre for Disease Control (CDC) in Atlanta. It became clear that the CDC was in search of HTLV viruses around the world and that they had come across one type in the Guaymi cell line. Theoretically, a cell line containing the HTLV virus could prove medically important for developing diagnostic

kits—possibly even cures—for leukaemia. According to the Atlanta office, they were seeking a patent in order to safeguard public sector research interest in the virus. How they obtained the blood sample; the extent to which the woman—or the Guaymi—were informed of the CDC's interests—remained unclear despite my careful questioning.

I talked with Alejandro Argumedo and Camila Montecinos and a few days after the discovery was on a plane to Colombia. While the meeting in Colombia was to look at our work with partners on crop genetic resources, I took the opportunity to sit down with Camila, Rene Salazar of the Philippines, Regassa of Ethiopia, Andrew Mushita of Zimbabwe, and Henk Hobbelink (GRAIN) to discuss the US patent attempt on the Guaymi. In the end, Camila bought me a plane ticket and Alejandro Argumedo made contact with the Guaymi General Congress—so that I could fly to Panama City and meet with the Guaymi.

At about 11 p.m. one Saturday night, I was drinking beer (they were drinking tea) in a hotel bar with three leaders of the Guaymi General Congress. Through a kind interpreter whose English was worse than my Spanish, I tried to explain to strangers what an HTLV virus was; what a patent was; why GATT was important; and why Ron Brown wanted their blood. By the time the sun was first making itself felt on the Panama Canal, I was back on a plane for Miami hoping the Guaymi General Congress didn't think I was an idiot.

Two weeks later, two members of the Guaymi Congress and Jean Christie from RAFI, were all in Geneva together challenging the US patent application. The Guaymi won. The media 'photo-opp' of Ron Brown faced off against Guaymi people at GATT in Geneva was a little too much for the United States to stomach at a delicate time in the trade negotiations. Before the interminable 1993 rang down its curtains, the patent application was withdrawn.

The victory was shortlived. In 1995, however, Miges Bauman of Swissaid was on the telephone with news of two other patent claims on indigenous peoples. In each case, the claimant was the United States of America. This time, the targets were a 20-year-old Hagahai man from Papua New Guinea and a 57-year-old woman from the Solomon Islands. Both carried HTLV viruses in their cell lines.

Jean Christie flew from Australia to both Papua New Guinea and the Solomon Islands to talk with governments—these meetings setting off a howl of

protest around the Pacific. Meanwhile, I changed my travel plans to detour to the Hague in order to pay a call on the International Court of Justice.

The last time I had been at the Court was in 1970—during the Second World Food Congress—when several hundred 'youth' from around the world put on trial the politicians who spoke the same platitudes at the second congress as they had at the first (in 1963). In the grand finale of the mock trial, five of us were to climb the fence surrounding the Court and nail our verdict to the palace's front door. With typical Dutch organisation and decency, it had been tactfully pre-arranged that the five of us who were to nail the verdict would be arrested after the act and spend a few hours in jail. Unfortunately, under the flickering torchlight, we realised that somebody had forgotten to tell the guard dogs protecting the wide lawns around the building. We decided to mail our verdict instead.

So, a quarter of a century later, I passed through the World Court's doors for the first time. When I left The Hague three days later, I was convinced that not only the patenting of indigenous peoples' cell lines by foreign governments—but the wider issue of life patenting—had to be, and could be, raised to the level of the Court.

A few weeks later, Rene Salazar of SEARICE and Alejandro Argumedo of Cultural Survival Canada and IPBN were with Beverly Cross, Edward Hammond and me in Jakarta. It was the second 'COP' (Conference of the Parties of the Biodiversity Convention). Together we decided to bring the issue of human cell line patenting before the Convention since, technically, human biodiversity is part of the Convention. It was, by no means, our intent to surrender the panoply of indigenous and other human rights issues to a Convention dominated by park wardens who thought they were dealing with panda bears. The intention was to use the political forum created by the intergovernmental body to point out that human biodiversity and projects such as the HGDP were not being monitored within the UN System.

The Solomon Islands and Papua New Guinea led the plenary hall attack on the US patent claims supported by a surprising range of countries that included Sweden and Canada. Although the US delegation refused to respond—even to direct questioning—in the formal meetings, we had a confrontation in one of the civil society seminars on intellectual property. Much flustered, a US diplomat told an angry gathering that his government had gone ahead with the patent on the Hagahai man only at the request of the Hagahai themselves. Through requests made under the Freedom of Information Act, Edward Hammond had already determined that the US govern-

ment had not a shred of evidence to substantiate this absurd defence. That the US Commerce Department was venturing into a new form of foreign aid by fronting the legal fees for a patent they regarded, now, to be commercially irrelevant, was too much for the audience to believe.

The Solomon Island patent claim was dropped before it was granted by the US patent office. The Hagahai patent was granted but continuing opposition from indigenous peoples and from Papua New Guinea led to its cancellation as well. The announcement of the removal of the Hagahai patent came, with a poetic logic wasted on the Commerce Department, on UN Human Rights Day—December 10, 1996.

If RAFI was successful in defeating the foreign claims on human cell lines, we have not been successful in stopping the patenting of human genetic material. Our investigations revealed, in early 1997, that patents are pending on more than one million human genes and human DNA sequences. Several hundred patents on human genes and sequences have already been granted.

Then as the RAFI board and staff gathered for our annual meeting in Bohol, Philippines, late in February 1997, Rene Salazar brought us all news clippings of the successful cloning of an adult sheep 'Dolly'. By May, RAFI had obtained copies of the two patent applications made through the World Intellectual Property Organization (WIPO) by the Roslin Institute in Scotland. The scope of the patents claims includes the cloning of human beings. Not long after came 'Polly'—a cloned lamb carrying human genes. Hard on its hooves came news that Japanese researchers could transfer whole human chromosomes into rodents. Then came 'Gene' the cloned calf created by a different and more efficient process than Dolly or Polly and bringing us still closer to the cloning of human adults. All disturbing. All under patent claims.

* * *

In October, 1997, a special committee of the US National Research Council, responding to a request from the NIH and National Science Foundation, tabled a report making clear that the Human Genome Diversity Project lacked the international governance structure, ethical guidelines and programme logic necessary to warrant the US government's financial support. It was a stunning—possibly fatal—setback for the HGDP. At the outset of the Committee's review process, RAFI and colleagues from Indigenous Peoples' Organisations in Colombia and the Solomon Islands had testified before it and raised the same concerns. It was the first time that the US sci-

entific establishment had heard directly from indigenous peoples on this issue. The committee, however, did endorse the importance of collecting and analysing human genetic diversity for both medical and historical reasons—under the right international arrangements and with the full participation of indigenous peoples. The committee also expressed its strong disapproval of the patent system. Finally, the committee agreed that those who make their genetic material available never relinquish control over it and have the right to recall the material rather than risk it being used for purposes not previously accepted.

A few days after this victory, RAFI's Edward Hammond, acting on information uncovered by Beverly Cross, discovered that the National Science Foundation—the governmental authority that had requested the evaluation—had continued to fund the HGDP throughout the evaluation process and had, in fact, spent more than USD 2 million on human genetic diversity research from Botswana to Bolivia to Borneo while the study was underway.*

* * *

Outside the main entrance to the Department of Commerce in Washington, DC, stands a plaque with an inscription from Abraham Lincoln, 'The patent system added the fuel of interest to the fire of genius'. One hundred and thirty years later, would Lincoln still be a patent booster—or would he be in Rockville, Maryland, freeing the slaves?

I do not know whether I was then a man
dreaming I was a butterfly,
or whether I am now a butterfly
dreaming I am a man.

Chuang Tzu (369-286 B.C.)

Notes

1. US patent 4,814,324.
2. US patent 4,981,980.
3. This estimate is found in Joyce, Christopher, 'Western medicine men return to the field', *BioScience,* Vol. 42, p. 399(5), June 1992, and also in Axt, Josephine R., Corn, M. Lynne, Lee, Margaret, and Ackerman, David M., 'Biotechnology,

* For continuing information on this and other matters addressed in this issue of *Development Dialogue*, readers might wish to access RAFI's Internet home page at http://www.rafi.ca

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4. Mussey, Dagmar, 'J&J, Merck Ready First Euro-Brand', *Advertising Age*, October 26, 1992, p. 1. and Costa Rican data from PC-Globe 5.0.
5. DeMassi, J., Hansan, R.W., Grabowski, H. G., and Lassagna, L., 'Costs of Innovation in the Pharmaceutical Industry', *Journal of Health Economics*, 1992, Vol. 10, p. 107.
6. Axt, Josephine R., Corn, M. Lynne, Lee, Margaret, and Ackerman, David M., *op. cit.*
7. US patent 5,215,882.
8. 'Philippines-Medicines: Who really discovered erythromycin?', Inter Press Service, November 9, 1994.
9. US patent 3,334,016.
10. US patent 4,495,286.
11. US patent 3,683,074.
12. US patent 5,102,794.
13. US patent 4,925,663. ATCC registration number 20872.
14. *AgBiotechnology News*, September/October 1990, p. 22.
15. *Business Week*, November 14, 1994, p. 72.
16. Cohen, Tracy, 'Pharmaceuticals from the Sea', *Technology Review*, Vol. 96, No. 3, p. 15(2), April 1993. In the article, an oceaonographer engaged in marine soil research at the University of California (San Diego) places the annual corporate expenditure at USD 10 billion. This figure seems unlikely since it would amount to 8 per cent of global drug industry sales.
17. 'Tuck into a Soil Sandwich', *New Scientist*, 18 October 1997, p. 14
18. Scheuer, Paul J., 'Drug from the sea', *Chemistry and Industry*, No. 8, p. 276(4), April 15, 1991.
19. *Ibid.*
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21. Reid, Walter V., *et al.* (eds), *Biodiversity Prospecting*, World Resources Institute, Washington DC, 1991, pp. 13–14.
22. *Global Marine Biological Diversity*, ed. by Elliott A. Norse, Island Press, 1993, p. 6.
23. Thorne-Miller, Boyce, and Catena, John G., *The Living Ocean: Understanding and Protecting Marine Biodiversity*, Island Press, WA, 1991, p. 28.
24. *Diversity*, Vol. 9, No. 4, 1993, and Vol. 10, No. 1, 1994 (double issue), p. 83.
25. Thorne-Miller, Boyce, and Catena, John G., *op. cit.*, pp. 61–62.
26. 'Spain gives tepid reaction to release of Estai', *European Business Report*, March 15, 1995.
27. Pescanova, which has annual sales of Pta 60,000mn, with its shares largely controlled within Spain although 20 per cent are held by Imperial Cold Storage (South Africa). The company has 13 per cent of the Spanish frozen food market, and more than 40 per cent of the frozen fish market. Pescanova has 20 per cent of the pizza and prepared food market in Spain as well. Unilever is said to be interested in buying Pescanova which is rumoured to be vulnerable because of its rapid overextension and heavy debt load.

28. 'PharmaMar: Risk capital costs to buy stakes after capital increases by FY92', *Cinco Dias*, August 6, 1990, p.10.
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43. US patent 4,707,438.
44. US patent 4,393,133.

7 Private Parts

Privatisation and the Life Industry

All the parts of life—its products and processes, even its formulae—are being privatised. The warning in The Laws of Life *was that the Lords of Life—the pharmaceutical and agrochemical industries—were massing to take control of the genetic supply industry and new biotechnologies. They have done so. The world is now faced with a level of corporate concentration no one would have believed possible two decades ago. The following is an update on the new life industry.*

In the mid-1990s, the US government estimated that Transnational Enterprises (TNEs) control one-quarter of global economic activity and that, in countries such as the United States, 40 per cent or more of all merchandise trade takes place between affiliated firms (between parent and/or subsidiary enterprises). On some trade routes—as between the USA and Europe or the USA and Japan—from 43 per cent to 71 per cent (respectively) of all merchandise trade is between 'sister' subsidiaries.[1] In other words, the 'buyer' is also the 'seller'. 'Profit' and 'tax' are mutually-agreed upon fictions—told by sophisticated conglomerates to gullible governments. This is the 'globalisation' that alarms us all and it is also the driving force behind the post-GATT Multilateral Agreement on Investment (MALI) that threatens to be the death knell for national sovereignty and electoral democracy.

In step with this kind of globalisation, however, is an equally disturbing integration that has almost gone unnoticed. Not only are the buyers and sellers integrating, but vast industrial segments as different as agribusiness and health care are achieving a global technological integration that would have been inconceivable two decades ago. The result—the new Life Industry—poses not only a threat to national security but to the security of life.

Despite the obvious implications of this kind of concentration even in the agricultural sector, the World Trade Organization (WTO) insists that national food self-reliance is *passé* and food security can now best be achieved through agricultural trade liberalisation. The South needs only to capitalise on its natural competitive advantage to increase exports and attract investment. Absurdly, the World Food Summit somewhat reluctantly echoed this conclusion and paved the way for a Double Green Revolution.

Corporate concentration

In the mid-1970s, when food shortages created the World Food Conference and the UN General Assembly was debating the impact of TNEs on the world economy, and CSOs everywhere were quoting from the newly-pub-

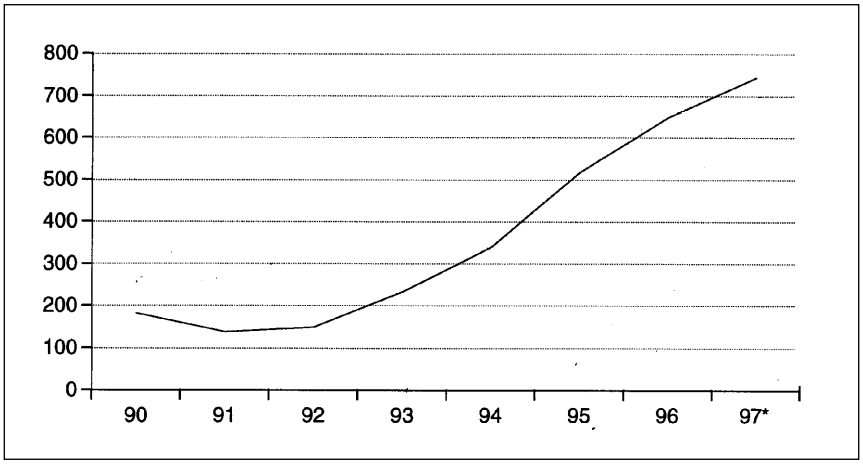

Figure 3 Value of US mergers in the 1990s (USD billion).
Note: The figures used reflect the situation in early November 1997; the figures will rise substantially up to 31 December.

lished *Global Reach*,[2] the total value of all US mergers and takeovers was an alarming USD 11.8 billion for the year. Ten years later, when the General Assembly was astutely silent on the subject[3] and the media had stopped paying attention, the annual US takeover figure was more than ten times higher—USD 125 billion. At the close of 1988 (the year RAFI began to formulate its life industry analysis), the takeover tally had climbed to an almost unbelievable USD 333 billion.[4] During the whole of the 1980s, according to *The Economist*, mergers and takeovers by TNEs worldwide accumulated to USD 3 trillion.

Industry used to insist that—despite these figures, the total number of mergers was declining—from around 6,000 per year in the United States in the late 1960s and early 1970s to half that number by the late 1980s. We, of course, argued that there were fewer companies to merge. Industry also argued that the 'feeding frenzy' of the late 1980s was unique in corporate history. Certainly, the recession of the early 1990s pushed the diners back from the table but whether this was a problem of tight money or tight trousers (deal brokers couldn't be heard over boardroom belches) was unresolved. In 1997, as the tables show, these debates are now at an end. When 1997 rang down, total US mergers for the year galloped to USD 919 billion and more than 10,700 deals. Global mergers for the year rocketed to USD 1.6 trillion! Even in Latin America, 1997 mergers almost doubled (to USD 70.9 billion) over 1996.

Hope Shand of RAFI has been monitoring transnational enterprises for 20 years. Most of the research concerning the life industry is her work. Mergers were once thought to be an American phenomenon. No longer. As the United States celebrated Columbus Day last October 13 (*The New Yorker*

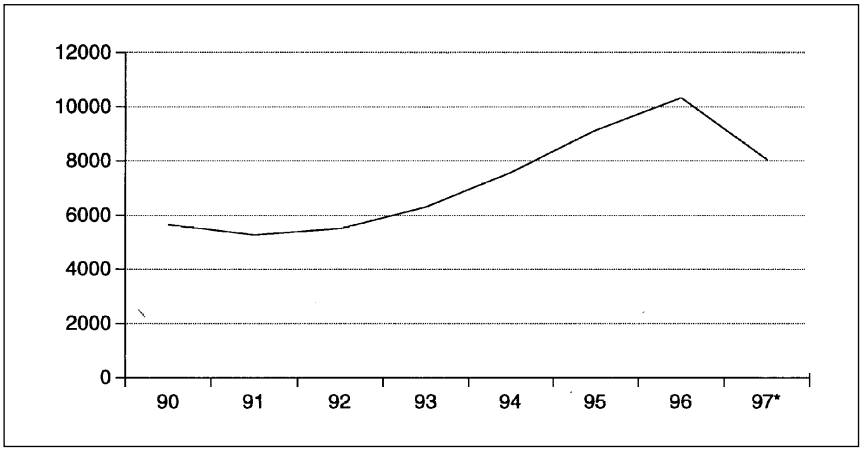

Figure 4 Numbers of US mergers in the 1990s.
Note: The figures used reflect the situation in early November 1997; the figures will rise substantially up to 31 December.

magazine called it 'Rape of the Americas Day'), European corporations announced USD 130 billion in acquisitions and takeovers.[5] By all estimates, a world record for a single day of trading. Although the year had yet to end, European observers were predicting a vastly bigger merger total for 1997 than the USD 400 billion of 1996—which, itself, was double the total of two years earlier. What is happening in the EU and the USA is also unfolding in other industrialised countries such as Australia and Canada.

Within the food and beverage industry, perhaps half of the top 50 companies of the late 1970s were either 'disappeared' or merged into the remaining companies by the late 1980s. RJR Nabisco, originally a tobacco company, was swallowed—for a record USD 24.9 billion—by Kohlberg Kravis Roberts, a notorious wheeler-dealer which had already consumed both Beatrice and Safeways. Philip Morris, another tobacco company turned food mogul, spent USD 12.8 billion gobbling up Kraft. There were other movements in health care at the time that did not seem as significant: Kodak, the camera film giant, put USD 5.1 billion into a buy-out of Sterling Drug[6] and picked up a number of small seed and biotech concerns along the way; Monsanto, the agrochemical major, moved into pharmaceuticals for the first time with the purchase of G. D. Searle.

Surprisingly for some, the 'feeding frenzy' had a direct impact on technology. According to the US National Science Foundation, merger activity between 1984 and 1988 contributed to a major drop in corporate R&D spending—down to a 2.6 per cent annual increase from 5.5 per cent during 1980–85.[7] Following takeovers, companies apparently consolidate their research programmes and/or cut R&D to pay debts. Historically, larger enterprises are not as innovative as smaller firms. In 1989, *Business Week*

surveyed the top 25 innovators in the USA and found that all were small. The top two—Dekalb Genetics and Pioneer Hi-Bred—were survivors as family seed businesses.[8] The largest pharmaceutical companies suffer from the same lethargy. In mid-1996, for example, 70 leading US biopharmaceutical boutiques with a combined market capitalisation of only USD 50 billion had 280 new drugs in development. By contrast, Merck, with a market capitalisation of USD 80 billion had only 26 drugs—less than 10 per cent of the number—in the pipeline.

Time has shown that the great merger mania of the 1980s was not, as advertised, unique. Following years in the doldrums, deal-makers came back with a vengeance in 1994 tallying a near-record USD 329 billion in mergers and acquisitions.[9] Leading the way, the two sources of corporate power on the planet today—the informatics industry (including communications and microelectronics) and the life industry.

From Landlords to Life Lords

Several factors have inspired the new merger wave—but chief among them is the need to control access to the new technologies. Indeed, the new wave coincides with the final adoption of the GATT Uruguay Round Agreement in 1994. The entire agreement—and especially the agriculture and TRIPs (Trade Related Intellectual Property Rights) chapters—promotes the interests of transnational enterprises and assures corporate monopoly over new technologies. For the first time in commercial history, a trade agreement has imposed a Western-style patent and trademarks monopoly—and amorality—over world trade.

The economic importance of intellectual property monopolies (usually patents) is inescapable. During the GATT Uruguay negotiations, the US accused the South of 'piracy', claiming that it was losing USD 202 million a year in royalties from pirated pesticides and more than USD 2.5 billion a year in royalties from pirated pharmaceuticals. US authorities argued that the total piracy including computer software, recorded music and clothing brands was costing the industrialised countries no less than USD 60 billion in lost sales and royalties every year.

These astronomic calculations are bolstered by other US trade estimates that the percentage of internationally traded goods with a high intellectual property content had soared from less than 10 per cent in the late 1940s to 30 per cent at the outset of the Uruguay Round. By RAFI's conservative estimate, however, the WTO's TRIPs chapter will boost the patent content of global trade to well over 70 per cent when the agreement comes into full force after

2004. Why the sudden jump? TRIPs effectively requires all member countries to apply intellectual property protection over most biological products and processes—from agricultural commodities to medicinal plants and brewer's yeast—that 40 per cent of the world's economy built on biomaterials. In 1994, intellectual property moved to centre stage in world economic affairs.

There was a time in history when the route to power was through the ownership of land. During Europe's Industrial Revolution, the rich landlords who orchestrated the enclosure movement, that put an end to communal lands, argued that common lands must be privatised so that they could take advantage of new agricultural technologies and feed growing urban populations. The wealth of the land created the industrial wealth. In time, land took second place to industrial raw materials and energy. In the same way and with the same arguments as the Enclosure Acts used to drive rural societies from their ancestral lands (and rights), TNEs are now using another Enclosure Act—the intellectual property ('IP') system—to privatise the intellectual commons and monopolise new technologies based on these commons. The Landlords have become the Mind Lords. In the post-GATT world of new biotechnologies, these are also the Life Lords.

The new patent/ enclosure system

It is not only that biomaterials are now part of intellectual property and that 'IP', in turn, is part of global trade arrangements, it is that the rules that have traditionally governed exclusive patent monopolies are also changing. For the first time in history, basic or near-basic research is a marketable—ownable—commodity. In the arena of new biotechnologies, and in the absence of a traditional product, it is now possible for researchers to buy, sell and profit from basic research in ways previously unheard of. Biotechnology companies carry out research for years, financed by venture capital, without producing a 'product' and without turning a 'profit'. Shaman Pharmaceuticals, for example, is a bio-prospecting company that has yet to produce a product but has grown into a bountifully profitless company with USD 120 million in assets.[10] In one 1996 industry survey of over 230 biotechnology companies in the US it was shown that they collectively lost more than USD 2 billion the previous year. Nearly all the companies invested more in R&D than they earned. Just 39 companies turned a profit—more than half of which was provided by one firm.[11]

The intellectual property system allows corporations to sidestep national competition and cartel laws. Through patents corporations can integrate vertically downward to monopolise basic research, or horizontally, to span

related commercial fields. A giant like Novartis, for example, could trade its pesticides patents for Asia in return for Monsanto's seed patents in Europe.

The beauty of the new intellectual property cartels is that they are often quite invisible. John Barton, a Stanford law professor who has long defended the patent and Plant Breeders' Rights systems, has come to describe patents as 'dysfunctional'—but dysfunctional for whom? Certainly not for global corporations. The intricacies and uncertainties of the patent system play to the interests of the biggest companies. Transnationals that could challenge each others' patents in the courts, according to Barton, are opting instead to allow each other invisible licenses and an informal understanding that they won't fight each other. Meanwhile, the same companies are prepared to attack upstart new companies trying to break into old markets by threatening patent litigation. And then there is the ultimate licensing strategy according to Barton—transnationals simply buy the company holding the patent rather than waste money fighting in the courts.

This is leading to a kind of intellectual stock market. Patents are now regarded as bargaining chips or intellectual legal tender. Patents are units of commerce and barter. It is possible to envisage a futures market in intellectual property stocks. The value of a company can increase because of the patent claims it might make or the patent scope it might defend.

Nowhere are the rule changes more profound—or more profitable—than in the realm of biological products and processes. In tandem with the intellectual property futures market, there is also emerging a genetic commodities market through which essential biomaterials can be bartered. The patent system—which once resolutely opposed any form of exclusive monopoly over foods, pharmaceuticals or any living resource—now accepts the wholesale patenting of virtually any bio-product, bio-process, or even formula of life. Micro-organisms, plants, animals, or parts thereof, are all now patentable subject matter.[12]

This trend complicates, makes more expensive, and slows the pace of scientific advancement in agriculture and health care. Consider the case of the world's largest seed company, Pioneer Hi-Bred, whose genetically engineered, insect-resistant maize hybrid requires access to 38 different patents controlled by 16 separate patent holders.[13] This is a system that invents work for lawyers but does little for people.

So, with the completion of the Uruguay Round, intellectual property has become a matter of trade. Under the TRIPs chapter, signatory states must

apply intellectual property protection to micro-organisms and to plants. Animals are optional. However, under the Budapest Convention on micro-organisms, human (and other animal) genetic material—including entire human cell lines, are considered micro-organisms and, hence, patentable. In short, life—including our own—is a trade issue which is subject to exclusive patent monopolies.

Until the 1980s, however, biomaterials and research were overwhelmingly a public sector activity. No longer. Private sector funding is now essential to public sector research. TNEs do not want competition from the public sector and corporations have worked hard in the USA, Canada and the UK to cut publicly funded research except where it is tightly tied to corporate contracts. In North America, at least, there is hardly a university researcher in biotechnology who is not working under private contracts. At the same time, more public funds are reaching the private sector by direct or indirect transfers. It is clear, at least in the United States, that the private sector now has a dominant influence over the direction of public research. In 1981, less than six per cent of all public sector patents was surrendered via exclusive license to the private sector. By 1990, the figure had surpassed 40 per cent. If present trends continue, by the end of the century half of all the intellectual property accruing to US universities and government agencies will be controlled by TNEs on an exclusive access basis.

This is revolutionary. An incentive system designed to be scale-free and self-financing, intended to encourage individual as well as corporate inventors, has reversed itself to favour the large-scale, becoming almost exclusively accessible to the largest (and most lethargic) corporations which can now skim off the cream of publicly funded research for their private benefit. In an earlier era, Americans would have dubbed this 'taxation without representation'. It is also monopolisation with constipation. As we have already noted, the bigger the company the smaller the research product. Patents are used to define technological turf and trading territory—not to stimulate ideas. The giants that over-indulged in the feeding frenzy don't need patent licences, they need intellectual laxatives. At least 90 per cent of all patents granted around the world go to companies, not individuals. In the case of life technologies the corporate share of intellectual property verges on 100 per cent. In fact, the leading 20 life industries have roughly 20 per cent of all biotech-related patents issued in the United States since life patents became possible in 1980 (see Table 8).

Table 8 US biotech patents granted to top 20 firms (1980–93) [a]

Enterprise [b]	Number	Per cent [c]
Merck	887	2.7
Eli Lilly	544	1.6
Novartis	444	1.3
Roche	441	1.3
Bristol-Myers Squibb	407	1.2
Hoechst	383	1.2
American Home Products	352	1.1
Abbott	350	1.1
Boehringer Manheim	337	1.0
Takeda	295	0.9
Monsanto	288	0.9
Pharmacia-Upjohn	242	0.7
Pfizer	234	0.7
DuPont	222	0.7
Bayer	218	0.7
Smithkline Beecham	197	0.6
Glaxo-Wellcome	187	0.6
AgrEvo [d]	183	0.6
Zeneca	155	0.5
Rhone Poulenc	122	0.4
Total	6,366	19.9

Notes:
a To the best of RAFI's knowledge, these 20 enterprises are also the only corporations with 1 per cent or more of all the patents granted during this period.
b Patent numbers take into account mergers which may have taken place since patents were granted or since 1993.
c Percentage of all US biotech patents granted during this period.
d AgrEvo is the result of the merger of the Hoechst and Schering crop chemical businesses and the number of patents is an estimate of the numbers that now reside with the merged enterprise.
Source: RAFI analysis based upon data from MicroPatent, US Biotech PatentSearch (1980–93), 1993 CD-ROM.

The rise of the new life industry

The leading transnationals began their corporate existence in explosives and dye products. From 'death and dyeing', the companies advanced into industrial chemicals, resins, lubricants, and paints. With the public sector's discovery of antibiotics and other pharmaceuticals around the time of the Second World War, the top chemical firms immediately expanded into health care products and the (strangely) related fields of crop chemicals and cosmetics (personal care products). If the chemical compound couldn't cure a cold, maybe it could kill a caterpillar, beef up a beer, or bring highlights to your hair.

The chemical and drug houses remained in these industrial sectors until environmental concerns about pesticides pushed them, in the late 1970s, to take on plant breeding and seeds distribution. Their reasoning, at the time, was that any decline in the use of pesticides and fertilisers would force an increase in cultivated hectares—meaning an increase in demand for planting seed. What they lost on herbicide sales they could gain on seed sales. Cor-

porate marketeers also reasoned that the same sales force could market seeds and crop chemicals simultaneously.

The unexpected rise of the biotechnology industry at the end of the 1970s and in the early 1980s proved how right they were. Package deals could be offered to farmers that would include plant varieties bred to tolerate (or even welcome) company chemicals. Today, virtually every major plant breeding company is either a subsidiary of a transnational agribusiness or has contractual relations with global agribusiness. The same TNEs have moved aggressively to dominate biotech research. TNEs have either taken major equity positions in cutting-edge biotech 'boutiques' or they have established contractual 'first refusal' or 'exclusive market' deals with the cash-strapped researchers. By the mid-1990s, the leading life industry enterprises (most of which also have in-house investments in biotech R&D) had *de facto* control over agricultural biotechnology—including its most important patents.

What had been an industry based on the discovery and manipulation of inorganic chemicals grew into an industry based upon genetic materials and the manipulation of life. Remember that some of the mergers in the 1970s and 1980s spanned the pharmaceutical and agribusiness industries. Because biotechnology has little regard for species barriers, the new life industry has also become commercially transgenic, allowing one company to span pharmaceuticals, crop chemicals, plant and animal breeding, veterinary medicines and even food processing. RAFI maintains a watching brief on corporate market shares in each sector of the life industry.[14] Here, on the downward slope of the 1990s, is where the life industry stands today.

Biotechnology

Research expenditures in biotechnology are enormous. The large life industry companies are spending approximately USD 7.5 billion per annum on in-house programmes.[15] In 1995, these same corporations spent at least another USD 3.5 billion acquiring biotech boutiques—and a further USD 1.6 billion in licensing agreements or R&D contracts to so-called 'independent' boutiques. In total, USD 12.6 billion was poured into the life industry.

The epitome of the Lords of Life is Novartis (Swiss-based transnational—the conjugation of Ciba-Geigy and Sandoz). The merged TNE is now, by far, the world's dominant pesticides enterprise; the world's second largest seed/plant breeding concern; third (some claim soon to be second) in global pharmaceutical sales; and fourth in veterinary medicines. Novartis ranks third in total biotech patents and is certainly in the top ten in total biotechnology

R&D. Novartis spent USD 2 billion to control Chiron—one of the most important biopharmaceutical boutiques in the United States. The giant also spent USD 295 million buying GTI (Genetic Therapy Inc.)—another biopharm leader. With Chiron and GTI under its belt, Novartis went after Systemix—a major human genome researcher and one of the top three holders of animal patents. In total, Novartis has a stake in at least five of the dominant 11 human genome enterprises. Some experts predict that as much as 50 per cent of all pharmaceutical industry research will be genome-based by the fast-approaching year 2000.[16]

Biotechnology research was initially conducted by small, specialised, industry 'boutiques', hatched out of the basement labs of moonlighting university scientists with supplementary cash from the big corporations which were unwilling to invest their own research programmes but happy enough to buy into the work of others in order to monitor progress in what was undoubtedly a high-risk endeavour. As the science has developed and the risk receded, however, the big players have moved in, picked up their options, and now dominate the high-tech field. The same companies are also devoting more of their own research and development to in-house biotech programmes. We are now seeing equity investments and buy-outs of the small boutiques. The scope of the change becomes obvious as we look at the various sectors of the life industry.

Pharmaceuticals

In 1993, in a move that prefigured what was to come, Hoffmann-La Roche ('Roche') of Switzerland purchased Genentech, at that time the largest biotech concern in the world. Many analysts thought the purchase an anomaly. However, in the little more than two years that elapsed between the end of 1993 and early 1996, a period marked by the merger of Glaxo and Wellcome drug companies at one end and the uniting of Ciba-Geigy and Sandoz at the other, pharmaceutical industry takeovers amounted to more than USD 80 billion, at least 16 of which were worth in excess of a billion dollars each. By 1995, 43 per cent of world pharmaceutical sales, totalling USD 197 billion, was in the hands of ten TNEs and more mergers were in the offing. When RAFI first began monitoring the industry in the late 1970s, the top 20 enterprises were thought to account for no more than one-fifth of global sales. Some investment analysts assume that within a decade, the top ten drug firms will control 75–90 per cent of the market. As if to highlight their point, Bayer has recently bought MDI (a leading British biotech company), while Hoechst acquired Marion Merrell Dow for USD 7.1 billion and Rhone Poulenc (which had already swallowed Rorer) scooped up Fisons for another USD 2.75 billion. Smithkline Beecham, itself the product of a major

Table 9 World's top 10 pharmaceutical corporations, 1996

Company	Headquarters	1995 sales (USD million)	Comment
Glaxo Wellcome	UK	13,026	
Merck	USA	11,617	
Novartis	Switzerland	9,858	Ciba-Geigy and Sandoz combined
Bristol-Myers Squibb	USA	8,702	
Hoechst	Germany	8,652	
Roche	Switzerland	8,462	
Pfizer	USA	8,188	
American Home Products	USA	7,924	
SmithKline Beecham	UK	7,431	
Johnson & Johnson	USA	7,188	

Source: *Scrip's* 1997 Pharmaceutical Company League Tables

merger a few years before, bought the Sterling Health subsidiary of Eastman Kodak. Then, Eli Lilly (a major drug, pesticides, and veterinary medicines player) bought marketing rights to Centocor's biotech products. When Sweden's Pharmacia and the USA's Upjohn merged, they created the world's tenth largest drug company—and destroyed 4,000 jobs.

If such mergers seem staggering in their dimensions, their tactical intent is of much greater concern. The pharmaceutical industry has a game plan. In the United States, the *Multinational Monitor* reports that pharmacy benefit management companies account for 50 per cent of US patient care and is anticipated to climb to 90 per cent around the turn of the century. Thus, when Merck acquired Medco Managed Care in 1993 (for USD 6.6 billion) the new entity's clientele rose from 41 million to 47 million by 1995. More to the profitable point, the number of prescriptions marketed to these patients during 1994 rose from 130 million to 170 million—a 14 per cent increase in clientele and a 30 per cent jump in prescriptions. Since then, other drug companies have opted for the same remedy. Eli Lilly prescribed itself PCS Health Systems, and SmithKline Beecham dosed up on Diversified Pharmaceutical Services. These represent three of the five largest managed care enterprises in the USA.[17]

Not that the old-fashioned mergers are over. 1998 began with the news that Glaxo-Welcome and Smithkline Beecham were in merger talks. At the time this volume went to press, most analysts were assuming the merger would take place and that the new entity would account for USD 20 billion in pharmaceutical sales—almost double the number two enterprise. Not only would this be the largest merger in world history, it would trigger a chain reaction throughout the drug industry as the other members of the Top Ten struggle for market share.

Table 10 World's top 10 veterinary medicine corporations, 1997

Parent company	Forecast for 1997 sales (USD million)	Comment
Merial Animal Health	1,600	Merger of Merck and Rhone Merieux to form Merial
Hoffman-La Roche	1,500	
Pfizer	1,300	
Bayer	950	Bayer acquired Upjohn/Pharmacia's vaccine business
BASF	780	
American Home Products	750	American Home Products' animal health business, Fort Dodge, acquired Solvay (Belgium) for USD 450 million
Rhone-Poulenc Animal Nutrition (USA)	650	
Schering-AH	650	Acquired animal health business of Mallinckrodt for USD 450 million
Novartis	630	
Elanco	570	

Note: Sales do not include pet foods.
Source: Hope Shand of RAFI, based on information provided by Brakke Consulting, Inc.

Veterinary medicines

Four of the top ten pharmaceutical companies also rank in the top ten in animal health care.

The global animal health care business, in 1997, stood at roughly USD 15.5 billion (about the same as the commercial seed industry) and the top ten companies command 63 per cent of sales (up from 30 per cent in 1980). All ten of the leading companies are charter members of the life industry with activity in all (or almost all) of the key sectors. Industry concentration picked up speed in the final days of 1996–97, when Merck and Rhone Poulenc announced that they would combine their animal health and poultry genetics businesses to form Merial Animal Health, now the world's largest animal drug firm and poultry genetics business. Their combined 1997 sales of animal health products were approximately USD 1.6 billion.[18]

Corporate interest in animal biotechnology is evident from the recent increase in animal patents issued by the US Patent and Trademark Office (PTO). The hesitancy with which the PTO began granting animal patents in 1988 has all but disappeared, and today the practice is accelerating dramatically.

A total of 69 animal patents had been issued in the US as of July 22, 1997. This number already exceeded the total number of animal patents issued in 1996. Based on projections from the first half of 1997, RAFI predicts that the number of animal patents issued in 1997 will more than double the previous year's total. The animal patent stampede is not likely to slow down

either. According to the PTO, over 355 animal patent applications are now being considered by patent examiners.

While most patents cover rodents, one lower invertebrate—a nematode (round worm)—has been patented. Patents have also been issued on two avian species, one rabbit, one sheep, one guinea pig, and one fish. With recent advances in the creation of transgenic sheep using cloning technology, more patents can be expected on livestock (sheep, cows and pigs) that produce human proteins or replacement organs for human transplant.

Not all animal patents claim transgenic animals. Some patents do not specify what type of animal or mammal is covered, leaving the door open to broad claims covering many species—including humans. As of mid-1997, not a single animal patent had been issued to an individual, while 25 per cent of all animal patents issued are held by three companies:

- Genpharm International (recently acquired by Medarex, Inc., a company that has collaborations with Novartis and Merck KGaA),
- Systemix, Inc. (a wholly owned subsidiary of Novartis),
- Ontario Cancer Institute (a hospital-based Canadian research institute).

Other major pharmaceutical/biopharmaceutical companies that hold animal patents include Bristol Myers Squibb, Novo Nordisk, Eli Lilly & Co., Takeda Chemical, Nippon Zoki Pharmaceutical and Amgen, Inc.

Ultimately the patenting of animals enables the life industry to use intellectual property to stake greater corporate control over agriculture and a rapidly diminishing livestock gene pool.

Pesticides

Five of the top vet companies also rank in the leading ten pesticide enterprises. When RAFI first began monitoring the pesticides industry, there were no fewer than 60 companies with active research and development programmes. In 1996, the world market began to boom again and global sales reached USD 30.5 billion, ten companies account for 82 per cent of global sales. The world leader, Novartis, has almost double the sales volume of the number two company, Monsanto, and its pesticide supremacy continues to grow. In May 1997, Merck sold its agrochemical division to Novartis for USD 910 million.[19] Another drug and seed giant, Zeneca, is in fourth position. Zeneca Agrochemicals and Cosun merged their seed businesses—Zeneca Seeds and Royal Van der Have Group—in 1996. Zeneca recently acquired Mogen—a Dutch plant biotechnology company—and one of the last independent biotech companies. AgrEvo (Germany) one of the world's

Table 11 World's top 10 agrochemical corporations, 1996

Company	1996 sales (USD million)	Comment
Novartis	4,511	Acquired Merck & Co. crop protection unit for USD 910 million May 1997
Monsanto	2,997	
Zeneca	2,638	
AgrEvo	2,475	Acquired Plant Genetic Systems International N.V. for DM 1 billion
DuPont	2,472	Du Pont acquired 20% of Pioneer Hi-Bred (world's largest seed corporation) in August 1997
Bayer	2,350	
Rhone-Poulenc	2,203	
Dow Agrosciences	2,010	
American Home Products/ American Cyanamid	1,989	
BASF	1,536	

Source: Hope Shand of RAFI, Inverizon Business Consultants, May 1997.

top ten pesticide companies, purchased Belgium-based Plant Genetic Systems International, a major plant biotech player, for USD 725 million.[20] PGS holds many valuable biotech patents, including broad patents on male sterility genes, *bacillus thuringiensis*, and herbicide tolerance.

Every major crop chemical company is now devoting the lion's share of its biotech research to developing herbicide-tolerant plants. The logic is straightforward. It costs USD 40–100 million to bring a new pesticide through the regulatory process to market. It costs USD 1 million or less to breed a new plant variety. Economics dictate that chemical companies invent new crop varieties adaptable to the company's chemicals rather than adapt expensive pesticides to inexpensive seeds. Every significant crop chemical company is now devoting the lion's share of its biotech research to developing herbicide-tolerant plants. The top companies are also exploring seed/chemical packages that allow them to market the two products together. Farmers are about to be made an offer they can't refuse—patented seeds with patented pesticides encased in a soluble gel. In fact, some high-value market garden species have the packages already.

Plant breeding

At least five of the pesticide industry's top ten companies are also dominant in plant breeding. A decade ago, FAO was able to list more than 7,000 'seed sources' worldwide (public and private) and the seed industry was free to argue that its market was highly diversified and unconcentrated. Today, the leading ten companies control more than 40 per cent of the world commercial seed trade. Among the dominant ten, only Novartis and Zeneca (formerly ICI) are well known as life industry enterprises. In fact, several of the other leaders also have extensive life industry connections: Takii and Sakata

of Japan; Cargill (the vast private grain trader and poultry genetics company) and Pioneer Hi-Bred. Cargill is also one of the world's top ten food and beverage companies. Although the value of the industry annually is placed in the range of USD 45 billion, the commercial portion of that figure is closer to USD 15 billion. Nevertheless, the commercial seed trade has a bright future. Revisions to Plant Breeders' Rights conventions and legislation are taking away the right of farmers to save seed from year to year. Since the North's grain growers normally only purchase new seed every four years, the intellectual property change could lead to a quadrupling of seed costs for farmers and profits for agribusiness.

Once again, the scene is in flux. Recently, Dow Chemical took over Elanco (an agrochemical major in its own right and, previously, a joint venture of Dow with Eli Lilly) and bought 46 per cent of Mycogen (a plant biotech company) after acquiring United AgriSeed and Agrigenetics. Dow made a deal with the world's largest seed company, Pioneer Hi-bred, for the development of transgenic maize, soya beans, canola, sunflowers and several other crops. From nowhere, this TNE now has annual US seed sales of over USD 100 million.

Among the most active enterprises has been Monsanto. First, the multinational monolith took a 14 per cent bite out of a biotech boutique known as Ecogen, including control of the company's key Bt (bioinsecticide) patents. Monsanto went on to buy the world's premier agricultural biotechnology enterprise, Calgene, which led the way in getting agricultural biotech products to market with its transgenic tomato Flavr-Savr and herbicide-tolerant canola (Laurate brand) and soya beans. In 1996, Monsanto inhaled Agracetus from W. R. Grace, giving it a dominant position in crop species patents (already granted for soya beans and cotton). As if this were not enough, Monsanto also acquired 40 per cent of Dekalb Genetics—arguably the second-largest maize seed company in the world—and then, early in 1997, scooped up Holden's Foundation Seeds, a maize genetics business that claims a third of the US market, for USD 1.2 billion. With astonishing insatiability, Monsanto also gobbled up Asgrow Seeds—the world's largest soya bean breeder.

DuPont, too, has made licensing agreements with Dekalb. In mid-1997, DuPont made the most anticipated coup of all. At a cost of USD 1.7 billion, DuPont acquired 20 per cent of the shares of the world's biggest seed company—Pioneer Hi-Bred. This was linked to a USD 1.5 billion deal to take over Protein Technologies International—a company that claims 75 per cent of the world's soya protein market. DuPont announced that it will be work-

Table 12 World's top 10 seed corporations, 1996

Company (seed sales only)	Estimated 1996 sales (USD million)	Comment
Pioneer Hi-Bred International	1,721	Du Pont now owns 20% share in Pioneer
Novartis	991	Formerly Ciba Geigy and Sandoz
Limagrain	552	French cooperative
Advanta—joint venture of Zeneca/Van der Have	493	Zeneca and Royal Van der Have established joint venture in 1996. The name of their merged companies is Advanta
Grupo Pulsar	approx. 400	Pulsar (a giant agro-industrial corporation) owns Empresas La Moderna (Mexico), which is majority shareholder of Seminis Inc.
Sakata	403	Vegetables/flowers/turfgrass
Takii	396	Privately-held; vegetables/flowers/ maize/turfgrass
Dekalb Plant Genetics	388	Monsanto is a large shareholder (approx. 40%)
KWS	377 0	World's largest supplier of sugar beet seeds (25% market share)
Cargill	+ 300 (est.)	Privately held—will not disclose financial information

Source: Hope Shand of RAFI.

ing with Pioneer and Protein Technologies to develop value-added (if proprietary) soya beans that farmers will contract to Protein Technologies for processing. Three-fifths of Europe's processed foods—everything from margarine to chocolate—include soya beans or soya protein. With this move, a battle royal is shaping up between the TNE titans over the lucrative maize and soya-bean seed and processing industries.

Although it looks as though the seed industry has fallen under the control of the North's Life Lords, there are some interesting surprises. Take Grupo Pulsar of Mexico which owns Seminis, Inc. with George J. Ball (including Petoseed and Royal Sluis). Venturing into the biotech field, Grupo Pulsar combined its fresh produce company, Bionova, with DNA Plant Biotechnology. Grupo Pulsar controls over 22 per cent of the global vegetable seed market. Will Grupo Pulsar plant breeding business remain independent of the North's TNEs? Not likely. In 1997, the company began selling off some of its seeds activities and announced that it was looking into another lucrative field—human health care. Watch out for other buyers, including Limagrain. French-based Groupe Limagrain, a cooperative which owns more than 75 subsidiaries, recently added Ferry-Morse, Harris-Moran and Clause

Table 13 World's top 10 food and beverage corporations, 1996

Corporations	1996 annual food and drink sales (USD million)	Food and drink as % of total sales	
Nestlé SA	43,662	96	
Philip Morris Inc.	32,277	47	
Unilever PLC/NV	25,785	49	
PepsiCo Inc.	20,204	64	
Coca-Cola Co.	18,546	100	
ConAgra, Inc.	18,074	75	
Cargill Inc.	15,680	28	(estimate)
Danone Group	14,796	92	
Mars Inc.	14,000	100	
Kirin Brewery Co.	13,337	97	(estimate)
Archer Daniels Midland	13,314	100	

Source: Hope Shand of RAFI.

to its seed empire, and now claims it is the third largest seed company in the world, and the largest vegetable and flower seed company.[21]

Given the nature of genomics research it is probably not surprising that even the lesser titans in the seed industry have formed cooperative links with human genome enterprises. Though it stands as the world's largest seed enterprise, Pioneer Hi-Bred is a tiny TNE when weighed against the likes of a Novartis or Monsanto. Yet, even Pioneer has a joint research programme with Human Genome Sciences. Not to be outclassed, Limagrain is said to have developed other collaborative relationships with human gene sequencing companies.

Food processors and traders

If the life industry has formed a tight monopoly around agricultural inputs and pharmaceuticals, its control of food processing, trading, and wholesaling appears to be the weak link in the chain that encloses food security. The food and beverage industry is vast in comparison to agricultural inputs. Nestlé, the world's largest food TNE with annual sales exceeding USD 46 billion, has a turnover greater than the entire global seeds and pesticides industries combined. Other leaders include the well-known Coca-Cola and Pepsico—each with sales volumes greater than the world's veterinary medicines. Their link to biotechnology seems tenuous.

Appearances are deceptive. Ranked in the top ten are TNEs like Unilever—a company with large seed interests that took over Cambridge University's Plant Breeding Institute (and gene bank) a few years ago. Cargill, also in the food industry's top ten, is a major player in seeds and poultry genetics. Japan's Kirin Brewery is a biotech R&D leader and also has connections to the seed industry. Another top-ten member, Mars Incorporated (the cocoa company) is also investing heavily in biotech R&D.

Bioprospecting and biopiracy around the world

The life industry sees bioresources as the raw materials for biotechnology. With this perspective, TNEs and savager suppliers are searching the world for commercially useful genetic material. According to German researcher Michael Flitner, Hoechst is doing intensive research on soil samples and traditional Ayurvedic medicine all over India. The company has already screened over 90,000 Indian soil samples and is building a new high-efficiency screening system in Frankfurt where it will sift through their genetic booty—plant and microbial diversity of Indian origin. At the end of 1995, the Hoechst Group held 86,000 patents and patent applications.[22] According to the head of Hoechst R&D, 'The most important publications for our researchers are not chemistry journals, but patent office journals around the world.'[23]

Hoechst does not confine its bioprospecting to India, however. In 1994, Hoechst and Schering merged their agrochemical businesses to form a new company, AgrEvo, the world's fifth largest agrochemical corporation. One of its patented and highly profitable genes for herbicide resistance comes from a soil sample from Cameroon—the so-called PAT gene.[24] The company's best-selling herbicide, Basta, was also developed from a soil bacterium of Cameroonian origin.[25] Hoechst has not offered any compensation to the donor country.[26] A list of companies and intermediaries active in biopiracy and bioprospecting is annexed to this section (pp. 156–163).

Table 14 sets out the 20 most outrageous patents obtained by companies and institutions. Membership in the roster is based upon the ethical unacceptability of the patent claim for moral and/or practical reasons. In most cases, the specific patent identified should be understood to be indicative of a category of intellectual property claims of which there may be many examples.

Table 14 The RAFI Roster: the world's 20 most outrageous patents

Patent	Description and patent holder
Umbilical Cord Cells Homo sapiens US 5,004,681, EP 343217,etc.	As unbelievable as it may seem, human umbilical cord cells have been patented by the US company **Biocyte**. Any doctor wishing to use umbilical cord blood cells in surgery or transfusions must pay royalties. The cells may be crucial in treating bone marrow diseases.
Human Genes Homo sapiens US 5,597,709, WO 9520398, EP 741578, etc.	A human growth hormone gene is one of the latest patents granted to **Human Genome Sciences** (HGS), a US company patenting human genes as fast as it can. HGS has filed patent applications covering over 1 million partial human gene sequences. HGS has alliances with at least 10 major drug corporations to provide access to human genes and genetic information.
Human Cell Lines Homo sapiens WO 9512814, EP 727046, etc.	Here's proof that the sometimes voiced perception that human patenting is an 'American problem' is only partially right. True, it's a problem in the US; but also throughout the world. Australia's **Flinders Medical Centre** is seeking patent monopoly on human cell lines (part of a diagnostic test for autoimmune disease) on five continents.
Cloning All animal species, including humans WO 9707668, WO 9707669, others pending	The UK's **Roslin Institute** is so sure it has an economic winner it is claiming its cloning patents in even the weakest of economies—North Korea and Liberia, for instance. The patents are licensed to **PPL Therapeutics**, a company which has agreements with major drug multinationals like Novo Nordisk, Boehringer Ingleheim, and American Home Products. More licenses may be granted. Unlike many bioengineering patents, which are specified for 'non-humans', Roslin says its cloning patents cover all animals, including humans.
Cotton Gossypium hirsutum US 5,159,135, EP 270355, CN 87107233, etc.	Challenged in the US and Europe, but so far still standing, **Monsanto**'s patent on all genetically-engineered cotton should never have been granted. Even the US Government, which is seldom hesitant to help US companies, agrees that the patent should be revoked and has asked its own patent office to do so. Monsanto wants to keep the patent, meaning it will take years and millions of dollars before the case is closed.
Soya Glysine max EP 270355, DE 3888040, CN 1030940, etc.	Action by RAFI prevented this species patent on transgenic soya from being issued in the US; but this patent, another in **Monsanto**'s long list of sweeping monopoly claims, has been issued in Europe and many countries. Originally issued to the WR Grace Corp, the patent drew an almost 300 page opposition from Monsanto at the European Patent Office. In 1996, Monsanto did an abrupt turn around on the patent after buying WR Grace's agbiotech division. Now Monsanto says it will defend the patent that it previously opposed as 'obvious'.
Brassica Rapeseed, broccoli, cauliflower, cabbage, etc. US 5,188,958, EP 270615, JP 1500718, WO 8707299	One of the most sweeping of a number of extremely broad patents issued in the last decade, **Monsanto Corporation**'s patent on transgenic brassica covers any plant in the entire brassica genus genetically-engineered using the agrobacterium method.
Sangre de Drago Croton sp. WO 9206695, EP 553253, US 5,211,944	**Shaman Pharmaceuticals** went to the Amazon to get sangre de drago('dragon's blood'), an indigenous peoples' medicinal plant from which Shaman has isolated its patented pharmaceutical. The company talks about 'reciprocity' in its relations with the indigenous peoples who it taps for resources and knowledge; but so far the indigenous people who are Shaman's sangre de drago sources have received a few thousand dollars while Shaman has raised millions in the US capital market.

Patent	Description and patent holder
Neem Azadirachta indica US 5,411,736, US 5,409,708, EP 436257, etc.	A very widely known and long-cultivated tree with medicinal and agricultural uses in Asia, and especially, India. Today's sad truth is that neem is almost as well known in Northern patent offices, where multinationals have filed dozens of patent claims on neem. Most recently, **Monsanto** has taken out a pair of patents on neem wax and oil and claimed broad fungicidal and insecticidal uses.
Snakegourd Trichosanthes kirilowii US 5,317,009, WO 9304085, EP 647272, etc.	Called 'the powder from the flower of the Gods' in Chinese, the **National Institutes of Health** (US) and **New York University** have brought snakegourd firmly down to earth with a series of patents that stretch across the globe. The 'inventors' claim a snakegourd-derived compound to treat HIV. As with the bitter melon patent, snakegourd's 'inventor' is quite frank about how the plant 'has been used in China for many, many years .. and is well-known for its therapeutic effect'.
Kava Piper mythesticum US 5,585,386, EP 672406, JP 8040894, etc.	The basis of the ceremonial beverage of the same name, Kava is grown in many Pacific countries, including Vanuatu, Samoa, Fiji, Papua New Guinea, Solomon Islands, Federated States of Micronesia, as well as Irian Jaya (Indonesia). Drug companies are racing to patent Kava's many beneficial uses. French cosmetics giant **L'Oreal** (Nestle is a major stockholder) has patented the use of Kava to reduce hair loss.
Turmeric Curcuma longa US 5,401,504	An ancient and Indian ayurvedic medicine, turmeric has been patented by researchers from the **University of Mississippi** (US). For thousands of years, Indians have applied ground turmeric root to cuts and scrapes to promote healing. But the US patent gives a monopoly to Mississippi for a 'method of promoting healing of a wound by administering turmeric to a patient afflicted with the wound'.'The Indian Council of Scientific and Industrial Research has asked the US to revoke the patent.
Barbasco Clibadium sylvestre EP 610059, GB 9301920, US application filed	A well-known plant cultivated by Amazonian indigenous people for hundreds of years and used in agriculture and medicine. It is best known as a highly effective poison that stuns and paralyses fish. Conrad Gorinsky, president of the UK's **Foundation for Ethnobiology,** has patented a barbasco compound and is marketing it to pharmaceutical multinationals Zeneca and Glaxo. Gorinsky's patent claims many uses including, not surprisingly, regulation of muscular activity.
Mamala Homolanthus acuminatus/ Omalanthus acuminatus EP 531413, US 5,599,839, WO 9118595, etc.	Like Shaman Pharmaceuticals, the primary 'inventor' behind this patent on a Pacific medicinal plant goes to great pains to say how important indigenous knowledge is to their research. They may even be providing some return to Samoan people; but the patent says the 'prostratin' compound isolated from this Pacific medicinal plant—found from New Caledonia to Tahiti—belongs to the **US Department of Health and Human Services**, the **US Army**, and **Brigham Young University**.
Ayahuasca Yagé / Banisteriopsis caapi US Plant Patent #5,751	A medicinal plant cultivated since pre-Columbian times across the Amazon basin. A small US company, the **International Plant Medicine Corporation** (IPMC) took out a US plant patent on a variety of ayahuasca collected from indigenous people in Ecuador. IPMC has ignored requests from indigenous people to give up the patent and is working to develop psychiatric drugs from the plant.

Patent	Description and patent holder
Quinoa Chenopodium quinoa US 5,304,718, WO 9314624, AU 9222922	A staple food crop for millions in the Andes, particularly for Quechua and Aymara people in Chile, Bolivia, Peru, and Ecuador who have bred a multitude of quinoa varieties adapted to variable Andean conditions. One of these, Apelawa (named for the farmers of a small Bolivian town),has been patented by two professors at **Colorado State University** (US) because this farmers' variety is the key to a male sterility system. The patent claims any quinoa crossed with male sterile Apelawa plants. **CPRO-DLO** (Netherlands) is also bullish on quinoa and has applied for PBR monopoly in the Netherlands on at least one variety.
J'oublie Pentadiplandra brazzeana US 5,527,555, EP 684995, WO 9531547, etc.	Called 'I forget' in Gabon, a reference to the sweet bliss of its berries. The sweet compound in J'oublie has been patented by the **University of Wisconsin** (US), which has licensed it to industry. Dubbed 'brazzein' by Wisconsin researchers, the extract of this African plant is 500 times sweeter than sucrose. Wisconsin thinks it may be a hit in the USD 100 billion a year global sweetener market. Researchers are trying to 'grow' brazzein in transgenic micro-organisms so that berries don't have to be obtained in Africa. The university says brazzein 'is an invention of a University of Wisconsin researcher' and 'Wisconsin has no connection to Gabon'.
Greenheart Ocotea rodiei EP 610060, US 5,569,456	From the Guyana Shield region, an extract of the nut of the greenheart tree has been patented by the director of the **Foundation for Ethnobiology**. The Greenheart patent claims broad medical uses and is being marketed to major pharmaceutical companies. The Foundation boasts that its ongoing studies in Guyana—which it calls 'The Greenheart Project'—include 'training and the examination of issues relating to sustainable development and intellectual property rights in anticipation of further development of biodiversity resources'.
Bitter Melon Momordica charantia US 5,484,889, JP 6501689, EP 552257, etc.	A fruit that has been used in Southeast Asia and China for centuries against tumours and infections, bitter melon has been patented by the **US National Institutes of Health**, the **US Army**, and **New York University** for its anti-human immunodeficiency virus (HIV) effects. Even the 'inventor' of the bitter melon patent admits it is 'very widely eaten in the Chinese community for health reasons' and that the fruit is widely thought to have anti-HIV properties.
Endod African Soapberry/Phytolacca dodecandra CA 2034414, US 5,252,330	Patented by the **University of Toledo** (US), endod has been selected and cultivated by Africans for centuries, particularly in Ethiopia. It is used as a soap and shampoo as well as a poison to stun fish. Endod is lethal to snails—a fact discovered by Ethiopian scientists—and may be effective controlling schistosomiasis. After an Ethiopian scientist demonstrated endod's potency to Toledo scientists, they took out a patent, hoping to sell endod as a biological control for the Zebra mussel, a pest in the Great Lakes of the US and Canada

Notes

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22. Quoted on Hoechst web site at: http://www.hoechst.com/press_e/13096e3.htm
23. *Ibid*.
24. Personal communication with Michael Flitner.
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Annex

Table 15 Biopirates and bioprospectors: RAFI's global list of companies and intermediaries

Company/organisation and/or intermediary	What collecting?	Geographical location	Use of indigenous knowledge/ indigenous peoples or territories	Additional information
Abbott Labs (USA)	microbes, plants			Programme reportedly terminated in 1995
Adheron Corp. (USA)	marine bacteria and other organisms			USD 5 million research agreement with the University of Maryland
American Cyanamid (USA)	arid land plants	Chile, Argentina, Mexico	Priority given to plants with rich ethnobotanical background	ICBG agreement with University of Arizona, Institute of Biological Resources of Buenos Aires, National University of Patagonia, Catholic University of Chile, National University of Mexico, Purdue University, Louisiana State University
AMRAD Corp. (Australia)	marine organisms	Australia, oceans		Collaborating with Australian Institute of Marine Science, which is providing AMRAD with 20,000 samples over the next 5 years
AMRAD Corp. (Australia)	marine organisms and soil microbes	Antarctica	Special focus on organisms from harsh environments	Collaborating with Antarctic Cooperative Research Centre (Hobart, Tasmania)
AMRAD Corp. (Australia)	Australian aboriginal medicines, soil and microbial samples from Bathhurst and Melville Islands	Australia, SE Asia	Targets medicinal plants used by Australian indigenous people. Wants anti-viral, anti-cancer, and immuno-modulatory compounds	Has signed a deal with the Northern Land Council to pay $12–$15 per sample and undisclosed royalties if drugs are developed. Has deal with Seattle, USA-based Panlabs Inc.
Aphios Corp. (USA)	marine micro-organisms	US territorial waters		Has research agreement with Bristol Myers Squibb (USA), Harbor Branch Oceanographic Inst., and CalBioMarine Technologies
Boehringer Ingelheim (Germany)	plants, microbes			Agreements with University of Illinois and New York Botanical Garden to obtain plants
Bristol-Myers Squibb (USA)	insects and related species	Costa Rica—dry tropical forests of Guanacaste		US government supported ICBG agreement with National Biodiversity Institute (InBio) of Costa Rica, University of Costa Rica

Company/organisation and/or intermediary	What collecting?	Geographical location	Use of indigenous knowledge/ indigenous peoples or territories	Additional information
Bristol-Myers Squibb (USA)	rainforest plants with medicinal properties, especially *Ancistrociadus* (anti-HIV agent), and anti-malaria agents	Cameroon (Korup forest range) and Nigeria (Oban Hills rainforest)	Ethnobotanical information from traditional medical practices will be used to prioritize collection of plants	US government-supported ICBG agreement terms are not available to the public. Also participating: Walter Reed Army Hospital (US), Smithsonian Inst., WWF, University of Yaounde, Nature Conservancy, World Resources Inst., Shaman Pharmaceuticals
Bristol-Myers Squibb (USA)	fungi, microbes, plants, marine organisms			Ranked second-largest pharmaceutical corporation in USA. Contracts with third parties to collect specimens, including Scripps Institute and Oncogen
Bristol-Myers Squibb (USA)	rainforest plants for drug development; non-medicinal plants for sustainable commercial harvest	Surinam	Use of plants by indigenous peoples targeted. 'Terms of agreement' are not public. Conservation International to set up 'Shaman's Apprentice' programme	US government supported ICBG project with Virginia Technical University, Missouri Botanical Garden, National Herbarium of Surinam, Bedrijf Geneesmiddelen & Conservation International Fund that receives and allocates benefits is majority non-indigenous
British Technology Group (UK)	plants, micro-organisms	Costa Rica	No information available—gives financial support to INBio of Costa Rica	BTG is tech. transfer organisation, which licenses new technology worldwide. Holds patent on nematicide derived from Costa Rican tree
Caapi Associates (USA)	Amazonian medicinal plants	Brazil	Focus on medicinal plants, says it will provide work for the poor	Says marketing of plant extracts may be an answer to Brazil's financial troubles, and a way to 'teach' the Brazilian government the value of its resources
Conservation International (USA-based intl. NGO)	plants, micro-organisms	global (in 23+ countries) in which CI works	'Possibly; but not at this stage' according to CI. (September 1997)	CI has a global agreement with Hyseq Inc., a US-based genome sequencing company, to provide Hyseq assistance in gaining access to resources for pharmaceutical screening programmes. CI and its regional affiliates will develop benefit-sharing agreements. Lead products have been identified; but neither CI or Hyseq will reveal origin

Company/organisation and/or intermediary	What collecting?	Geographical location	Use of indigenous knowledge/ indigenous peoples or territories	Additional information
Diversa Inc. (USA), name changed from Recombinant Biocatalyst Inc. in 1996	micro-organisms	US, Iceland, Costa Rica. Negotiating agreements in Mexico and Indonesia		Focuses on 'isolating and patenting new enzymes produced by extremeophiles'—mircoorganisms adapted to harsh environments such as hot springs. Has signed an agreement with the US government to collect samples in USA's Yellowstone National Park
Ecogen, Inc. (USA)	entomoparasitic nematodes for biocontrol agents	Malaysia		Has R&D agreement with Malaysian Research and Development Institute
Ecopharm (USA) (part of Pharmagenesis)	micro-organisms associated with medicinal plants	worldwide		Explores drug leads from non-pathogenic microbes that have symbiotic relationships with medicinal plants
Ecoscience Corp. (USA)	screening of soil samples for fungal strains to be used in pest control	China		Ecoscience will pay Chinese Institute Biological Control
Eli Lilly Co. (USA)	plants, algae			Major pharmaceutical corporation. Recently purchased Sphinx Pharmaceuticals
Ethno-Medicine Preservation Project (Peru +)	plants	Peruvian Amazon	Seeks 'new and important weapons in the age-old battle against disease' by working with healers	Also aims to preserve knowledge by encouraging a new generation of healers
Foundation for Ethnobiology (UK)	medicinal plants worldwide, drug and agricultural applications	South America, Asia	Specifically targets indigenous peoples' knowledge	Foundation purports to be an academic endeavour. President holds two patents on drugs from Amazonian medicinal plants and is trying to sell them
Geneseas Asia (Philippines)	marine animals, esp sponges and snails	Philippines		Philippine company with US directors and backers is offering bioprospecting services to international drug companies
Glaxo Group (UK)	plants, fungi, microbes, marine organisms	Asia (includ. Laos), Latin America, possibly other areas		Has obtained materials from Kew Royal Botanical Gardens, Biotics Ltd., University of Illinois, National Cancer Institute, contracts with Carnivore Preservation Trust to collect plants in Laos

Company/organisation and/or intermediary	What collecting?	Geographical location	Use of indigenous knowledge/ indigenous peoples or territories	Additional information
Hoechst (Germany)	plants, soil micro-organisms	India, Cameroon	Routinely sampling medicinal plants used in traditional Ayurvedic practice	Has already screened 90,000 Indian soil samples; holds patents on compounds extracted from Indian medicinal plant, *Coleus forskohlii*
Instituto Nacional de Biodiversidad (InBio) Costa Rica	plants, insects, microbes	Costa Rica—Guanacaste Park & other protected areas	Possibly collecting in Talamanca reserve, unclear to what extent relying on indigenous peoples	Private organisation that has entered into high profile contracts with Merck, Bristol Myers Squibb, and possibly other major pharmaceutical companies
International Marine Biodiversity Development Corp.	deep ocean research to collect exotic species for biotech applications	international waters		10-year research project undertaken with Russian Academy of Sciences
International Plant Medicine Corp. (USA)	Amazonian medicinal plants	Ecuador	Targets indigenous people's knowledge of medicinal plants	Has reportedly proposed to forcibly extract medicinal plant information from indigenous people
International Organization for Chemical Sciences in Development—IOCD (Belgium/ international)	'rare trees, bushes, insects, amphibians, fungi, microbes, and other natural species'	Plans to start work in Africa or Latin America, and then move worldwide	Will depend on indigenous people for leads, says its will work 'equitably and ethically' and 'sustain bioprospecting at a commercial scale'	IOCD wants to create 'the Biotic Exploration Fund, a new world-level agency that aims to catalyse a great increase in the quantity of bioprospecting in developing countries'
Ix Chel Tropical Research Foundation (Belize)	plants	Belize	Exports samples of plants identified by traditional healers. Has exported 1,500 such plants	Participant in US National Cancer Institute's phytomedical screening programme. NCI patents are usually transferred to US companies
Janssen Pharmaceutica N.V. (Belgium)—subsidiary of Johnson & Johnson (USA)	animals, plants, fungi, micro-organisms	Philippines		Agreement with West Visaya State University (Philippines) and Rijkuniversiteit Gent (Belgium) to do collecting
Johnson & Johnson (USA)	novel chemical compounds			Funds bioprospecting at Cornell University, training South scientists in prospecting
Knowledge Recovery Foundation Intl. (USA)	medicinal plants for new drugs	Amazon Basin, tropical Asia		Proposes to develop a library of plant extracts that can be 'rented' to pharmaceutical firms

Company/organisation and/or intermediary	What collecting?	Geographical location	Use of indigenous knowledge/ indigenous peoples or territories	Additional information
Magainin Pharmaceuticals (USA)	African reptiles, marine fish and organisms			Developing human drugs from the African clawed frog and the dogfish shark
Marine Biotechnology Institute (Japan)	marine organisms	Micronesia		Consortium composed of Japanese government and 21 Japanese corporations
Martek Biosciences Corp. (USA)	micro-algal strains for nutritional, pharmaceutical, and diagnostic products	worldwide		Merck & Co. will screen extracts from Martek's collection of more than 1,600 micro-algal samples. Merck pays Martek to supply extracts
Maxus Ecuador, Inc. (US/ Argentine parent companies)	1,200 plant species have been gathered; 18 'new' to science; 200 'new' in Ecuador	Ecuadorean Amazon	Plant collection and inventory traverses Yasuní National Park and Waorani Ethnic Reserve	Contracts with Missouri Botanical Garden for plant collection and inventory during construction of 120-km road in tropical moist forest
Merck and Co. (USA)	fungi, microbes, marine organisms, plants	Latin America	Indigenous knowledge of Urueu-wau-wau of Brazil; has patent on anticoagulant made from their plant	Major drug corporation. Contracts with New York Botanical Garden, MYCOSearch, Martek Biosciences; InBio of Costa Rica (made up-front payment of USD1.2 million)
Missouri Botanical Gardens (USA)	plants (on an extremely wide scale)	everywhere, especially tropics	Uses indigenous people to assist work. Collaborates with ethnobotanists, and loggers and oil companies.	One of the world's largest collectors of plants. Does not conduct its own product-oriented research; but assists and provide samples those that do
Monsanto Corp. (USA)	plants	Peruvian Amazon	Exclusive focus on collecting indigenous people's medicinal plants and knowledge	Plans to receive samples via Washington University (USA) part of US government-sponsored ICBG programme. Local indigenous peoples' organisation opposes the project
Myco Pharmaceuticals (USA)	screening of fungi for drug development	worldwide		Company will identify, develop and commercialise drug leads. Also developing screening technologies

Company/organisation and/or intermediary	What collecting?	Geographical location	Use of indigenous knowledge/ indigenous peoples or territories	Additional information
National Cancer Institute (government agency) (USA)	plants, microbes, marine life. One NCI natural products repository has over 500,000 samples primarily from Africa, Asia and Latin America	over two dozen countries worldwide, plus oceans and reefs	Uses indigenous knowledge to identify some materials	Contracts with University of Illinois to collect in Southeast Asia; Missouri Botanical Garden collects in Africa; New York Botanical Garden collects in Latin America. Marine organisms collected by Coral Reef Research Foundation in Indo-Pacific. Microbes collected by various organisations
National Institutes of Health and New York University (USA)	screening folk remedies as source of anti-HIV and anti-tumor therapeutics	original source of plants not disclosed	Using traditional knowledge as basis for selecting plants	Patents held on proteins derived from Chinese bitter melon; carnation; 'heavenly fruit' from Himalayas. Seeking commercial partners
New York Botanical Garden (USA)	everything	worldwide, special focus on Latin America	Leading centre for ethnopharmacy and ethnobotany research, uses indigenous knowledge to collect	Contracts with private companies for collection of plants. Personnel prominent in the field. Also collects from other botanical gardens
NPS Pharmaceuticals, Inc.	animals, insects (esp. insect toxins)	Madagascar		Malagasy government gave NPS exclusive rights to research animals for medical uses
Oceanix Biosciences Corp. (USA)	enzymes from marine sources	deep sea thermal vents, polar waters, etc...		Has joint research agreement with University of Maryland. Seeks a variety of exotic enzymes, including treatments for central nervous system diseases
Paracelsian, Inc. (USA)	plants	China	Exclusive focus on traditional medicines	Is seeking US government approval for anti-HIV drug derived from Chinese medicine. Is screening at least 2,800 samples of traditional Chinese medicines
Pfizer, Inc. (USA)	plants	USA	Collections based partly on existing ethnobotanical leads	3-year, USD 2 million research collaboration with New York Botanical Garden. Trying to buy access to tropical plants in US botanical gardens as part of project

Company/organisation and/or intermediary	What collecting?	Geographical location	Use of indigenous knowledge/ indigenous peoples or territories	Additional information
Pfizer, Inc. (USA)	plants	Ecuador (proposed)	May use indigenous people as 'parataxonomists' to assist plant collection and identification	Proposed to pay USD 1 million to receive exclusive rights to a comprehensive set of samples from each of Ecuador's major biomes. As yet unapproved by government
Pfizer, Inc. (USA)	plants	China	Exclusive focus on traditional medicines	Has agreement with China Academy of Traditional Chinese Medicine to study traditional Chinese herbs as sources of new drugs for human and animal health
Pharmacognetics (USA)	natural products for drug development	Latin America	Hopes to rely entirely on indigenous peoples to identify plants for drugs and cosmetics based on indigenous peoples' products and uses	Founded 1993; partly-owned by Pan American Development Foundation, a non-profit organisation that works with rural and indigenous groups in Latin America. Will use these connections to organize plant collection and identification
Pharmagenesis (USA)	plants	Asia, especially China	Traditional medicinal plants	
PharmaMar (Spain)	bioactive materials from marine sources to develop drugs for cancer and AIDS	worldwide		PharmaMar researchers travel aboard the ships of Pescanova, one of the largest fishing fleets in the world
Phytera, Inc. (USA)	plants	worldwide		Specializes in plant cell technology, has one of world's largest plant cell collect-ions. Can provide large quantities of a compound from small tissue sample
Phyton Catalytic, Inc. (USA)	plants	agreements in Africa, Asia, Europe, Americas		Focuses on production and supply of plant-derived compounds through cell culture
PhytoPharmaceuticals Corp. (part of Escagenetics) USA	plants	negotiating agreements in Brazil, China, Africa, India, Eeastern Europe		Will acquire plant samples from collaborating institutes, who will retain rights on drugs developed and receive royalties. Filed for bankruptcy, January 1996
Research Corporation Technologies (USA)	bacteria	Latin America		Selling bacteria with nematocidal and antifungal properties isolated from Costa Rican soil

Company/organisation and/or intermediary	What collecting?	Geographical location	Use of indigenous knowledge/ indigenous peoples or territories	Additional information
Rhone-Poulenc Rorer (France)	microbes, plants, marine organisms			Samples obtained from University of Hawaii, Shanghai Medical Univ Beijing Medical University, Tianjin Plant Institute
Sabinsa Corp. (USA)	plants	India	Focus on plants with established medicinal uses in Indian cultures	New company hopes to broker botanical and pharmacological resources of India to North America. Will develop, process and market extracts of Indian plants
Shaman Pharmaceuticals (USA)	plants for drug development	Latin America, Africa, Asia	Identifies promising plants using indigenous knowledge; traditional healers are primary informants	Has received two patents on drugs in clinical trials (anti-fungal and anti-viral). Strategic alliances with Eli Lilly, Merck, Bayer, and Inverni della Beffa of Italy
SmithKline Beecham (USA)	microbes, plants, marine organisms			In-house collectors; obtains samples through Biotics, University of Virginia, Scripps Inst. of Oceanography, Kew Botanical Gardens, Morris Arboretum, MYCOsearch
Sphinx Pharmaceuticals (subsidiary of Eli Lilly) USA	fungi, algae, plants, marine organisms			Has obtained materials from Biotics
Sterling Winthrop (USA)	microbes, plants, marine organisms			Has obtained materials though Mississippi State University , Brigham Young University, New York Botanical Garden
Syntex Laboratories	microbes, plants			Has obtained materials from the Chinese Academy of Sciences
University of Utah (USA)	plants	Panama	Targets knowledge of the Emberá people and farmers. Says that drug finds will make indigenous people 'more likely to value the forest'	Proposed project with the University of Panamá, Smithsonian Tropical Research Institute, Natura Foundation, and an unidentified 'indigenous organisation'. No concrete plans for compensating local people
Upjohn Co. (USA)	microbes, plants			Major pharmaceutical corporation. Has obtained materials through the Shangai Institute
Xenova Ltd. (UK)	micro-organisms and plants; has in-house collection of 23,000 live micro-organisms (lichen, bacteria, fungi), and in labs of collaborators	worldwide; in 1996 exploring opportunities in Peruvian indigenous areas	In 1996 exploring opportunities in Peruvian indigenous areas	Alliances with Genentech, Warner-Lambert Co., Genzyme and Suntory Ltd. and other academic institutions

8 The Part of the People

Hope for a Third System in the Midst of 'Paradise Lost'

Barley, pay attention to me! Communism is not a threat! It's a parasite industry that lives off the mistakes of all you stupid arseholes in the West!
Leo, in John Le Carré's The Russia House

The vital ideological struggle that dominated this century must not be left to the facile ruminations of a drunken Moscow publisher. But John Le Carré's words can be far too painfully adapted as an epitaph for that half-movement, half-morass widely known as Non-Governmental Organisations (NGOs). After a half-century of successful 'awareness-building' and unsuccessful campaigning, it could be argued that civil society advocacy is a parasite industry feeding off the worst mistakes of capitalism. This is a harsh—but not entirely unsympathetic—indictment. All the parts of life are being pirated and patented and the laws of nature and of society have been silenced. The world is not doing well. The only part left to be played is the part of the people, cooperating within a Third System strategy. This is not new but it could be revolutionary. Have we learned enough—had enough failures and pseudo-successes—to take the risk?

Our common past and our uncommon future

1996—the year of agricultural biodiversity, the year of the Leipzig 'Seed Summit', the Rome Food Summit and the Buenos Aires biodiversity battle. The year the CGIAR blinked. The year that took CSOs from Rome to Leipzig to Montreal to Buenos Aires, to Rome again, to Singapore, to Rome again. In 1996, we knew all roads led to Rome. The question was, do any roads lead *from* Rome?

Background for a Third System movement

The need to take stock—an ongoing nagging necessity for all of this fading decade—has now become an unbearable clanging urgency. BUKO, the German coalition that propelled us through Leipzig, caught the urgency and—with insight and bravado—called for an evaluation of 1996 at a meeting outside Hamburg. In part, because 1997 marks 20 years of work on what we all once called the 'seeds issue', but mostly because the pace of change demands reflection, we—as civil society organisations—must evaluate our situation and review our strategies and relationships. The time of the Third System cannot be delayed. Contrary to the title of the half-forgotten Brundtland Commission report, *Our Common Future*, the future role of not-for-profit organisations and People's Organisations is anything but common. The voluntary sector is being forced by world realities into becoming a real and practical Third System that must countervail the negative powers of the other two—corporations and governments.

'Fifty Years is Enough' (for us too!)

Civil society organisations answered the World Bank's 50th anniversary ceremonies with the now-famous '50 Years is Enough' campaign culminating in Madrid where Bank officials were forced to their feet in a minute's silence for those whose lives had been destroyed by Bretton Woods policies. In 1995, when FAO marked its 50th anniversary, albeit more modestly, in Quebec City, CSOs summed up the half-century with the slogan, 'FAO—50/50'—leaving FAO to hope it indicated support for another half-century and the media to recognise it as a scorecard. What about us? Dare we be so analytical about our own accomplishments? Whether we hail from the Bretton Woods institutions or the Rainforest Coalition, we have all worked hard and we have all seen ourselves on the side of the angels. But when is the Jubilee for CSOs?

In the more than 50 years since 'development NGOs' became bit players on someone else's stage, we have meandered through a veritable plethora of roles. The first of these—the 'emergency relief' role—was the logical camp follower to the Second World War. This role evolved naturally into the 'development project' with its emphasis on government aid increases and additional NGO fundraising. With the older roles still marching, the cutting edge of NGO action moved on (following the failure of the Pearson Commission of 1970) to address the food crisis and commodity trade concerns of the early 1970s. Offered the script for the New International Economic Order (NIEO) in 1974, we played political 'court jester' on the UN stage for the rest of the decade. For a while, civil society marched to the monotone drum of the UN agenda. By the time of UNCTAD V in Manila in 1979, however, the NIEO's death knell was sounding and NGO enthusiasm had waned. By the late 1970s, NGOs (South and North) adopted an 'issue/network' approach on such important concerns as infant formula ('Nestlé Kills Babies'), pesticides (the 'Dirty Dozen'), health (drug prices and safety) and seeds. These more targeted campaigns—where civil society brought its own agenda to the UN—proved reasonably effective. Known sometimes collectively as the 'HAI-bred, SAN, PAN, IBFAN Scam',* these campaigns convinced governments, and UN secretariats, to adopt codes of conduct (on pesticides, seeds and formula) and/or created monitoring mechanisms that have been helpful if not completely successful. More recent networks on tropical rainforests, the greenhouse effect, toxic dumping, dams and rivers (to select a few) are perhaps more advanced manifestations of this approach.

* Health Action International, Seeds Action Network, Pesticides Action Network, International Baby Foods Action Network.

500 years and a turning point

The Rio Earth Summit of 1992 not only coincided with the 500th anniversary of European imperialism in the Western hemisphere (and the greatest ecological shockwave since Noah built an ark), it also ushered in another role in civil society activism. Literally thousands of CSOs joined forces (albeit clumsily) to tackle the immense spectrum of cross-cutting issues that make up 'environment and development'. It was not a pretty sight. Governments at Rio were treated to a new generation of CSOs playing 'diplomat' and lobbying one another over CSO 'treaties' rather than taking on governments and corporations. Miles from the actual Summit, separated by an entire army battalion from reality, CSOs with highly inflatable egos ensconced in plastic Pepsi chairs (highly deflatable) contemplated the fate of people, pandas and parks—more like a waiting cast of extras on a corporate stage than advocates for a social revolution.

Yet, governments could not have held an Earth Summit without civil society. Whether CSOs propelled the Rio agenda—or merely gave it a scenic backdrop—can be judged by the results. Now that the five-year review of Agenda 21—the Summit's principle product—has come and gone, it is obvious to all that there is nothing to celebrate. Quixotically, Rio fundamentally changed how governments and the UN System look upon civil society—and Rio changed how we see our own potential. Almost in spite of ourselves, Rio showed that we have more power and influence than we dreamed. We have done little or nothing to deserve this. The painful truth is that the decline in power among governments and within the UN System has created a power vacuum into which CSOs have been spilled.

In the Rio process, the old-guard NGOs lost control. Scattered among the CSOs in Rio were peasant farmers, indigenous peoples and women's groups. Traditional NGOs had to contend with—and welcome—People's Organisations who did not need others to be their intermediaries. Succeeding summits, especially the Social Summit in Copenhagen in 1995 and the Food Summit in Rome in 1996, and conferences such as the Beijing Women's Conference, maintained the revitalised prominence of civil society actors in gala UN events. On the downward slope of the 1990s, it has begun to feel as though summits and conferences couldn't happen if civil society decided not to attend. A thought worthy of careful reflection.

The need is not to abandon our roles but to write the whole cast a play instead of merely a pageant—an integrated Third System strategy—that allows each of us to act in concert while still developing our own characters. For as much as we have been effective on some issues and as much as we have earned applause in some fora, the pageant's procession has led almost

entirely downhill. The key intergovernmental powers—the World Trade Organization and the Bretton Woods institutions, have plagiarised our scripts without adopting our demands. The corporations, meanwhile, are hardly aware that we are on the stage.

Systems analysis: Second is First and Third is lost

If civil society is less than at the heart of corporate thought these days, it is a position we may hold in common with governments. In the 1980s when Marc Nerfin (the eclectic UN guru and political philosopher) was first formulating the concept of a Third System, it was clear that the First System was comprised of the 'Princes' (the politicians or governments) while second position fell to 'merchants' (now transnational enterprises). Today, the reality is otherwise. Thoughtful corporate executives—of whom there are a surprising number—sadly confess that at least in such economic giants as the United States, the UK, Canada, Australia and Japan, the Merchants dictate to the Princes. Some would argue that it has always been thus—but the nature of the relationship and the corporate dominance has clarified in the 1990s as 'deficit reduction', and 'globalisation' have become a kind of corporate mantra mouthed by politicians. If the power relationship is clearer now, the benefit to national sovereignty is hard to fathom. Certainly, US corporations do not act for the benefit of the US economy. In fact, the servitude of governments with respect to enterprises—which, in another era, could have been charged with transnational treason—is remarkable.

First System

Second System

Governments—as the new tenants of the Second System—don't get much respect from the Third System either. This is their own fault. After years of politicians telling us they can no longer manage everything on their plate, we are coming to believe them. Increasingly, disenfranchised and disenchanted sectors of civil society are asking why governments who can't deliver services should be permitted to set policies. If they can't cook they should wash dishes. Not because it is the way things should be—but because it is the way things are—civil society is forced to take on a more aggressive policy role.

When we allowed governments to call us NGOs, we sometimes joked that we were 'non-governable organisations'. Today, we could argue that governments are becoming no more than NGOs with guns, guns that allow them to collect taxes. Indeed, the acronym for the new Second System could be GUNS—Governments and the UN System. Or since the turf is vacated, NGOs—non-governing organisations.

This analysis obviously bespeaks a disrespect for governments—but not

necessarily for those in government. Many diplomats and UN officials with whom we work feel the feebleness of governance intensely and share our dismay. During Keystone, we joked that plants and governments were the only living organisms that manage to grow without moving. Today, governments neither grow nor move and they only serve to provide camouflage for corporations. It is peculiar to the 1990s—so different from the 1960s, when the cry was for civil disobedience in the face of crushing bureaucratic power—that we must now demand civil obedience of our governments.

Third System

Although we may have moral victories aplenty, our temporal triumphs are few and fragile. It is time to be more honest with ourselves. We have shrouded our campaigns in a bombastic and bucolic haze convincing even ourselves that the poor—especially women—understand GATT, TRIPs and Bretton Woods institutions perfectly, that the failures of dams and irrigation, of Green Revolutions and nuclear energy, are all revealed truths, and that the Poor are always with us (on our side), ready to rise up and throw off their chains.

Were this true, the revolution's trenches should be at least two generations deep in cannon fodder ready to charge upon the corporate citadel. Will the bugles sound when just one more dam is built, one more pesticide is sprayed, one more human cell line is patented?

Have we made the fuse too long? Or have we forgotten that for every marketplace or church basement that resounds to our exhortations, there are a thousand markets that hear only pesticide jingles and Unilever soap songs? We have not been the only ones pitching to the people. And we have been losing:

- 160 countries have joined the WTO—or are asking to join—despite our opposition.
- The USA's regional GATT, i.e. NAFTA (the North American Free Trade Agreement), is expanding into Latin America.
- The European Parliament reversed its former decision and accepted a new EU directive favouring life patenting.
- Life patenting is spreading like wildfire throughout the South.
- Pesticide sales are sky-rocketing.
- Infant formula companies are booming.
- Tobacco sales in the South are going through the roof.
- Drug prices and profits have never been higher.
- Foreign aid—even the good stuff—is vanishing.
- An Earth Summit was held that did nothing for the earth.
- A Social Summit was held that entrenches unemployment.

- A Food Summit was held that promises to make the hungry obey trade agreements.
- Another Women's 'feel good' Conference was held.

The people are not united. The people are always being defeated. It doesn't have to be that way—but that's the way it is right now.

The basis for a bigger role

Vaclav Havel has argued that the difference between optimism and faith is that optimists really believe they can win while those with faith believe their cause is just. There is more to faith than this. We can have faith in people, faith in ourselves as civil society. Perhaps the analysis here is sarcastic but it is not cynical. Our weaknesses are not lack of courage or energy. Only, sometimes, a lack of vision.

The other reality is that we have learnt a lot. Through painful trial and error, we have attained a much better grasp of the current structure and mechanisms of political and economic power. Still more important, we (that is, those in CSOs that are close to the grassroots) have found—or formed—effective relationships crossing communities, countries and regions. Amidst all the failures, we know of things that work. At the micro-level, in communities and countries, we have forged patterns of information and cooperation that both function and point the way.

1996 also showed us that we could—and need to—cooperate globally. Although there were differences in emphasis and perspective when more than 1,300 CSOs gathered in Rome for the Food Summit, the level of shared political analysis was simply inspiring. The same level of common sense and purpose arose in Buenos Aires at the Biodiversity Convention—a forum once famous for the factious split between conventional environmentalist CSOs and 'development' or 'agricultural' CSOs.

If giving up the pretence that the poor are massing to overthrow the rich pours cold water on somebody's illusions, we can take real heart in the patchwork pieces of realistic cooperation and practical progress that are being achieved. There is reason to hope that a Third System quilt can be sewn from our many separate works.

Anwar Fazal (who was the Founding Father of most of the HAI-bred-SAN-PAN-IBFAN Scam) taught us to count our blessings alphabetically. Here are the seven 'Cs' we have picked up over the last half-century:

- *Care*. We have learned to use our extremely finite human and financial resources with incredibly greater efficiency than corporations or governments.
- *Consistency.* We have shown that we can keep to an issue, that our institutional memory (at least by comparison) is much greater than those of the other systems and that the individuals that comprise the Third System can embody greater experience and expertise than those in corporations or governments.
- *Context*. We have developed a more holistic vision of where we are going and can analyse and contextualise issues in a more realistic framework than can those we find ourselves opposing.
- *Cooperation*. The scope and pace of our cooperation has increased massively. We use fax, e-mail and the Internet with growing effectiveness. We know one another as we never used to. The community of cooperation has also extended beyond the wobbly matrix of classic 'development' and 'environment' CSOs to Indigenous Peoples' networks, organisations of the differently abled; the women's movements; youth; strong association's of the elderly; and other genuine Peoples' Organisations.
- *Connections*. Unlike governments and corporations, we are able to sustain a mutually valuable flow of information and experience between on-the-ground community realities and multilateral UN policy fora.
- *Conviction*. We have the moral high ground whereas those working for the other systems rarely have our loyalty or commitment.
- *Credibility.* In general, we are not seen to be self-serving in the way that government and corporate spokespersons are seen by most of society.

These are not modest tools for civil society. To this list, we could add a number of things that we are not. Most prominent among this category is that we are not homogenous or monolithic. Our diversity is a strength, especially because we still share broadly similar social goals but we approach them from so many different points.

50 years is not too long

For CSOs, time is the lever or pulley that allows us to lift and move what we could not otherwise muster the resources to move. It is David's catapult against Goliath's sword. The seven strengths of CSOs should lead us to the conclusion that we are least effective in short-term campaigns and most effective when our strategic resources are brought to bear in long-term initiatives (within which, of course, there must be more immediate tactical campaigns). It is important to evaluate our use of time (and consistency) against that of the other two systems.

It is common wisdom, for example, that governments plan four years at a time. This is just partly correct. Most of the issues advocacy CSOs raise in the North never make it to the Cabinet table and are left in the hands of bureaucrats with much longer time-lines. It is usually when we reach the politicians that we are able to employ time to our advantage. Here and there, of course, bureaucracy has lost its memory. The aid ministries of most industrialised countries have been so gutted and demoralised as to lose their historic overview and issue consistency. As government departments 'downsize' personnel, staff turnover increases and this can strengthen the position of CSOs.

Connection—the link between national and international action—is crucial here. To engage the politicians, international advocacy CSOs must work in cooperation with national CSOs. As long as we are duelling with diplomats, we are wasting energy. The message must get back to their capitals. This may be still more true for the North—where the listening line from UN fora to the Cabinet room is very uncertain—than for the South.

But if the political pressure in the North must be essentially domestic to be effective, the practical experiences of People's Organisations in the South is an essential part of that pressure and of our ability to influence global fora and international media.

Consistency is also a barrier for the First System. Although corporations pretend otherwise, the heads of transnational enterprises (TNEs) are forced to focus only three or four months ahead—to the next quarterly shareholders' report and credit-rating evaluation. True, each industry division within the giant enterprise has a medium- and long-term game plan, but the divisions would be foolish to assume that, ten years down the road, they will still be part of the same TNE—or that specific pieces of themselves will not have been cut off or cut away. Indeed, their game plan must include these possibilities. Profitability is no protection—if other divisions are still more profitable. In the world of global companies, people, policies and plans are all transient.

After all, while there were USD 659 billion in mergers in 1996, there were also close to a hundred billion dollars in divestitures (where conglomerates shucked off less appetising subsidiaries). Transnationals are not immune to these problems. One-third of today's Fortune 500 won't be around in 2010. The average life expectancy of a US TNE, in fact, is between 40 and 50 years. European and Japanese corporations manage a short and brutish existence of only 13 years.

As bureaucrats are the politicians' unsteady answer to Alzheimer, trade associations are industry's protection against their memory loss. However corporations mix their subsidiaries, the trade associations carry on with a tenaciousness comparable to that of CSOs—and with a lot more money. The good news is that they are still not as consistent and their personnel turnover is still greater than our own. Many industry associations also rely heavily on individuals from corporations to get their message across.

By comparison, CSOs can reasonably expect to carry out a multi-year strategy, accumulating greater and greater expertise and influence in multilateral negotiations. Time is on our side. We have failed to use it well. The social change we seek will take a very long time—generations. Our medium-term strategies should never be less than a decade. In order to develop strategies that play to our strengths, we need to examine some of our weaknesses and the changing realities of South–North relationships.

Access to resources

Bank-rollers and issue ambulances

The handful of government agencies, development CSOs, church-based agencies and foundations that have been the mainstay of advocacy campaigns must be prepared to move beyond the 'issue ambulance' chase and short-term campaign to seek the long-term structural strategy that allows a variety of advocacy CSOs to play separate roles in concert. Funders also need to work with advocacy CSOs to hone an early-listening system. There have always been those among us who see what is coming but few among resource donors who are willing to look up from their project reports long enough to listen.

The record of recent decades convinces us that the Third System is capable not only of catching ambulances, but preventing accidents. The Bank-rollers among us need to look for and support wider and longer strategies.

Third World or Third System?

For all this, we need a Third System movement. Aside from the control of money, Northern CSOs have also been the gatekeepers of both information and information analysis. The improvement of communications and the development of micro-electronics (from faxes to Internet to cellular phones) means that it is cheaper (and better) to undertake most information gathering and analysis in the South.

Power in the relationship between Northern and Southern CSOs is shifting southward. Progressive, effective Southern CSOs can access money for progressive work more effectively than can Northern counterparts. They can also undertake more useful analysis closer to the area of impact. Progressive

Northern CSOs will increasingly depend upon Southern cooperants for support and will be needed less and less to supply relevant information. Ten years from now, Northern CSOs will offer only very specialised kinds of information and a 'lobbying' function in their own governments and fora located in the North (not merely Brussels, Geneva, New York, Washington, Tokyo, Frankfurt and Paris, where we may glean information but have little hope of influence—but also Ottawa, The Hague, Oslo, Stockholm, Canberra, etc. where information and influence are both possible). Northern CSOs will also retain a human resources and technical training role since the easiest access to education (if not information) will still reside in the North.

Northern CSOs will also have a growing role to play in monitoring decision-making and technological strategies among transnational enterprises. Bohol happens in the South, but the corporate decisions that let it happen are made in the North.

Can we extend ourselves beyond classical South–North strategies to create an informal—but real—Third System movement that would convene occasionally to review our shared interests and identify points of collaboration?

At a Brundtland follow-up conference near Tunis towards the end of 1988, we were reminded that scoundrels and hypocrites act in the name of the 'general good' and that William Blake claimed that art and science were only possible in 'minutely organised particulars'. In other words, grand strategies not only don't work but they are destructive.

Agreed. The strength of civil society lies partly in its diversity. But diversity does not prevent coherence and cooperation. South and North, donor and taker, like-concerned people need to spend more time thinking long-term together. A Third System movement is not homogenous—but it must be a patchwork quilt of minutely organised particulars—having individual integrity and a collective strategy. There are at least three areas in which a common strategy might be possible. Some thoughts are offered here for each of these for the purpose of encouraging discussion. In a sense, they are obvious: the common need of actors in civil society to influence governance; to strengthen rights; and to democratise information.

The governance agenda

In the early–mid-1990s, the Dag Hammarskjöld Foundation and the Ford Foundation threw their considerable weight behind the work of Sir Brian Urquhart and the late Erskine Childers in reviewing the governance of the UN System and recommending a major restructuring of UN leadership. Civil society organisations dealing with the UN will have no difficulty

endorsing all—or most—of the proposals. The series of studies have stirred international debate and provoked a number of intergovernmental initiatives for UN reform from Stockholm to New York. Left in the hands of governments, however, the studies are dead.

Urquhart and Childers are very clear. UN leadership—UN governance—is a tragedy verging on a travesty. Between the indolence of the G7 (and the towering stupidity of Jessie Helmes), the impotence of the 'little Northerners' (Canada and the Nordics), and the employment needs of the G77, governments are simply incapable of bringing intelligent governance systems to bear within the UN System or other multilateral institutions. Change will only come about if CSOs make it happen.

If more proof were needed, it was provided in mid-1997 when the UN Secretary-General tabled a new restructuring proposal. Largely orchestrated by Maurice Strong, the new proposals are breathtakingly menial, avoid all the tough issues, and sidestep the realities of the major UN agencies outside the New York net. Indeed, among the most telling recommendations are those that would bring the corporations into the policy-making arena of international governance.

Why should CSOs take action? Because the UN and its Specialized Agencies are filled with talented, capable, mismanaged people whose expertise could be put to much better use with effective governance. Because the UN System still devotes many hundreds of millions of dollars to the development agenda that could be put to much better use. Because the intergovernmental agreements and policies established in UN organs often propel national legislation and regional cooperation throughout Africa, Asia and Latin America. Because the United Nations can still hope to provide some counterbalance to the First System. Because civil society can realistically achieve these changes.

Thanks to Urquhart and Childers, we also have all the information we need. Two simple tables from their 1996 study, *A World in Need of Leadership: Tomorrow's United Nations—A Fresh Appraisal*, provide the dates and process (or non-process) for the selection of the heads of each of the major UN bodies. Another study, sponsored by the same Foundations and penned by one of the UN System's foremost experts and philosophers, Charles Weitz, gives CSOs the nitty-gritty detail on the malfunctioning of UN electoral politics. Weitz, who worked as a senior official at FAO for decades, has authored *Who Speaks for the Hungry? How FAO Elects Its Leader.* What he says about FAO can just as readily be translated to other UN bodies. We will always be in his debt.

Table 16 Timetable for leadership elections/appointments for major United Nations agencies

Post	Election	Tenure	Terms	Timetable	Nomination	Search	Scrutiny	Approval
ITU	1998	4	Two	No	State	No	No	Plen. Conf.
UNHCR	1998	5						
WHO	1998	5	No limit	Yes	State/Exec. Bd.	No	Yes	Assembly
FAO	1999	6	No limit	Yes	State	No	No	FAO Conf.
ILO	1999	5	No limit	Yes	State	No	No	Gov. Body
UNCHS	1999	4						
UNCTAD	1999	4						
UNESCO	1999	6	Two	Yes	State/Exec. Bd.	No	Yes	Gen. Conf.
UNFPA	1999	4						
UNRWA	1999	3						
UPU	1999	5	Two	No	State	No	No	Congress
WMO	1999	4	No limit	No	State	No	No	Congress
(WTO)*	1999	4						
IBRD	2000	5	No limit	Yes	Exec. Bd.	No	Yes	Exec. Bd.
ICAO	2000	3	No limit	Yes	State	No	Yes	Council
UNEP	2000	4						
UNICEF	2000	5						
IAEA	2001	4	No limit	No	Bd. Govs.	No	Yes	Gen. Conf.
IFAD	2001	4	Two	No	State	No	No	Gov. Counc.
IMO	2001	4	No limit	Yes	Council	No	Yes	Counc./Assem.
UN S-G	2001	5	No limit	No	State/S-G	No	No	UN GA
UNDP	2001	4						
UNIDO	2001	4	Two	Yes	Dev. Bd.	No	Yes	Gen. Conf.
IMF	2002	5	No limit	Yes	Exec. Bd.	No	Yes	Exec. Bd.
UNU	2002	5	Two	Yes	UN/UNESCO	Yes	Yes	Council
WFP	2002	5						
WIPO	2003	6	No limit	No	Coord. Comm.	No	Yes	WIPO GA

* The World Trade Organization is included because according to UN Charter Article 57 it should be brought into relationship with the UN and the system as a Specialized Agency. At time of preparation of this issue this has not yet been done.
Source: Urquhart, Brian, and Childers, Erskine, *A World in Need of Leadership: Tomorrow's United Nations—A Fresh Appraisal,* 1996, tables 4 and 5.

Change must begin where Urquhart, Childers and Weitz point the way. If CSOs are able to bring order and democracy to the backroom elections of the UN's agency heads, the winds of real change will blow freely and other, more profound, institutional and inter-institutional changes will become a matter of tune.

Precisely how can we do this? First, those CSOs working in a formal rela-

tionship with a UN agency must take the lead, based upon their special knowledge of the permanent representative, professional officers and staff unions as well as their detailed sense of the agency's culture and programme of work. Civil society's task, of course, is not to appoint UN leaders but to ensure that the election process is sound, attracts a number of good candidates, and involves a healthy debate on the future work of the agency.

In the almost complete absence of any kind of transparent process, CSOs could consider the following actions:

- Make public all the current legal processes (including key dates and timetable) related to the nomination and selection of candidates for a post at least two years in advance of an election.
- Invite the agency's governing body to formally establish job qualifications, description (including benefits), a search and review (scrutiny) process, and information on the election process and to make this information available to all member governments.
- If the governing body fails to do this at least 18 months in advance of an election, publish a job description and qualifications list, based upon informal advice from governments, the staff union, and professional officers as well as other CSOs. Also publish the salary and benefits associated with the post.
- Where an incumbent is seeking re-election, conduct and publish a poll among governments and staff on their evaluation of the incumbent's performance.
- Advertise (including in appropriate journals and newspapers as well as on the Internet) for candidates for the post and encourage governments and others to consider nominations based upon the qualifications.
- Interview all declared (and undeclared) candidates to assess their qualifications and to understand their proposals for the future of the agency. Make available the interviews to governments and to appropriate media. If any potential candidate declines to be interviewed, obtain background and other information from those familiar with the candidate.
- Convene individual and all-candidates meetings, neutrally chaired, so that governments and staff have an opportunity to talk with nominees and hear their views.
- Analyse and publish the results of the election and make recommendations for the conduct of the next election.
- Monitor the conduct of the agency head with respect to the vision outlined during the campaign.

Since CSOs may have specific ideas on the future of the agency and on its leadership, they must ensure that the governance process they invoke is

independent from their own proposals for the agency. Certainly, CSOs should use the election opportunity to present their own views and support the candidates they believe best suited for the work.

Improving governance around election/selection processes in the UN System is one direct and clear way in which civil society can make a contribution. The task is not to put UN secretariats on notice but to put governments on notice. But we can do more. Advocacy CSOs monitor most UN fora. Were we to share our observations in these fora more efficiently, we could make a further contribution to governance. During 1996, to offer one example, Canada's delegations to the Food Summit and to the Biodiversity Convention adopted a strongly supportive position favouring Indigenous Peoples. At different points in each negotiating process, however, Canadian diplomats appeared 'accidentally' to drop the ball, leading to bad text and worse decisions. Scandinavian delegates in one fora—and the Dutch in another—were surprised by the apparent mistakes and rushed to correct the damage too late. In their frustration, they talked to other delegations and CSOs. Because the CSOs monitoring the Biodiversity Convention were in daily contact with CSOs monitoring the Food Summit, the parallel 'mistakes' were noted and the Canadian government was accused of deliberate duplicity. Other governments were also told of the Canadian ploy and that country's diplomats were exposed. A short time later, Canada's negotiating posture improved. This is only one example where CSOs have noticed governments—South and North—have played a double-game.

Working more cooperatively, CSOs could provide national capitals, media and international conferences with regular reports, noting both the consistencies and inconsistencies of governments in different fora and making clear the strategies being followed by key countries. Incidentally, the embarrassment led Canada to change its policy stance early in 1997.

This is not a costly strategy. It would be difficult to conjure another civil society contribution that could have as much impact on the quality of work of the United Nations. If we do not take on this task, we could be accused of dereliction of duty.

The rights agenda

Among the more delicate negotiations around the World Food Summit in 1996 were those between CSOs campaigning, variously, for a Convention on World Food Security; a Covenant on the Right to Food; and a Protocol to the Convention on the Economic and Cultural Rights of Peoples related to the Right to Food. Meanwhile, still other CSOs in Rome were campaigning for Farmers' Rights. Across the pond, in Buenos Aires, their counterparts

were also talking about Farmers' Rights; Indigenous Rights; and the defence of human rights in the face of the Human Genome Diversity Project. Although the starting point for their discussions might have been FAO or the Biodiversity Convention, each advocacy group found itself inevitably considering the UN High Commissioner for Human Rights and the International Court of Justice.

Recognising that the erosion of rights is one of the most imperiling threats of our times, CSOs are increasingly looking to 'constitutional' or 'human rights' mechanisms to counter the force of the World Trade Organization or the World Intellectual Property Organization. The invocation of human rights is both a strategy and a principle. It is one that draws together a broad spectrum of civil society and holds real promise of success.

The diverse CSOs advocating the right to food (be it protocol, covenant, or convention) have two goals: to entrench an enforceable legal right to food nationally and internationally; and, to create a counterweight to the WTO's draconian agricultural chapter when it comes up for review in 2000. Under the Uruguay Round agreement, the South has lost its right to agricultural self-sufficiency and nationally protected food security. The hungry are now to depend upon the benevolence of the marketplace.

The Right to Food is being interpreted in a variety of ways which would seem to be compatible. Some CSOs stress the consumers' right to available, adequate, affordable, culturally appropriate food. Others see the Right to Food as also the right of the producers (small farmers, fisherfolk, foresters) to the security of production resources and equitable markets, including the concept of Farmers' Rights (with additional dimensions of collective cultural and intellectual integrity). In this framework, the issue draws together coalitions ranging from IBFAN, PAN and genetic resources CSOs to trade groups and traditional human rights advocates. It also addresses the concerns of indigenous peoples' organisations and grassroots groups like Via Campesina.

The strategic path for the Right to Food, engages both FAO and the UN Human Rights Committee but its ultimate goal is to create a legal instrument that could be defended before the International Court of Justice and counter the WTO.

But the rights agenda has dimensions—hopefully still compatible—beyond the Right to Food. Indigenous peoples and farmers at the Convention on Biological Diversity are fighting to protect their local and indigenous

knowledge against biopiracy. Indigenous peoples, in particular, are alarmed that human biodiversity is technically subsumed by the Biodiversity Convention. These groups feel that their intellectual contribution is being usurped by the patent system and that the TRIPs chapter of the GATT accord sanctions the theft on a global scale. One solution is to take the issue to the World Court and ask for an advisory opinion on patentability and trade in life forms and on the predatory nature of international patent regimes. Here, the intellectual integrity agenda could mesh with the Right to Food agenda.

As with any good strategy, it is rather straightforward. Indigenous peoples and farmers (supported by others in civil society) could ask any one of the UN General Assembly, ECOSOC or any major UN agency to request one or all of four advisory opinions from the Court:

1.Given that current intellectual property regimes allow the incorporation of local and indigenous knowledge as the substantive part of many accepted claims, but render it either impossible or impractical for the local or indigenous communities themselves to be protected by the same regimes, is intellectual property predatory upon the rights and legitimate interests of these communities and does it represent an unfair usurpation of their rights and resources?

2.Is the issue of intellectual property protection over living materials, or their products and processes, fundamentally moral in nature, needing to be determined at the personal, community and national level rather than being subject to the dictates of international trade agreements, or can such agreements be interpreted as obliging signatory states to accept practices they deem to be immoral?

3.Is human biodiversity acceptable subject matter for management by the Convention on Biological Diversity or are special measures and institutional mechanisms required?

4.Is the Right to Food, as expressed in United Nations resolutions and conventions, a higher obligation than the requirement of a State to observe trading agreements that could imperil the right of its citizens to food security?

The Court would normally return an opinion within 12 months—certainly before the WTO reviews of its TRIPs and agriculture chapters in 1999/2000 (respectively).

Should the International Court of Justice express sympathy for the notion that current patent practices are predatory and that the ownership of life's products and processes is a legitimate moral consideration, the consequences could be far-reaching. Certainly, countries such as the USA and Japan will flatly reject the Court's opinions but multilateral trade agreements have at least a modest life of their own. The current TRIPs chapter, to be reviewed in 1999, allows that individual patents may be rejected on the basis of morality. Most industrialised countries make the same allowance in their own laws. Based on the Court's findings, many governments (including a few in the North?) might agree that the morality exclusion clause could be expanded to an entire class of intellectual property—denying protection for any 'invention' involving living material products or processes. This could, *de facto*, revoke the requirement to 'protect' plants and micro-organisms in the trade agreement.

In the same way, a Court opinion suggesting that the Right to Food is of a greater magnitude of importance than trade obligations would also enforce the Marakesh exemption (for food-deficit countries) in the WTO and give impetus to the development of stronger legal provisions through the UN High Commissioner for Human Rights and FAO. The Court findings could be discussed extensively at the time of the 1999 FAO Biennial Conference (coinciding with the review of the WTO's TRIPs chapter and on the eve of the agricultural chapter) and contribute to its Right to Food/Food for All campaign. The review of the Food Summit is also slated to take place in either 2004 or 2006—about the same time as 'least developed' countries are obliged to adopt the agricultural provisions of the Uruguay Round.

In short, the multi-faceted rights agenda flows through the same arteries of the UN General Assembly, the International Court of Justice and the World Trade Organization. Each facet of the agenda, has its own tributaries (the World Health Organization and the UNESCO Bio-ethics Committee, for human biodiversity; the FAO Commission, Committee on World Food Security and the Biodiversity Convention, for food security initiative) but there could be synergy of civil society action at crucial places along the way.

The information agenda

Activist CSOs collect, research and analyse information with considerable effectiveness. We get our information to politicians and civil society through a multitude of media with varying degrees of efficiency and credibility. Although the information receives modest coverage in the South, very little of it penetrates the North. The overall result is more kaleidoscopic than coherent. It takes a very long time for critical information about new issues or developments to reach people.

The limited numbers of us who are riding the crest of the Information Highway cooperate and improve communications by linking our Internet Home Pages. The overwhelming majority of us who still rely on paper could do much better.

A variety of media channels is not only democratic but practically desirable. In the English language, effective communication requires the populism of the *New Internationalist*, the substantive campaigning of *The Ecologist*, and the newly-established *The Corner-House*, the hard-news impact of Inter Press Service and the reflectiveness of *Development Dialogue*—and probably much more. The issue-specific information provided by PAN or GRAIN's *Seedling* or the *RAFI Communiqué* all have a role. In a Third System movement, however, the level of dialogue and the sense of direction could lead to better information and action. This does not—could not—mean a super-editorial board. Therein lies disaster.

As the Internet becomes more accessible in the South, however, the level of coordination between independent information providers could increase in both quality and quantity to reach policy-makers, press and people. In such areas as governance and rights—and right now as many of us work to challenge the upcoming GATT reviews—more coordinated approaches in both electronic and print communications could be one part of our shared strategies. We have talents and tools we are not using as well as we should.

The part of the people

In 1977, the struggle confronting a group of activist researchers meeting in Saskatchewan, Canada, was to get seeds—crop genetic erosion—on the world's agenda. In 1987, in Bogève, France, the struggle was to win recognition for the coming impact of the new biotechnologies. The work in these areas must continue. But, in 1997, success or failure for all our separate issues depends on how well we construct a Third System movement and help make space for the Part of the People.

Milan Kundera was only partly right. 'The struggle of people against power is the struggle of memory against forgetting'. True enough. But, today, it is also the struggle to achieve a creative balance between remembering and vision, and between cooperation and diversity. Sometimes, it is also the struggle between corrections and courage.

Glossary

Agenda 21	A multi-faceted intergovernmental Plan of Action to address sustainable development issues in the 21st Century adopted at the United Nations Conference on Environment and Development ('Earth Summit') in Rio de Janeiro, Brazil, in June 1992.
AgreeCulture	Individual scientists and policy-makers from Australia, Canada, UK and USA, who play a dominant role in CGIAR governance and science strategy.
Assay	A test to detect the presence of an enzyme or protein.
BioPiracy	The expropriation of any biological material for commercial purposes, in the absence of effective intergovernmental regulation and the fully informed consent of those who have nurtured and developed the material.
Conference of the Parties (COP) to the Convention on Biological Diversity (CBD)	All the national governments which have ratified the Biodiversity Convention. The COP meets periodically to debate and carry out the Convention's mandate. COP scheduled meetings in the Bahamas in 1994, in Indonesia in 1995, in Argentina 1996 and in Slovakia in 1998.
Cooperative Innovation System(s)	Also known as the Informal or Community Innovation System, the term describes the collective process of scientific research traditionally carried out by indigenous peoples and other farming communities. The term compliments the Institutional or Formal Innovation System that is traditional in western-style public and private laboratories.
Deep ecology	A perspective of the biosphere that looks upon *homo sapiens* as only one (among equals) of the millions of planetary species with no special rights or claims on the earth's resources.
DNA (deoxyribonucleic acid)	The molecule in chromosomes that is the repository of genetic information in all organisms (with the exception of a few viruses in which the hereditary material is ribonucleic acid or RNA). The information coded by DNA determines the structure and function of an organism.
(Rio) Earth Summit	See Agenda 21.
Ecosystem	All the biotic (living organisms) and abiotic (non-living components) and the total environment within which the organisms naturally occur.
Ex situ conservation	Literally, conservation off-site or outside an organism's natural habitat. Gene banks and botanical gardens are examples.
Farmers' Rights	In 1985, RAFI introduced the principle of Farmers' Rights to the UN Food and Agriculture Organization (FAO) Commission on Plant Genetic Resources (now the FAO Commission on Genetic Resources for Food and Agriculture). The FAO's International Undertaking on Plant Genetic Resources was amended in 1991 to include Farmers' Rights. The amendment recognises farmers as past, present and future *in situ* agricultural innovators who collectively conserve and develop agricultural genetic resources around the world. Farmers are recognised as innovators entitled to intellectual integrity and to compensation whenever their innovations are commercialised. Farmers have the right to Germplasm, Information, Funds, Technologies and Farming/Marketing Systems (GIFTS). Compensation is anticipated via a global Gene Fund, paid into by the North for genetic conservation and improvement in the South. Agenda 21 and the Biodiversity Convention have also adopted the principle of Farmers' Rights.

First Farmers	Indigenous peoples around the world who were the first to domesticate plant and livestock species and who continue to conserve and enhance the majority of the world's agricultural biodiversity.
First Nations	Indigenous peoples having—or struggling for—self-determination within their own lands.
Gene (or seed) bank	A form of *ex situ* conservation for plant germplasm. Gene banks are preferably (but only sometimes) humidity- and temperature-controlled facilities where seeds (or other reproductive material) are stored for future use in research and breeding. Many gene banks are nothing more than deep freezers or refrigerators. Banks should only be seen as a back-up for the maintenance of crop genetic diversity *in situ* or *on-farm*.
Genome	All the genetic material in the chromosomes of a particular organism or species.
Genotype	Genetic or factorial constitution of an individual; a group of individuals all of whom possess the same genetic constitution.
Germplasm	The total genetic variability, represented by germ cells or seeds, available to a particular population of organisms.
Hepatoma	A usually malignant tumour of the liver.
In situ conservation	Literally, conservation on site. *In situ* conservation is the conservation of ecosystems and natural habitats, and the maintenance, recovery and development of viable populations of species in their natural surroundings. In the case of domesticated livestock or cultivated crop species, it is their conservation on-farm.
Keystone Dialogue	The Keystone International Dialogue on Plant Genetic Resources (1988–91) conducted by the Keystone Center of Keystone, Colorado, USA.
Landrace	A derogatory term sometimes still used to describe Farmers' Varieties (farmer-bred crop varieties developed through the Cooperative Innovation System). Up until the 1980s, 'Landrace' was interchangeable with even less attractive terms such as 'stoneage seed', 'heirloom seed', or 'primitive cultivars'.
Life industry	With the development of biotechnology and the expansion of patent-like regimes over living material, the agrochemical, seed, pharmaceutical, animal health care, human genomics, and food industries are merging into a new Life Industry dependent upon a common set of technologies and monopoly laws.
Microbe (or micro-organism)	Algae, bacteria, fungi (including yeasts), protozoa, and viruses. The term *micro-organism* has no universally-accepted scientific or legal definition. In patent law, it often applies to any minute biological material, including cell lines of plants and animals, and human genetic material.
Phylum (plural: phyla)	A main division of the animal or the vegetable kingdom.
Protozoa	The lowest and simplest of animals, unicellular forms or colonies multiplying by fission.
Transgenic organism	Any organism that has been genetically engineered to contain a gene from another organism, usually from a different species.

Note on the Author

For more than thirty years, Pat Roy Mooney has worked with civil society organisations (CSOs) on international trade and development issues related to agriculture and biodiversity. Born in Brandon, Manitoba, Canada, Mooney has lived most of his life on the Canadian prairies despite extensive international travel obligations. The author or co-author of several books on the politics of biotechnology and biodiversity, Mooney received The Right Livelihood Award (the 'Alternative Nobel Prize') in the Swedish Parliament (1985) and the American 'Giraffe Award' given to people 'who stick their necks out' (1986). Pat Mooney has no university training, but is widely regarded as an authority on agricultural biodiversity and biotechnology issues. Mooney is known within the Canadian development community for his work with the Miles for Millions Marches of the 1960s, the provincial 'matching grants' drive of the 1970s, and campaigns to conserve crop genetic diversity in the 1980s and 1990s. Internationally, Pat Mooney is best known for his original work in organising South/North CSO lobbies in UN fora in the 1970s and for his work with genetic resources, biodiversity and biotechnology since then.

Together with Cary Fowler and Hope Shand, Pat Mooney began working on the 'seeds' issue in 1977. In 1984, the three co-founded the Rural Advancement Foundation International (RAFI). RAFI is a small international CSO addressing the impact of new technologies on rural communities. RAFI has offices in Canada and the United States, and works closely with CSO partners in Africa, Asia, Latin America, Europe and Australia. Most recently, Mooney has been looking at the role of civil society organisations in support of multilateral governance systems and in the context of the growing power of transnational enterprises.

Pat Mooney lives in Winnipeg, Canada, where he is Executive Director of RAFI. Pat is married to Susie Walsh and has five children from an earlier marriage. They are Robin (1978), Kate (1980), Sarah (1983), Jeff (1985) and Nick (1988). With Susie, he shares responsibility for Kelsey (1989).

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Pat Mooney has also contributed to numerous books, periodicals and UN studies.

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